Heart Emergency Room: Effective for Both Geriatric and Younger Patients

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ABSTRACT

Objectives: To compare the 30-day cardiac event rate between patients aged at least 60 years (geriatric group) with those younger than 60 (younger group), who were enrolled in an Emergency department-based chest pain centre management protocol.

Methodology: This was a retrospective, cohort study done at the Centre for Emergency Care at the University of Cincinnati, from 1 Oct 1991 to 31 March 1999 (from Oct 1991 to Dec 1998: 9-hour protocol in use; from Jan 1999 to March 1999: 6-hour protocol in use). Patients, at least 25 years, with the chief complaint of non-traumatic chest pain were eligible for management in the unit. Exclusion criteria included acute ST-elevation or depression > 1 mm in 2 contiguous leads, haemodynamic instability or clinical syndrome consistent with unstable angina. Outcomes studied were disposition and cardiac events at 30-days (defined as acute myocardial infarction, congestive heart failure, ventricular fibrillation / tachycardia arrest, coronary artery bypass surgery or percutaneous transluminal coronary angioplasty).

The protocol was the standard of care and enrolled patients underwent continuous ECG and ST-segment trend monitoring, serial CK-MB draws at 0, 3, 6 and 9 hours, followed by either a graded exercise stress test or a sestamibi myocardial perfusion scan (from Oct 1998). With the 6-hour protocol the 9-hour draws were omitted and the GXT done 3 hours earlier.

Results: A total of 2491 patients were enrolled; 304 (12.2%) in the geriatric age-group. The mean age was 66.8 ± 5.9 and 41.3 ± 8.6 years respectively. There were 133 (43.8%) female patients in the geriatric group and 1170 (53.5%) in the younger group. There were no statistically significant differences between the groups in terms of prevalence of risk factors, but there was significant difference when comparing illegal drug use (p < 0.001) and ECG changes from the baseline (p = 0.0015).

The geriatric patients were also not different from the younger ones in terms of GXT positive for ischaemia (10, 5.3% vs 42, 2.7%; p = 0.124), admission rates (61, 20.1% vs 321, 14.7%; p = 0.312), coronary care unit admissions (8, 2.6% vs 63, 2.9%; p = 0.418 and 30-day complication rate (10, 3.6% vs 46, 2.4%; p = 0.303).

Conclusion: The ED-based chest pain unit represents an effective way for the risk-stratification and management of both geriatric and young patients with low-to-moderate risk of acute coronary events.

Keywords: geriatric patients, chest pain, coronary events.

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INTRODUCTION

In most developed countries, the proportion of elderly is expected to increase in the forthcoming decades of the first half of the twenty-first century[1,2]. Currently, in Singapore, there are about 235 000 (7.2%) elderly at least 65 years in age. This number is expected to increase to 800 000 (20%) by the year 2030. This represents an average increase of 3.6% per annum. The old dependency ratio of 1 elderly: 13 working adults in 1990 will become 1:3 by the year 2030[3].

The growth in this group represents an important public health challenge as they are often said to consume disproportionately high amounts in terms of health and long-term care costs[4,5].

Over the past decade, geriatric medicine has made a profound impact on health care systems. Its effect on Emergency Medicine is no exception, as it becomes more prominent and increasingly directed towards the elderly[6-8].

With advancing age, cardiovascular diseases has become a leading cause of death and disability. It is also the most common cause for hospitalisation.

About 80% of deaths due to ischaemic heart disease now occur in individuals older than 60 years[9-11].

Cardiovascular complaints rank number one as the Emergency Department (ED) presenting complaint amongst patients in many countries[7,8]. Establishing the diagnosis in these 'golden age' patients is a challenge and relatively few diseases are 'isolated' or 'pure' in this age group[12]. Pre-existing comorbidities are also well-known. Variable display of symptoms and signs may result in the elderly spending more time in the Emergency Department (ED), having more diagnostic tests and they are also more likely to be misdiagnosed compared to their younger counterparts[11,12]. A comprehensive evaluation requires sensitivity to their concerns, awareness of the unique aspects of their medical problems, an ability to interact effectively with the patients as well as with a variety of health professionals and a great deal of patience. Cardiac ischaemia in this age-group is often clinically 'silent' or associated with atypical symptoms and establishing the diagnosis will frequently depend on results of carefully selected and implemented tests to avoid unnecessary utilisation of resources[13,14]. Their care must be individualised as disease-oriented models for non-elderly may not be appropriate.

In this era, where rapid diagnostic centres for chest pain and the Heart Emergency Room (HER) concept are gaining acceptance, perhaps the answers pertaining to the more efficient management of the low-to-moderate risk elderly with chest pain may lie here[15-20]. At present, there are no studies pertaining to, in particular, the management and outcome of the elderly in chest pain units/HER. The results of the present study would thus highlight some preliminary information on this ever increasing and important group of patients.

OBJECTIVES

This retrospective, observational cohort study was done to compare the 30-day cardiac complication rate between patients aged 60 years and older (geriatric patients), with those younger than 60 years, who were managed in the HER at the Department of Emergency Medicine, University of Cincinnati. Their demographic data, risk factors, ambulance utilisation rate, clinical presentation, management and disposition were also analysed.

METHODOLOGY

The HER database was reviewed for records of patients enrolled in the University of Cincinnati HER Program from Oct 1991 to 31st March 1999. The protocol driven care rendered to patients admitted to the HER has been considered the standard of care in the institution. Patients were eligible for the HER if they were older than 25 years and presented to the ED with non-traumatic chest pain, suspicious of Acute Coronary Syndrome (ACS), but with an initial 12-lead ECG, non-diagnostic for ischaemia or myocardial infarction. The initial ECG was considered diagnostic for Acute Myocardial Infarction (AMI) or myocardial ischaemia if there was ST elevation or depression greater than 1 mm in two contiguous leads. These patients, as well as those with a history consistent with unstable angina pectoris or hypotension with systolic blood pressure less than 90 mmHg were excluded.

Once enrolled, patients were subjected to serial ECGs and biochemical markers, namely myoglobin, troponin and CKMB, at 0, 3 and 6 hours. In the initial phase of the program, the protocol was for up to 9 hours, but since January 1999, it has been reduced to 6 hours. In monitoring the ECG, a non-specific ST-T change is defined as flattening of the T-wave or minimal T-wave inversion, with ST-segment depression, The left ventricular hypertrophy (LVH) criteria used in the study is the voltage criteria, where the sum of the depth of the S-wave in V1 and the height of the R-wave in leads V5 or V6 exceeds 35 mm[21].

Depending on the results, patients could be admitted, discharged or made to undergo further tests such as a graded exercise stress test (GXT) or sestamibi SPECT (single photon emission computerised tomography) perfusion scanning (introduced in October 1998). These were usually done in collaboration with the Cardiology attending. The patients enrolled were followed-up to determine the 30-day complication rate. These cardiac-related complications included cardiac deaths, cardiogenic shock, congestive heart failure admission, ventricular fibrillation/tachycardia arrest, percutaneous transluminal coronary angio-plasty (PTCA), coronary artery bypass grafting (CABG) and myocardial infarction greater than 24 hours after presentation.

All the data required for follow-up information were sought from computerised hospital records. If incomplete, the patients were contacted by either telephone or a mailed questionnaire. Local and national statistics and databases were also searched for mortality information.

Microsoft ACCESS program was utilised for data management and SAS was used for descriptive analysis and statistics. Chi-square test was used to evaluate the difference between the two groups. Statistical correction was done for age, sex due to the different number of patients in the two groups.

RESULTS

A total of 2491 patients were enrolled in the HER protocol at the University of Cincinnati during the

Table I. Comparison of Demographic Data in the Geriatric and Younger Patients.

	Geriatric Patients > 60 years	Younger Patients < 60 years
Number of Patients	2187 (87.8%)	304 (12.2%)
Mean Age (years)	66.8 ± 5.9	41.3 ± 8.6
Sex	Male : Female 171 : 133 56.2% : 43.8%	Male : Female 1018 : 1169 46.5% : 55.5%
Race	Blacks : 207 (68.1%) White : 90 (29.6%) Others: 7 (2.3%)	Blacks : 1290 (59.0%) White : 864 (39.5%) Others : 33 (1.5%)

Table II. Comparison of Risk Factors in the Geriatric and Younger Patients.

Risk Factors	Geriatric Patients	Younger patients	p-value
Cigarette Smoking	116 (38.2%)	1315 (60.1%)	p = 0.095 NS
Hypertension	173 (56.9%)	692 (31.6%)	p = 0.102 NS
Diabetes Mellitus	58 (19.1%)	212 (9.7%)	p = 0.150 NS
Increased Lipids	33 (10.9%)	187 (8.6%)	p = 0.008 NS
Family History	62 (20.4%)	242 (11.1%)	p = 0.065 NS
Illegal Drug Use	2 (0.7%)	211 (9.6%)	p < 0.001

Table III. Results and Outcomes.

	Geriatric Group	Younger Group	p-value
Number who had GXT	189 (62.2%)	1 531 (70.0%)	
GXT positive for ischaemia	10 (5.3%)	42 (2.7%)	0.124
Admission to hospital	61 (20.1%)	321 (14.7%)	0.312
Admission to coronary care unit	8 (2.6%)	63 (2.9%)	0.418
Number lost to follow-up at 30-days	23 (7.6%)	308 (14.1%)	
Complications at 30-days	10 (3.6%)	46 (2.4%)	0.303

study period. Of these, 304 (12.2%) were at least 60 years (the geriatric patients) and 2187 (87.8%) made up those less than 60 years. The mean age ± standard deviation was 66.8 ± 5.9 and 41.3 ± 8.6 years for the two groups respectively. In the geriatric group, females made up 43.8% whilst in the younger group, they made up 53.5% (p = 0.200). The number of blacks in the two cohorts were 207 (68.1%) and 1290 (59.0%) (p = 0.130). (Table I)

Six (1.9%) geriatric patients came to the ED by ambulance compared to 46 (2.1%) of the younger patients (p = 0.120) The chest pain to ED presentation interval was 13.7 ± 43.7 and 10.9 ± 28.1 hours respectively for the two groups (p = 0.095).

Among the 304 geriatric patients, 116 (38.2%) were cigarette smokers, 173 (56.9%) had hypertension, 62 (20.4%) had significant family history of Coronary Artery Disease (CAD), 58 (19.1%) were diabetic and

33 (10.9%) were known to have hyperlipidaemia. Eighteen had previous history of myocardial infarction. For the younger group, 1315 (60.1%) were cigarette smokers, 692 (31.6%) were hypertensive, 242 (11.1%) had family history of CAD, 212 (9.7%) had history of diabetes mellitus and 187 (8.6%) had hyperlipidaemia (Table II). Illegal drug use was more common among the younger group (9.6% versus 0.7%, p < 0.001).

When looking at the initial baseline ECG in the ED, 39 (12.8%) of the geriatric patients had non-specific ST segment-T wave changes and 18 (5.9%) had left ventricular hypertrophy (LVH). The corresponding numbers were 66 (3.0%) (p = 0.005) and 41 (1.9%) (p = 0.002) amongst the younger patients.

Upon admission to the HER, patients would have continuous ST-segment trend monitoring and also a repeat of the 12-lead ECG at 3 and 6 hours or at any time they experienced chest pain. In the geriatric group, there were, in general, more ECG changes (ST segment and T wave changes) compared to the younger patients ie. 13.5% versus 7.2% (p = 0.0015).

One-hundred and eighty-nine (62.2%) geriatric patients had GXT done compared to 70% of the younger patients. 5.3% of the former and 2.7% of the latter were positive for ischaemia (p = 0.124). (Table III)

The sestamibi technetium 99m perfusion imaging became available for the HER patients at the University of Cincinnati from October 1998. A total of 43 rest imaging was performed up to 31st March 1999. Of these, 6 were for geriatric patients. The results were positive for ischaemia in 1 of the 6 (16.7%) geriatric patients and 3 of the 37 (8.1%) younger patients. No statistical analysis was done for this as the number was too small.

The geriatric patients were not different from the younger ones in terms of admission rate (61, 20.1% vs 321, 14.7%; p = 0.312), coronary care unit admissions (8, 2.6% vs 63, 2.9%; p = 0.418) and 30-day complication rate (10, 3.6% vs 46, 2.4%; p = 0.303). In total 331 patients (13.4%) were lost to follow-up at 30-days. (Table III)

DISCUSSION
The HER/CPC in the ED is now gaining popularity and widespread acceptance. It serves as a form of extension of the usual services offered by EDs[18,19,22]. Data published thus far has been mostly supportive of the concept and practice and results shows benefits in terms of more rapid assessment, risk stratification and management of the low risk chest pain patient[18-20,22]. Several studies have also proven its cost-effectiveness[22-25]. As the number of elderly increases and the prevalence of cardiovascular disease remains high, utilisation of the HER for this group

of patients will become a prominent feature in the forthcoming years.

In this study, the elderly ($\geq$ 60 years) represented about 12% of the total HER admissions, with a slight male predominance (56.2%). It is known that the older females were more likely to present at a more acute stage, with more complications, more severe symptoms and multiple concomitant diseases[26-28]. Therefore , they may not have been suitable candidates for the HER and required direct admission for inpatient management. In this study cohort, it is also interesting to note that 60% of those who were subsequently admitted after going through the HER protocol, were females.

There were also more blacks in the study population (68% and 59% in the geriatric and younger population respectively). This could be explained by several factors such as the catchment zone for the hospital ED, ED accessibility to the different races and the racial distribution in the community.

Risk factors such as hypertension, diabetes mellitus, hyperlipidaemia and obesity are prevalent among the elderly. They continue to impart substantial risk due to the high incidence and prevalence of (CAD) in the population[29-32]. The study cohort, with a slight black predominance, showed a higher incidence of some of these risk factors[33-36].

The ECG plays a role in establishing the diagnosis of Ischaemic Heart Disease (IHD). However, it could be normal even with classical angina or abnormal in patients without ischaemia. Tresch and Brady[37] concluded that 50% of those 60 years and older have abnormal ECG tracings and 40% of those older than 70 years with AMI, did not demonstrate typical ST elevation or develop Q-waves. Minor ECG changes especially in the ST segment-T waves are common in the elderly and may not necessarily represent ischaemia. The incidence of these changes in the elderly cohort was comparable to some previously published studies[38-41].

Graded exercise stress testing (GXT) in the elderly, retain the same diagnostic and prognostic value as demonstrated in younger patients[42,44]. One would need to exercise for an optimal duration of at least 8 to 12 minutes in order to allow sufficient time for the observation of graded changes in heart rate, blood pressure and ST-segments, in order to determine the likelihood of significant IHD. In some of these older patients, GXT is not possible due to physical and emotional limitations as well as the lack of coordination. Many poorly conditioned elderly will terminate the effort prematurely. Many cannot accomplish the requirements of the standard Bruce protocol where speed and elevation are increased simultaneously with each stage.

Immediate GXT in the HER patients has been shown to be both safe and feasible in several studies[43-45]. For the elderly, full assessment of individual risk and estimation of the pre-test likelihood of CAD is important before deciding on the test. A negative test is predictive of good prognosis and low risk of cardiovascular events[46,47].

'Silent ischaemia' is more common in the elderly[48,49]. With silent ischaemia, there is a greater risk of cardiac events over time. There is a decrease in the frequency of perception of pain or the intensity of perceived pain in the elderly. This has been postulated to be due to a higher pain threshold, damage to sensory and autonomic nerve fibres from previous myocardial infarction or neurological impairment secondary to cerebro-vascular events[49,50]. These may help to explain why the older patients tend to present later after the onset of chest pain. It may also be likely that they have poorer short-term memory and tend to forget the symptoms they experienced. As a result, they misinterpret their symptoms and may treat it as being less serious, thus not calling for the ambulance or asking for help till very much later. Tresch[51] in another study, showed that patients older than 80 years took on average > 6 hours from the onset of chest pain to get to the ED. This was < 4 hours for those below the age of 60 years.

The overall complication rate was generally low in both groups (3.6% vs 2.4%). When looking at the complication rate amongst those discharged from the HER for both groups of patients (10% vs 8.7%), the difference was not statistically significant.

LIMITATIONS

This is the first study to assess geriatric patients in the HER. At the time this analysis was carried out, there were some limitations observed.

1. The smaller sample size of geriatric patients managed in the HER made it necessary to adjust for confounding variables such as age and sex.
2. The number lost to follow-up at 30-days.
3. At the time of analysis, the number of patients undergoing sestamibi perfusion scan was still small as it had only been recently introduced, thus no conclusions were made on this.
4. This is a retrospective, observational study and therefore has inherent weakness associated with it.

CONCLUSION

The HER represents an effective way for managing and risk stratifying both the geriatric and younger patients, who present to the ED with chest pain thought to be of low to moderate risk of acute coronary events.

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