Utilization of the emergency department by older residents in Kuala Lumpur, Malaysia

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Aim: To determine the pattern of utilization of emergency department (ED) services by older patients in Kuala Lumpur, Malaysia, compared with younger patients in the same setting.

Methods: The sociodemographics, clinical characteristics and resource utilization of consecutive patients attending the adult ED at the University Malaya Medical Center were recorded during a typical week.

Results: A total of 1649 patients were included in the study; 422/1649 (25.6%) were aged ≥60 years and 1077 (74.4%) were aged <60 years. Older adult patients were more likely to be diagnosed with ischemic heart disease (12.6% vs 2.5%, P < 0.001), and more likely to require investigations such as electrocardiogram (68.1% vs 16.6%, P < 0.001) or chest X-rays (67.6% vs 24.0%, P < 0.001) than their younger counterparts. Logistic regression methods showed that older adults remained an independent predictor of hospital admission (OR 2.75, 95% CI 2.11–3.57).

Conclusion: The ratio of older adult patients attending our ED over the proportion of older people in the general population was 26:6, which is far higher than reported in previous published studies carried out in other countries. Older ED attenders are also more likely to require investigations, procedures and hospital admissions. With the rapidly aging population in Malaysia, reconfiguration of resources will need to occur at a compatible rate in order to ensure that the healthcare needs of our older adults are met. Geriatr Gerontol Int 2014; ••: ••–••.

Keywords: admission, elderly, emergency department attendances, investigations, procedures.

Introduction

Population aging in developing countries is becoming an urgent global issue. With the rapid rate of population aging in developing countries, more older people will be residing in developing countries within the next few decades.1 Older people consisted of 6.3% of the Malaysian population in the year 2000.5 In comparison with developed countries, such as the USA, 12.4% of the population were aged over 65 years in the year 2000.3 In middle income developing countries, such as Malaysia, factors such as better healthcare facilities, increasing life expectancy and declining fertility rates are giving rise to an aging society. It is projected that the older population will increase to 9.9% of the total population by the year 2020, which in absolute numbers will equate to doubling of the older population from 1.4 million to 3.2 million within 20 years, as the total population of Malaysia will also increase from 22.3 million to 32.4 million within the time-period.4

In the crowded emergency department (ED) environment, older adult patients are an ever increasing group of patients.5,6 Alongside the changes in demographic profile in the population and within the ED, the change of diseases from infectious to degenerative and non-communicable diseases is also occurring.

In addition, older adult patients are also expected to have different clinical characteristics compared with younger patients attending the ED, as a result of the physiological changes and increased comorbidities associated with aging.5,6,9 This changing pattern of diseases brought about by population aging would have
major implications on healthcare resource planning and policy-making. The impact of the demographic transition of Malaysia towards an aging population on the healthcare system in general, and the ED in particular, is inevitable and can no longer be ignored.

**Materials and methods**

This was an analytical cross-sectional study carried out at a busy ED located in a teaching hospital in the capital city of Kuala Lumpur. During a 1-week period from 5 March 2011 until 12 March 2011, all patients aged 12 years and older who attended the ED were identified and included in the study. Scheduled visits and registered patients who left before the consultation were excluded from the present study.

Data on ED visits were collected prospectively and recorded in a study proforma. A researcher was present to ensure that proformas were filled in accurately. If required, additional data were collected from the patient’s hospital notes, retrieved from the medical records department.

Patients were divided into two groups, those aged 60 years and older (older group) and those aged less than 60 years (younger group). Continuous variables were plotted on a histogram and tested with the Kolmogorov–Smirnov test for normal distribution. Normally distributed continuous data were presented as means with standard deviation, whereas non-parametric data were presented as the median with interquartile range. Categorical data were presented as numbers with percentages in parentheses. The χ²-test was used to determine the statistical difference between groups. A multivariate logistic regression model was used to determine the relationship between age and hospital admission. Odds ratios (OR) and 95% confidence intervals (CI) were calculated. The following variables were adjusted for in the model: sex, ethnic group, living arrangements, methods of arrival, triage, investigations and procedures carried out, and time seen in ED. Variables with $P < 0.25$ in the univariate analyses and variables of clinical significance were included in the model. Data and analysis were carried out with the Statistical Package for the Social Sciences software (SPSS, Chicago, IL, USA) version 20.0.

Ethical approval was obtained from the University of Malaya Medical Center medical ethics committee, and informed consent was obtained from all respondents.

**Results**

A total of 1649 patients attended the adult ED during the 1-week period. The youngest patient seen was 12 years-of-age and the oldest was 98 years-of-age. Of the total attendees, 422 (25.6%) were aged 60 years and older, whereas 1077 (74.4%) were aged less than 60 years. The hospital served a large catchment of 1,765,495 people residing within the immediate catchment of the hospital and of which, 108,459 (6.14%) were aged 60 years and older.² A total of 299 of the 422 older adults (70.8%) were old (aged 60–74 years), and 123 (29.1%) were very old (aged 75 years and older).

The sociodemographics of the patients who attended the ED according to the age-defined groups are summarized in Table 1. There were no significant differences in sex distributions between the two groups. Older adult patients were more likely to be nursing home residents when compared with the younger adult patients (1.7% vs 0.2% $P = 0.002$). Just five (1.2%) older adult patients lived alone, 404 (96.9%) lived with family

**Table 1**  Basic characteristics of younger and older adult patients attending the emergency department

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Age group (years)</th>
<th>$P$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Younger patients</td>
<td>Older patients</td>
</tr>
<tr>
<td></td>
<td>(&lt;60)</td>
<td>(≥60)</td>
</tr>
<tr>
<td>Sex (female : male)</td>
<td>610:617</td>
<td>194:228</td>
</tr>
<tr>
<td>Race, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malay</td>
<td>570 (46.5%)</td>
<td>132 (31.3%)</td>
</tr>
<tr>
<td>Chinese</td>
<td>191 (15.6%)</td>
<td>172 (40.8%)</td>
</tr>
<tr>
<td>Indian</td>
<td>326 (26.6%)</td>
<td>108 (25.6%)</td>
</tr>
<tr>
<td>Others</td>
<td>4 (0.3%)</td>
<td>7 (1.7%)</td>
</tr>
<tr>
<td>Non-Malaysis</td>
<td>135 (11.0%)</td>
<td>3 (0.7%)</td>
</tr>
<tr>
<td>Living alone, n (%)</td>
<td>15 (1.2%)</td>
<td>5 (1.2%)</td>
</tr>
<tr>
<td>Nursing home residents, n (%)</td>
<td>2 (0.2%)</td>
<td>7 (1.7%)</td>
</tr>
<tr>
<td>Homeless, n (%)</td>
<td>0 (0.0%)</td>
<td>1 (0.2%)</td>
</tr>
</tbody>
</table>

NS, not significant.
members and one (0.2%) older adult patient was found to be homeless. There was no significant difference in living arrangement between the older and younger age groups.

Older adult patients were more likely to present with shortness of breath compared with the younger adult patients (17.1% vs 6.8%, \( P < 0.001 \)). Older adult patients were also more likely to present with the main complaint of chest pain compared with younger adult patients (10.7% vs 5.1%, \( P < 0.001 \)). The two most common groups of diagnoses in the older adult patients were ischemic heart disease (12.6%) being the most common, followed by infectious diseases (12.1%). Just 10.2% of older patients presented with surgical illnesses. In the younger age group, the most common diagnosis was infectious diseases (23.5%), followed by laceration/non-fracture injury (14.8%) and surgical or gastrointestinal conditions (8.2%). Older adult patients were more likely to be diagnosed with ischemic heart disease compared with the younger adult patients (12.6% vs 2.5%, \( P < 0.001 \)). However, younger adult patients were more likely to be diagnosed with infectious diseases (23.5% vs 12.1%, \( P < 0.001 \)). Other diagnoses, such as hypertension, pneumonia and metabolic problems, were significantly more likely in the older adult group compared with the younger adult group \( (P < 0.001; \text{Table 2}) \).

When the triaging zones were compared between the adult and younger adult patient groups, out of the 422 older adults who attended the ED, 70 (16.6%) were triaged to T1 zone compared with 76 (6.2%) from the younger adult patients group. A total of 163 (38.6%) older patients were triaged to the T2 zone compared with the 224 (18.3%) younger patients. A total of 189 (44.8%) older adult patients were triaged to the lower priority zone, T3, compared with 927 (75.6%) of the younger adult patients (Fig. 1). Older adults were therefore significantly more likely to be triaged to the higher priority zones of T1 and T2 compared with younger adults (233/422 [55.2%] vs 300/1227 [24.4%]; OR 3.81, 95% CI 3.02–4.80, \( P < 0.001 \)).

Older adult patients were significantly more likely to attend the ED during office hours than younger adult patients (221/422 [52.4%] vs 526/1227 [42.9%]; OR 1.46, 95% CI 1.17–1.83, \( P < 0.001 \)). However, older people presenting during non-office hours were significantly more likely to be triaged to the resuscitation zone (T1), with 43 out of 201 (21.3%) of older adult patients attending the ED outside office hours being triaged to

### Table 2  Comparison of diagnoses between older and younger adult patients

<table>
<thead>
<tr>
<th>Diagnoses</th>
<th>Age (years)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Less than 60</td>
<td>60 and older</td>
</tr>
<tr>
<td></td>
<td>( n = 865 ) (70.5%)</td>
<td>( n = 318 ) (75.4%)</td>
</tr>
<tr>
<td>Ischemic heart disease, ( n ) (%)</td>
<td>31 (2.5%)</td>
<td>53 (12.6%)</td>
</tr>
<tr>
<td>Infectious diseases, ( n ) (%)</td>
<td>288 (23.5%)</td>
<td>51 (12.1%)</td>
</tr>
<tr>
<td>Other medical illness, ( n ) (%)</td>
<td>98 (8.0%)</td>
<td>41 (9.7%)</td>
</tr>
<tr>
<td>Laceration/non-fracture injury, ( n ) (%)</td>
<td>182 (14.8%)</td>
<td>19 (4.5%)</td>
</tr>
<tr>
<td>Surgical gastrointestinal, ( n ) (%)</td>
<td>101 (8.2%)</td>
<td>31 (7.3%)</td>
</tr>
<tr>
<td>Other surgical illnesses, ( n ) (%)</td>
<td>101 (8.2%)</td>
<td>43 (10.2%)</td>
</tr>
<tr>
<td>Hypertension, ( n ) (%)</td>
<td>15 (1.2%)</td>
<td>14 (3.3%)</td>
</tr>
<tr>
<td>Pneumonia, ( n ) (%)</td>
<td>11 (0.9%)</td>
<td>19 (4.5%)</td>
</tr>
<tr>
<td>Malignancy, ( n ) (%)</td>
<td>13 (1.1%)</td>
<td>11 (2.6%)</td>
</tr>
<tr>
<td>Sepsis syndrome, ( n ) (%)</td>
<td>13 (1.1%)</td>
<td>15 (3.6%)</td>
</tr>
<tr>
<td>Metabolic/endocrine, ( n ) (%)</td>
<td>12 (1.0%)</td>
<td>21 (5.0%)</td>
</tr>
</tbody>
</table>

**Figure 1**  Percentages of the older adult and younger adult patients who were triaged according to priority; \(*P < 0.001\). AMC, acute medical care zone; RESUS, resuscitation zone.
T1 compared with 27 out of 221 (12%) of older adults attending during office hours being triaged to T1 (OR 1.96, 95% CI 1.16–3.31, *P* = 0.011).

Older adult patients received more investigations than the younger adult patients. A total of 344 (82.5%) of the older adult patients had blood tests as compared with just 514 (42.3%) of the younger adult patients (*P* < 0.001). A total of 112 (26.9%) older adult patients required arterial blood gases, compared with 81 (6.7%) younger adult patients (*P* < 0.001). Of the older adult patients, 124 (29.7%) required urinalysis compared with 186 (15.3%) of the younger adult patients (*P* < 0.001).

The older adult patients were also more likely to be investigated with electrocardiography (68.1% vs 16.6%, *P* < 0.001) and chest X-rays (67.6% vs 24.0%, *P* < 0.001; Fig. 2).

More procedures were carried out in the older adult patient group (Fig. 2). Older adult patients were more likely to have a central venous line inserted in the ED as compared with the younger adult patients (1.2% vs 0.1%, *P* < 0.05). Catheter bladder drainage was more likely to be inserted in the older adult patient than in the younger adult patient group (28.3% vs 5.7%, *P* < 0.001). Older patients were more likely to require intravenous medications than younger adults (50.8% vs 19.3%, *P* < 0.001). Nasogastric tubes were also more likely to be inserted in older adult patients than younger adult patients. There was no significant difference in non-invasive ventilation rates between the older adult patients and the younger adult patient group.

Older adult patients were more likely to be referred to the medical specialty. A total of 156 (37%) older adult patients were referred to the medical specialists compared with 128 (10.3%) of younger adult patients (*P* < 0.001). There was no significant difference in the proportion of older adult patients referred to the surgical and orthopedic specialties compared with the younger adult patients. Older adult patients (211 [39.6%]) were more likely to be admitted to a hospital ward compared with the younger adult patients (167 [17.2%]; OR 3.1, 95% CI 2.4–4.0, *P* < 0.001).

Logistic regression methods were then used to determine whether being aged 60 years or older remained an independent predictor of hospital admissions after adjustments for potential confounding factors. After adjustments for the potential confounders of sex, ethnic group, living arrangements and methods of arrival, older adults remained significantly more likely to require hospital admissions (OR 3.13, 95% CI 2.13–3.03). After additional adjustments for triage, investigations, procedures carried out and time seen by the doctor in addition to the aforementioned factors, older adults remained an independent predictor of hospital admission (OR 2.75, 95% CI 2.11–3.57; Table 3).
In the present study, the attendance of older adult patients was recorded at 25.6% of the total attendances to the ED. This proportion is far higher than that reported by similar studies carried out in other developed and developing countries. A Singaporean study showed that just 12.4% of their attendees to the ED were aged 60 years and older. A similar study carried out in Hong Kong where the elderly population has been increasing at a faster rate than Malaysia yielded a proportion of older adults attending the ED of 9.99%. Both of these studies were carried out in urbanized areas of the city states. Additionally, when comparisons were made using the ratio of ED attendances of the older adult patients with the general elderly population, a disproportionately higher rate of attendance by the older adult patient group was also found in our population. The general elderly population surrounding the University of Malaya Medical Center comprises 6.1% of the total population. The ratio of 26:6 (ED/general population ratio in %) found in the present study is only similar to that found by one Israeli study. Other international studies showed much lower proportions of elderly attendance as compared with the general elderly population, suggesting possible differences in terms of knowledge, attitude and practice among the elderly population, and differences in policies, locally and internationally.

The reasons behind the higher proportion of older adult patients attending the ED in our setting have not been evaluated. Perhaps, the lack of community- and home-based services catering to the older adult community in Malaysia, and a lack of confidence toward the primary care physician and general practitioners’ practices could have contributed to this high proportion. There are nine government-funded health clinics in the hospital catchment area, but the strategic position of the university hospital means that many find the hospital more accessible than the local health clinics. Older patients will consider the ED as their “first port of call” when they are ill, as they perceive that a fully-equipped medical institution is more likely to cater to their complex needs. A study in a French hospital confirmed that the ED is considered an important point of access to better facilities and care. However, there is growing evidence that a continuous relationship between older adult patients and their primary care physicians was able to reduce the attendance to ED.

The triaging process is based on acuity, and triaging is one of the most important steps other than clinical assessment and disposition in an emergency care process. Older adult patients were more likely to be triaged to high-priority zones, namely T1 and T2 zones. This is consistent with other studies. On the contrary, in a study that examined the pitfalls of ED triage of frail older adult patients, it was reported that frail elderly patients admitted without specific complaints are at risk of inappropriate or delayed evaluation as a result of undertriage. Perhaps it is unavoidable to overtriage older adult patients when risk assessment and protocols regarding older adult patients are not yet established in certain ED settings. In addition, the older adult patients in the present study were less likely to attend the ED for trivial ailments. Older adult patients were more likely to attend the ED during office hours as compared with the younger adult patients. Further analysis showed that during office hours, older adult patients were more likely to be triaged to the low-priority zone. This shows that older adult patients and their family members might be unaware of or reluctant to access other means of accessing healthcare, such as the primary care clinic, because of reasons stated previously. In contrast, older adult patients who attended the ED during non-office hours were more likely to be triaged to the T1 zone as compared with during office hours. A likely explanation for this is that they were more ill and more likely to require urgent medical attention. Previous studies have suggested that most older adult patients only attend the ED out of hours, because they were too ill to wait for an office visit. The ED should therefore consider more appropriate senior staffing with special training in caring for older patients during non-office hours to cater for sicker older patients.

| Table 3 Crude odds ratio and multivariate adjusted odds ratios for the relationship between age and hospital admission |
|-----------------|-----------------|-----------------|
|                 | Crude OR        | Model 1†        | Model 2†        |
| Younger adults  | 1.00            | 1.00            | 1.00            |
| Older adults    | 3.15 (2.46–4.03)| 3.13 (2.43–4.03)| 2.75 (2.11–3.57)|

†Model 1 adjusted for sex, ethnic group, living arrangements and methods of arrival; model 2 adjusted for sex, ethnic group, living arrangements, methods of arrival, triage, investigations and procedures carried out, and time seen in the emergency department. CI, confidence interval; OR, odds ratio.

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Older adult patients were more likely to present with the symptoms of shortness of breath and chest pain, and were more likely to be diagnosed with cardiac problems, which is consistent with previously published studies.\textsuperscript{7,10,11} Interestingly, even though older adult patients were more likely to complain of shortness of breath as their presenting symptom in the present study, not many of them were subsequently diagnosed with pulmonary conditions. Such inconsistencies in the diagnosis of the older adult patients, which has also been demonstrated in our study, suggest that older adult patients might present atypically or non-specifically to the ED. This adds to the diagnostic challenges faced by ED staff, and further adds to the argument that specialist trained personnel on the frontline could assist with abating the current difficulties.\textsuperscript{8}

Older adult patients were more likely to receive further investigations and invasive procedures in the ED. Investigations carried out on the older adult patients are considered necessary, as older adult patients do present either atypically or with multiple symptoms.\textsuperscript{28,29} However, more investigations carried out on the older adult patients equates to more waiting time in the ED, and increased clinician time to carry out and interpret the investigations, which then translates to increased costs.\textsuperscript{30} As for procedures carried out on the older adult patients, there was no significant increase in intubation and non-invasive ventilation rates in the older adult patients, despite the increased rates of triage to the T1 zone. This is likely to be because decisions are sometimes made against mechanical ventilation on the grounds of low likelihood of success because of multiple comorbidities, poor functional status or “do not intubate” orders.\textsuperscript{31}

The odds of a referral to the medical department for an older adult patient were nearly fourfold higher than for the younger adult patient. The admission rate of the older adult group was also higher than the younger adult patients, showing that these referrals to other specialties were appropriate. A lack of protocols in the management of older adult patients in the ED, as well as a lack of emergency physicians trained in geriatric medicine could have contributed to this. The increase in referrals and admissions again translate to increased ED transit times and human resource utilization as discussed earlier, as well as subsequent hospitalization costs.

The present study has provided data from which to plan future allocation of resources for emergency care specifically, as well a healthcare services for our older population broadly.\textsuperscript{32} The findings of our study suggest that many of the daytime admissions to the ED could be diverted if community services and preventive healthcare programs are to be established, reducing the ratio of ED to general population of older adults to match that of developed countries, where such services are already well established. Changing the perception of the public regarding the general practitioner and primary care centers through education and better integration of primary and secondary care would also contribute to the reduction of the ratio. As ours was the first such study to be carried out in a middle-income developing country, our findings can also be translated to healthcare planning for other countries with similar economic and demographic profiles.

In conclusion, older adult patients in the present study were more likely to attend the ED compared with other previously published reports from more developed countries, as evidenced by the greater ratio of percentage of older persons attending the ED over the percentage of older persons in the general population. The characteristics of older adult patients attending the ED differ from that of younger adult patients. Resource utilization in terms of investigations, consults by other specialties and subsequent admissions was also significantly higher among older ED attenders. It is therefore vital that healthcare policy-makers consider developing community and preventative health services to divert daytime attendances to the ED in order to avert a potentially avoidable emergency healthcare crisis, which is likely to emerge with the rapidly expanding older population.

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Disclosure statement

The authors declare no conflict of interest.

References


Elderly in the emergency department


