Original Article

Profiling Acute Presenting Symptoms of Geriatric Patients Attending an Urban Hospital Emergency Department

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Abstract

Objective: To study the profile of geriatric patients warded to the emergency department (ED) of an Asian acute care general hospital and determine if they are 'more ill', more likely to have atypical presentations and have a higher utilisation of healthcare resources when compared to a younger group of patients. Materials and Methods: This is a retrospective chart review of consecutive patients aged 45 years and above presenting to the study ED over a period of 4 weeks from 4 June 2006 to 1 July 2006. The following data were obtained: (i) demographics, (ii) mode of arrival and triage acuity, (iii) presence of co-morbidities, (iv) investigations ordered in the ED, (v) clinical symptoms and diagnoses, (vi) disposition, (vii) length of hospital stay, (viii) injuries and outcomes of elderly fallers. The study population was divided into 2 groups – a study group with patients aged 65 years and above, and a control group with patients aged 45 to 64. Results: There were 2847 patients in the study group and these were compared against 2875 in the control group. Those 65 years and above had greater representation in the ED population compared to the general population. In the study group, the proportion of females, the number arriving by ambulance and the likelihood of having a higher triage acuity increased with age. The elderly had higher rates of co-morbidities. They also had a higher resource utilisation rate. Falls was their commonest presenting complaint. Conclusion: It is crucial that EDs recognise the special needs of elderly patients due to the growing ageing population. Healthcare policy makers when allocating resources should take into account the profile of elderly patients presenting to an ED and their resource utilisation.

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Key words: Elderly, Presentation, Symptomology

Introduction

Singapore's population is ageing rapidly. Today 1 out of every 12 Singaporeans is aged 65 or above. In 2030, it is expected to be 1 out of 5.[1] This poses a challenge to our healthcare system especially our emergency departments.

The study hospital is an Asian acute care general hospital with 1000 beds serving an urban population. Her emergency department (ED) is the busiest in the country and attended to 139,516 patients in the study year (2006). Of these patients, about 22% were 65 years and above elderly patients. This ED had the highest volume of elderly patients amongst the EDs of the 6 acute care general hospitals in Singapore.

As Western literature[2-5] has consistently found that elderly patients when compared to younger patients were 'more ill', more likely to have atypical presentations and have higher utilisation of healthcare resources even in the emergency departments, this study sought to determine if an 'Asian ED' had similar problems.

If we identify the problems posed on the ED by our elderly patients, our healthcare system can be better prepared to meet the 'silver tsunami'.

Materials and Methods

Data Collection

This is a retrospective chart review of consecutive patients aged 45 years and above presenting to the study ED over a period of 4 weeks from 4 June 2006 to 1 July 2006. The following data were collected.

i)   Demographic data such as age, gender and race
ii)   Mode of arrival and triage acuity
iii) Presence of co-morbidities
iv)   Investigations ordered in the ED
v)   Clinical symptoms and diagnoses
vi)   Disposition
vii) Length of hospital stay

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viii) Injuries and outcomes of elderly fallers

Data Analysis

The collected data were analysed by SPSS version 13 (SPSS Inc, Illinois, USA). Our study population was divided into 2 groups – a study group with patients aged 65 years and above and a control group with patients aged between 45 and 64 years. For sub-group analysis, our study group was further stratified into 3 different age groups – Young-Old (65 to 74 years), Old (75 to 84 years) and Old-Old (85 years and above).

The independent *t*-test was used for continuous variables, and chi-square test for categorical data. Non-parametric tests were used, as the data were not normally distributed. Simple linear regression was used to analyse the relationship between one continuous explanatory variable and the outcome variable. A two-tailed significance level of $P < 0.05$ was used throughout. This study was approved by the institution's governing ethics committee.

Results

During the study period, 11,534 patients attended the ED, of which 24.9 % (n = 2875) were in the control group (45 to 64 years) and 24.7 % (n = 2847) belonged to the study group (65 years and above).

Demographics – Age, Gender and Race

Upon stratification as shown in Table 1, the Young-Old made up 10.6%, Old 9.7% and Old-Old 4.5%. Our oldest patient was 104 years. When compared to the Singapore census conducted in 2007,[1] the elderly had greater representation in the study group compared to the general population. The proportion of females increased across the age groups (45 to 65: 41.4%, Young-Old: 43.8%, Old: 53.6%, Old-Old: 63.2%). This was not unexpected as women tend to have longer life expectancy than men.[1] The ethnic composition of the elderly in the study group correlated closely to that of the general population.

Mode of Arrival and Triage Acuity

The number arriving by ambulance and the likelihood of having higher triage acuity both independently increased with age. In the control group shown in Table 1, 21.2% arrived in ED by ambulance, compared to 39.9% of the study group. Upon arrival at the hospital, elderly patients were triaged at a higher acuity than their younger counterparts (urgent priority, P1: control 8.3% vs study 12.1%; semi-urgent, P2: control 50.7% vs. study 67.6%).

Presence of Co-morbidities

The elderly had higher rates of co-morbidities. In the study group, 84.2% had at least 1 chronic disease, 26.4% had at least 2, and 19.0% had at least 3. This was much higher than the control group, 66.3% had at least 1 chronic disease, 19.8% had at least 2, 8.3% had at least 3. The 2 most common chronic diseases in our elderly patients were hypertension (64.6%) and diabetes mellitus (38.9%).

Investigations Ordered in the ED

An analysis of the common ED investigations such as capillary blood sugar, electrocardiogram, chest X-ray, urine dipstick and basic blood tests showed that higher proportions of elderly patients required each of these investigations compared to the younger control group as shown in Table 2. This reflects greater resource utilisation rates of elderly patients compared to younger patients.

Clinical Symptoms and Diagnoses

The top 10 triage symptoms and ED diagnoses are presented in Tables 3 and 4. 'Falls' was the most common presenting complaint for the elderly (13.9%). Non-specific symptoms such as giddiness, lower limb swelling and generalised weakness featured prominently amongst the top of the study group symptoms, suggesting that the elderly often present with atypical presentations for common diseases. In contrast to the control group, serious infections (pneumonia, sepsis) were the most common ED diagnoses for the elderly. This was followed by end-organ diseases such as chronic obstructive pulmonary disease, heart failure and ischaemic strokes.

Disposition and Length of Hospital Stay

As expected, the admission rate increased linearly with age ($P < 0.001$). An elderly patient who was admitted generally had a longer length of stay in the hospital compared to one from the control group (Table 5). This trend generally increased with age.

Injuries and Outcomes of Elderly Fallers

As 'falls' was the most common symptom amongst the study group, fallers were sub-analysed in Tables 6a and 6b. We found that an elderly faller had higher odds of getting admitted compared to one from the control group [odds ratio (OR), 1.9; 95% confidence interval (CI), 1.4-2.6)]. Head injury was the most common diagnosis within fallers in both groups. Of the fallers from the study group, 11.8% sustained hip fractures but this was not a common injury seen in the fallers from the control group. Falls were also the presenting symptom of underlying acute illnesses in the elderly while sepsis and pneumonia were the fourth and fifth most common diagnoses in the elderly presenting with falls.

Discussion

The past 20 years has seen growing attention on elderly patients presenting to emergency departments in Western

Table 1. Characteristics of Patients in Study and Control Groups

	Control 45-64 y (n = 2875)	Study ≥65 y (n = 2847)	Study subgroups		
			Young-old 65-74 y (n = 1221)	Old 75-84 y (n = 1113)	Old-old ≥85 y (n = 513)
% of total ED attendances	24.9	24.8	10.6	9.7	4.5
Mean ± SD age	54 ± 5.6	77 ± 7.9	70 ± 2.9	79 ± 2.8	90 ± 3.7
Ethnicity, study population (%):					
Chinese	1988 (69.1)	2298 (80.7)	949 (77.7)	889 (79.9)	460 (89.7)
Malay	338 (11.8)	212 (7.5)	100 (8.2)	99 (8.9)	13 (2.5)
Indian	393 (13.7)	230 (8.1)	122 (10.0)	83 (7.5)	25 (4.9)
Others	156 (5.4)	107 (3.7)	50 (4.1)	42 (3.7)	15 (2.9)
Ethnicity, Singapore population (%)					
Chinese	79.5	82.8	82.6	82	87.1
Malay	11.5	9.6	10.0	9.7	6.8
Indian	7.1	6.3	6.2	6.9	4.8
Others	1.9	1.2	1.2	1.4	1.2
Arrival by ambulance (%)	609 (21.2)	1135 (39.9)	405 (33.2)	447 (40.2)	283 (55.2)
Patient acuity category(%)					
P1	239 (8.3)	343 (12.0)	131 (10.7)*	145 (13.0)*	67 (13.1)*
P2	1457 (50.7)	1925 (67.6)	775 (63.5)*	771 (69.3)*	379 (73.8)*
P3	1178 (41.0)	579 (20.3)	315 (25.8)*	197 (17.7)*	67 (13.1)*
History of chronic diseases (%)	1409 (66.3)	2232 (84.2)	936 (83.9)*	914 (86.9)*	382 (79.1)*
≥1 chronic disease	66.3%	84.2%	83.9%	86.9%	79.1%
≥2 chronic diseases	19.8%	26.4%	25.7%	28.5%	23.6%
≥3 chronic diseases	8.3%	19.0%	19.0%	10.1%	18.2%
Diabetes (%)	645 (30.3)	1030 (38.9)	449 (40.2)*	434 (41.3)*	147 (30.4)*
Hypertension (%)	993 (46.7)	1713 (64.6)	725 (65.0)*	708 (67.3)*	280 (58.0)*
Dyslipidaemia (%)	366 (17.2)	644 (24.3)	302 (27.1)*	269 (25.6)*	73 (15.1)

*P ≤0.01

countries.[3-7] To our knowledge, this is one of the first more comprehensive profiles of ED elders in an Asian setting. Our results, in summary, mirror that found in Western literature: that elder patients present with a higher acuity, more co-morbidities and have non-specific presenting symptoms. Furthermore, they were more likely to be wheeled when arriving at the hospital (i.e. by ambulance and on trolleys),[8] and require more investigations for signs and symptoms in ED, and are more likely to be warded, with a mean length of stay of 9.0 days.

These findings confirm the high burden of care we can expect from elderly patients in ED and this will increase with time. The elderly attendance in ED has already risen from 14.9% in 1995 to 24.7% today (data from study hospital's Office of Clinical Governance). When the geriatric population in Singapore doubles to 18.7% in 2030,[1] there are fears of an 'Epidemic of the Elderly' in the ED. Several studies have suggested that the current ED is unprepared for such an imminent surge in the numbers of elderly patients.[3,4,9] To prepare for this 'epidemic', we recognise the need for a paradigm shift, both in our clinical approach toward the elderly patient in the ED, as well as in the future allocation of resources.

Clinical Approach and Education

It has been shown that there is inadequate training amongst ED doctors and nurses in the recognition of geriatric emergencies.[10-14] Our study has highlighted that non-specific symptoms such as giddiness, lower limb swelling and generalised weakness are common triage

Table 2. Frequency of Investigations at ED

	Control 45-64 y (n = 2875)	Study ≥65 y (n = 2847)	Study subgroups		
			Young-old 65-74 y (n = 1221)	Old 75-84 y (n = 1113)	Old-old ≥85 y (n = 513)
Capillary blood sugar (%)	1094 (38.1)	1755 (61.6)	626 (51.3)	616 (55.4)	513 (100)
Electrocardiogram (%)	1079 (37.5)	1485 (52.2)	596 (48.8)	607 (54.5)	282 (55.0)
Urine dipstick (%)	399 (13.9)	351 (36.1)	149 (12.2)	147 (13.2)	55 (10.7)
Full blood count (%)	1079 (37.5)	1618 (56.8)	640 (52.4)	661 (59.3)	317 (61.8)
Urea & electrolytes (%)	929 (32.3)	1545 (54.3)	600 (49.1)	638 (57.3)	307 (59.8)
Troponin I (%)	379 (13.2)	544 (19.1)	228 (18.7)	237 (21.3)	79 (15.4)
Chest X-ray (%)	1050 (36.5)	1515 (53.2)	592 (48.5)	628 (56.4)	295 (57.5)

Table 3. Most Frequent Presenting Symptoms at ED

	Control (45-64 y) (n = 2875)		Study (≥65 y) (n = 2847)	
	Symptom	No. (%)	Symptom	No. (%)
1	Fever	275 (9.6)	Falls	397 (13.9)
2	Falls	220 (7.7)	Shortness of breath	351 (12.5)
3	Shortness of breath	205 (7.2)	Fever	188 (11.3)
4	Chest pain	147 (5.1)	Cough	189 (5.4)
5	Abdominal pain	140 (4.9)	Giddiness/ dizziness	139 (5.0)
6	Cough	122 (4.3)	Abdominal pain	103 (3.7)
7	Road traffic accident	92 (3.3)	Chest pain	98 (3.5)
8	Back pain	54 (1.9)	Lower limb swelling	59 (2.1)
9	Groin pain	214 (1.8)	Vomiting	58 (2.1)
10	Vomiting	302 (1.7)	Generalised weakness	48 (1.7)

symptoms in the elderly. Textbook presentations of common diseases such as acute myocardial infarction and cerebrovascular accidents no longer apply in the elderly, where the 'atypical' becomes the norm rather than the exception. Repeated studies have also shown that ED staff are unable to identify geriatric depression in most cases.[15-17] This is attributed to low awareness amongst ED staff, family members and patients themselves, as well as prevalence of somatic complaints and symptoms mimicking ageing. Training of ED staff in geriatric atypical presentations is the key in the preparing the ED for the 'Epidemic of the Elderly'.

Resource Allocation

In our study, 'falls' was the most common presenting symptom of the elderly presented at ED. For example, ED physicians often encounter elderly patients who are managed for a Colles' fracture, only to suffer from a fall a few months later and sustain a even more debilitating hip fracture. The

PROFET study has demonstrated that enrolling ED elderly fallers into *falls evaluation programme* reduces falls in the future.[18] This challenges the current ED's tendency of focusing on the patient's primary injury. There is also sufficient evidence that an ED should include a tertiary injury prevention centre, where risk factors are identified and managed through a multi-disciplinary team approach, with the aim of preventing a future fall or injury.[19-22]

In a similar light, McCusker[21] and Mion[22] have demonstrated, through a two-stage ED intervention programme, many ED elderly patients have hidden or unmet needs that are not readily evident during their ED visit. Failure to address these unmet needs can lead to adverse outcomes. On the other hand, allocating the necessary manpower and resources to screen for these hidden needs have been shown to reduce functional decline, ED re-attendance and hospitalisation rates.[19,21,22] In Singapore, the ED is one of the most accessible points of entry into the public health system. An ED visit therefore

Table 4. Most Frequent Diagnoses at ED

	Control (45-64 y) (n = 2875)		Elderly (≥65 y) (n = 2847)	
	Diagnosis	No. (%)	Diagnosis	No. (%)
1	Upper respiratory tract infection	159 (5.5)	Pneumonia	290 (10.2)
2	Gastroenteritis	138 (4.8)	Septicaemia	178 (6.3)
3	Chest pain	125 (4.3)	Chronic obstructive pulmonary disease	133 (4.7)
4	Pneumonia	117 (4.1)	Heart failure	109 (3.8)
5	Cellulitis	107 (3.7)	Head injury	94 (3.3)
6	Asthma	93 (3.2)	Gastroenteritis	93 (3.3)
7	Abdominal pain	72 (2.5)	Stroke – ischaemic	85 (3.0)
8	Head injury	67 (2.3)	URTI	81 (2.8)
9	Dizziness and giddiness	66 (2.3)	Cellulitis	71 (2.5)
10	Stroke – ischaemic	54 (1.9)	Dizziness and giddiness	69 (2.4)

Table 5. Frequency of Admission and Length of Stay

Age group (No. admitted)	Control 45-64 y (n = 941)	Study ≥65 y (n = 1688)	Study subgroups		
			Young-old 65-74 y (n = 642)	Old 75-84 y (n = 685)	Old-old ≥85 y (n = 361)
Numbers admitted (%)	941 (32.7)	1688 (59.3)	642 (52.6)*	685 (61.6)*	361 (70.3)*
Length of stay (in days)					
Mean (SD)	7.7 (10.6)	9.0 (12)	9.1 (13.5)*	10.3 (12.2)**	9.7 (8.8)***
Median	5.0	6.0	5.0	7.0	7.0
Range	1-105	1-201	1-201	1-158	1-64

*P = 0.03, **P = 0.00, ***P = 0.00

Table 6a. Frequency of Patients Presenting with Falls at ED and Admission Rates

Age group (No. admitted)	Control 45-64 y (n =?)	Study ≥65 y (n = ?)	Study subgroups		
			Young-old 65-74 y (n = ?)	Old 75-84 y (n =?)	Old-old ≥85 y (n = ?)
Number of patients presenting with falls (%)	257 (8.9)	396 (13.9)	143 (11.7)	167 (15.0)	86 (16.8)
Number of fallers admitted (%)	78 (30.4)	206 (7.2)	70 (48.6)	80 (47.9)	56 (65.1)

Table 6b. Most Frequent Diagnoses among Patients Presenting with Falls at ED

	Control (45-64 y) (n = 257)		Elderly (≥65 y) (n = 397)	
	Diagnosis	No. (%)	Diagnosis	No. (%)
1	Head injury	38 (14.8%)	Head injury	77 (19.4%)
2	Fractures of the radius and ulna	28 (10.9%)	Fracture of hip	47 (11.8%)
3	Contusion of lower limb	16 (6.2%)	Fractures of the radius & ulna	18 (4.5%)
4	Contusion of trunk	12 (4.7%)	Septicaemia	16 (4.0%)
5	Fractures of the tarsal and metatarsal bones	9 (3.5%)	Pneumonia	12 (3.0%)

presents as an important window for opportunistic screening for the elderly, so that early interventions can be instituted for those at-risk.

Limitations

The use of a control group aged 45 to 64 years is unconventional. Our intention was to compare the elderly against a middle-aged population, and the age limits set were arbitrary. Nevertheless, in most variables, the trend from the control group through the 3 elderly sub-groups showed a consistent pattern with advancing age. Apart from ED investigations, we would have also liked to study/analyse the time spent on clinical evaluation and decision-making. However this was not possible in a retrospective study. Finally, because of the differences in demographics, our results may not be readily extrapolated to other settings. However, as many Asian countries also faced with the problem of an ageing population like ours, we believe other EDs will also have a similar profile of patients in the future.

Conclusion

Elderly patients present to the ED with higher acuity, more co-morbidities and more atypical presentation than those younger. They also have a higher resource utilisation rate. ED staff should be well trained in geriatric emergencies as this will facilitate their management of an ageing patient population. On the evidence of the benefit from an *ED falls evaluation programme* in the UK, the ED should consider taking on the role of a tertiary injury prevention centre, and provide opportunistic screening for the at-risk elderly. This can provide an opportunity for early intervention. It is hoped that with early intervention, function can be preserved, future morbidity can be prevented and overall healthcare utilisation can be reduced.

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