Older patients' utilisation of emergency department resources: a cross-sectional study

KEVIN CHU, ANTHONY BROWN, AND ROOKS PILLAY

Kevin Chu is Staff Specialist, Anthony Brown is Clinical Associate Professor, and Rooks Pillay is Director in the Department of Emergency Medicine, Royal Brisbane Hospital, Brisbane, Queensland, Australia.

Abstract

A cross-sectional study was conducted to investigate older patients' utilisation of emergency department resources. Patients aged ≥65 years, compared with adults <65 years, were more likely to be triaged to higher clinical urgency categories. They have a higher hospital admission rate and longer length-of-stay even after adjusting for triage category. Patients ≥80 years, compared with 65-79 years, were more likely to be triaged to higher urgency categories. These groups had similar hospital admission rates and lengths-of-stay. Patients ≥65 years presented in similar numbers during office-hours and after-hours, but after-hours attendances were more likely to be triaged to higher urgency categories. The greater emergency department resource utilisation by older people has implications for the provision of health services in an aging population.

Introduction

Australians are aging. The Australian population, though growing, is aging because of decreasing birth rate and increasing life expectancy (Australian Bureau of Statistics 2001). The population is projected to grow from 19 million in 1999 to 24.1-28.2 million by 2051.

People aged 65 years and over are expected to increase both in absolute numbers and as a proportion of total population. The proportion is anticipated to increase from 12% in 1999 to 18-19% by 2021 and 24-27% by 2051. People aged 85 years and over represented 1.3% of total population in 1999. This proportion is expected to more than double within the next 25 years.

Aging Australians have important implications for provision of health services. Older people disproportionately use more health services including ambulances for transportation to health and aged care facilities (Haas 1995, Clark 1998).

A major portal of entry for the elderly into the hospital system is the Emergency Department (ED) (Stathers 1992). Insight can be gained into projected demand for health services particularly emergency care by examining current ED resource utilisation. Studies in Victoria have found that older patients were likely to be triaged to more urgent categories and likely to be admitted to hospitals (Lamb 1995, Oates 1997, Street 1996). It is not well documented, however, whether older age is an additional predictor of hospital admission after adjusting for higher clinical urgency. There are also few comparisons amongst subgroups of older patients in the literature. Such information may assist in planning supply of emergency health services to meet the increasing demand from aging Australians.

The objective of this study was to investigate older patients' utilisation of ED resources. The specific aims were to compare patients aged 65 years or older with adult patients younger than 65 years, to compare patients aged 65 to 79 years with the 80 years or older age group, and to compare patients aged 65 years or older presenting during office-hours with those presenting after-hours.

Methods

Design and setting

A cross-sectional study was conducted at Royal Brisbane Hospital (RBH), an adult metropolitan tertiary-referral teaching hospital with 760 inpatient beds. The RBH directly serves a local population of 485,000 in the northern suburbs of Brisbane. The city of Brisbane in southeastern Queensland has a population of 1.3 million. The ED is actively involved in the regional medical rescue and critical care retrieval service using helicopter and fixed-wing aircraft. The department has a primary care section to which low urgency (Australasian Triage Scale category 5) patients are triaged between 08:00-17:00 hours, Monday to Friday.

Resource markers

Three surrogate markers for the utilisation of ED resources were used. The markers were the Australasian Triage Scale (ATS), hospital admission rate, and length-of-stay in ED.

The ATS is an ordinal scale ranging from one to five with one being assigned to the most urgent clinical category (Australasian College for Emergency Medicine 2001). The scale directly relates to a range of outcome measures and resource consumption (Erwich-Nijhout 1997, Jelinek 1995, Whitby 1997). ED triage was performed by trained and experienced ED nurses upon the patients' arrival in the department.

Hospital admission was defined as admission to an inpatient ward in accordance with the National Health Data Dictionary (Australian Institute of Health and Welfare 2000). An emergency medicine registrar or emergency physician who hold authority for hospital admission reviewed all patients presenting to the ED. Length-of-stay in ED was defined as the interval from time-of-triage to time-of-disposition. Time-of-disposition was the time the patient physically left the department.

Sampling

The study sampled all ED attendances over six months from 1 June to 30 November 2000. A relatively short time period was chosen to minimise the effects of potential changes in clinical practices that might be associated with possible variations in hospital admission rates and/or lengths-of-stay in ED. Attendances were identified from the hospital's computer information system (HCIS). The HCIS data set included demographic and clinical data entered by clerical, nursing, and medical staff during the course of the patients' visit. The sample included patients transferred from other hospitals and those accepted by inpatient units that required stabilisation in the ED. The sample also included patients arriving via the regional medical rescue and critical care retrieval service, and patients treated in the primary care section of the ED.

Data definition and collection

An ED management support officer electronically retrieved the data. Data abstracted included patients' age, gender, ATS category, time-of-triage, time-of-disposition, and disposition. Disposition was divided into discharge from the ED, admission to an inpatient ward, or admission to the ED observation ward.

Patients were admitted into the 16-bed ED observation ward under the care of emergency physicians if they required further assessment and treatment, but were considered likely to be discharged from hospital within 24 hours. For the purpose of this study, hospital admission was defined as an admission to an inpatient ward without initial admission to the ED observation ward.

Office-hours were defined as from 08:00 to 17:00 hours, Monday to Friday. After-hours were defined as time outside office-hours. Patients' age, gender, and previously listed surrogate markers of ED resource utilisation were complete for the entire data set. Reliability of data elements was not formally tested.

Statistical analysis

Descriptive statistics were calculated with results expressed as medians and inter-quartile ranges, or as percentages with 95% confidence intervals (CI). Series of stratified tables were analysed using the Mantel-Haenszel Chi-square test. Incidence rates were compared using relative risk (RR) with 95% CI. Continuous data were tested for normality then compared using the Wilcoxon rank-sum test. Statistical significance was considered at $P < 0.05$. Analyses were performed using SAS 6.12 statistical software (SAS Institute Inc, NC, USA).

Results

Over six months in the second half of year 2000, the RBH ED cared for 29,798 attendances by 21,471 patients. Patients aged 15 years or older comprised 99.0% of attendances. The total of inter-hospital transfers, arranged admissions, and retrievals that required stabilisation in the ED accounted for 2.5% of cases. Patients treated in the primary care section of the ED comprised 16.4% of attendances.

Patients aged 65 years or older versus adult patients younger than 65 years

Six thousand and seventy (20.4%, 95% CI 19.9%-20.8%) of total attendances were by patients aged 65 years or older. The number of attendances stratified by gender, age, and ATS categories are in Table 1a. The proportion of patients aged 65 years or older was greater than expected in higher urgency compared with lower urgency ATS categories ($P = 0.001$). For example, male patients aged 65 years or older comprised 16.8% of all male attendances, yet made up 25.3% of male ATS category 1 attendances.

Five thousand five hundred and sixty five (18.7%, 95% CI 18.2%-19.1%) of total attendances were directly admitted to an inpatient ward while 4,133 (13.9%, 95% CI 13.5-14.3%) were admitted to the ED observation ward. The proportion of attendances admitted to an inpatient ward, stratified by gender, age, and ATS categories are in Table 1b. The proportions admitted were greater for the higher urgency compared with lower urgency ATS categories. The likelihood for hospital admission in ATS categories 1 to 4 was greater for patients aged 65 years or older compared to adult patients younger than 65 years in the same ATS category. The proportion of ATS category 5 admitted was small, with the younger group having higher likelihood of admission.

The distribution of the triage-to-disposition intervals was asymmetrical with longer intervals more spread out than shorter intervals (positive skew). The interval was less than four and eight hours for 88% and 99% of total attendances respectively. The intervals stratified by gender, age, and ATS categories are in Table 1c. The intervals were longer in all ATS categories for patients aged 65 years or older compared with adult patients younger than 65 years.

Patients aged 65 to 79 years versus patients aged 80 years or older

In the 65 years or older age group, there were 2,288 (37.7%, 95% CI 36.5%-38.9%) attendances by patients aged 80 years or older. The number of attendances stratified by gender, age, and ATS categories are in Table 2a. The proportion of patients aged 80 years or older was greater than expected in the higher urgency compared with lower urgency ATS categories ($P = 0.001$). For example, male patients aged 80 years or older comprised 29.1% of attendances by male patients aged 65 years or older, yet made up 40.4% of male ATS category 1 attendances.

Two thousand two hundred and thirty three (36.8%, 95% CI 35.6%-38.0%) of the attendances by patients aged 65 years or older were directly admitted to an inpatient ward while 998 (16.4%, 95% CI 15.5-17.4%) were admitted to the ED observation ward. The proportion of attendances admitted to an inpatient ward, stratified by gender, age, and ATS categories are in Table 2b. The proportion admitted was greater for the higher urgency compared with lower urgency ATS categories. The likelihood of hospital admission for patients aged 80 or older compared with the 65-79 age group was similar in all ATS categories.

The triage-to-disposition intervals for the 65 years or older age group stratified by gender, age, and ATS categories are in Table 2c. Overall, the intervals were similar for patients aged 80 years or older compared with the 65-79 years age group, although in some categories the intervals were significantly longer for the older age group.

Patients aged 65 years or older presenting within office-hours versus similarly aged patients presenting after-hours

In the 65 years or older age group, 2,755 (45.4%, 95% CI 44.1%-46.6%) of attendances were after-hours. The number of attendances stratified by gender, time-of-presentation, and ATS categories are in Table 3. The proportion of patients presenting after-hours was greater than expected in the higher urgency compared with lower urgency ATS categories (P = 0.001). For example, male patients presenting after-hours comprised 45.2% of male attendances, yet made up 64.9% and 3.7% of male ATS category 1 and 5 attendances respectively.

Discussion

Patients aged 65 years or older compared with younger adult patients, were more likely to be triaged to higher clinical urgency categories according to ATS and be admitted to hospital. This finding is consistent with other Australasian and North American studies (Hu 1999, Lamb 1995, Oates 1997, Strange 1992, Street 1996, Wofford 1996). Our study, however, appears to be the first to demonstrate that the older patients' higher rate of hospital admission and longer length-of-stay in ED were present even after adjusting for triage category. A likely explanation is that older patients have greater comorbidities, which contributed to further resources being spent on assessment and treatment even for the same ATS category (Singal 1992). This finding lends support to the use of age groups in addition to urgency and disposition, for costing Australian ED patient attendances in the casemix model proposed by Bond and co-workers (Bond 1998).

Patients aged 80 years or older compared with the 65-79 years age group, were more likely to be triaged to higher urgency ATS categories. The former patients' rate of hospital admission and length-of-stay in ED, however, were similar to the latter after adjusting for ATS. It is possible that the increase in comorbidities from 65-79 years to 80 years or older was slight, compared with the change from younger than 65 years to 65 years or older.

Just under half the number of patients aged 65 years or older attended after-hours. Older patients presenting after-hours, compared with office-hours, were more likely to be triaged to higher urgency ATS categories. Perhaps the existence of a primary care section within the ED during office-hours, which treated only ATS category 5 patients, or the availability of transport during that time attracted a large number of low urgency patients including those with repeat visits. However, if ATS category 5 patients were removed from the analyses, the greater proportion of older patients triaged after-hours to higher urgency categories is unchanged. Sicker patients presenting after-hours have implications for the maintenance of senior ED staffing throughout the whole seven-day week.

The study had several limitations. Firstly, the use of surrogate markers for resource utilisation was problematic. Ideally, markers should measure the cost of staff time and resource usage (Erwich-Nijhout 1996, Erwich-Nijhout, 1997). The use of ATS categories and hospital admission rates has been validated but length-of-stay in the ED may not accurately reflect resource utilisation (Erwich-Nijhout 1997, Jelinek 1995, Whitby 1997). A multi-trauma patient requiring urgent surgery can have a short length-of-stay but concentrated use of ED resources. Access block, an issue of substantial importance for many EDs across Australia, can prolong waiting time and length-of-stay after the completion of ED assessment and treatment for patients requiring hospital admissions (Gaudry 2000, Richardson 2000).

Secondly for the purpose of this study, hospital admissions only included patients directly admitted to an inpatient ward. Patients indirectly admitted to an inpatient ward after initial admission to the ED observation ward were excluded. Thus, this study underestimates the true proportion of final inpatient admissions. Thirdly, the provision of ED resources for the retrieval service was not reflected in the ED attendances. Patients cared for by the retrieval team at the scene of an accident or in a peripheral hospital, may be transported to another tertiary centre or brought directly back to the intensive care unit, and thus not counted in the ED attendance.

Finally, the study's setting may preclude generalisation of the results to other institutions. Older people, for example, may make less use of EDs in a rural environment compared to our teaching ED in a metropolitan setting (Lishner 2000). Comparison of different models of health service delivery or EDs with different role delineation should be interpreted with caution to avoid incorrect inference being drawn from "apples with oranges" comparisons (Australasian College for Emergency Medicine 2001, Ieraci 2000).

This study raised two questions worthy of further research. Firstly, the length-of-stay in the ED has several components that need to be refined, if it is to be used as a valid outcome measure. These components include the interval from time of arrival, medical assessment, treatment, and decision on admission to disposition. Secondly, the outcome of older patients initially admitted to the ED observation ward with the plan of hospital discharge in less than 24 hours needs to be investigated. These patients do not fulfil strict medical criteria for hospital admission in the milieu of limited health care resources, but often cannot be readily sent home because of functional, cognitive, and social problems. The number of such patients will increase with the aging population.

Conclusion

Older patients presenting to EDs are more likely to be triaged to higher urgency categories especially after-hours. They have a higher rate of hospital admission and length-of-stay in ED even after adjusting for triage category. The greater ED resource utilisation by older people has implications for the provision of health services in the future. The challenge is to ensure that these increasing emergency health care needs will be met for our aging population.

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Table 1a. Number of Emergency Department attendances by all patients stratified for gender, age group, and Australasian Triage Scale category over six months.

	Australasian Triage Scale category					
Male	1	2	3	4	5	Total
Age group						
≥ 65 years	57 (25.3)	498 (26.6)	1,269 (19.6)	342 (7.3)	595 (18.6)	2,761 (16.8)
< 65 years	168 (74.7)	1,377 (73.4)	5,199 (80.4)	4,367 (92.7)	2,607 (81.4)	13,718 (82.3)
Total	225	1,885	6,468	4,709	3,202	16,479

	Australasian Triage Scale category					
Female	1	2	3	4	5	Total
Age group						
≥ 65 years	69 (47.3)	536 (35.4)	1,670 (26.7)	404 (14.1)	630 (24.8)	3,309 (24.8)
< 65 years	77 (52.7)	978 (64.6)	4,579 (73.3)	2,469 (85.9)	1,907 (75.2)	10,010 (75.2)
Total	146	1,514	6,249	2,873	2,537	13,319

Column percentage in brackets.

Table 1b. Proportion of attendances by all patients admitted to inpatient wards directly from the Emergency Department, stratified for gender, age group, and Australasian Triage Scale category over six months.

	Australasian Triage Scale category				
Male	1	2	3	4	5
Age group					
≥ 65 years	41/57 (71.9%)	344/498 (69.1%)	535/1,269 (42.2%)	82/342 (24.0%)	13/595 (2.2%)
< 65 years	107/168 (63.7%)	421/1,377 (30.6%)	967/5,199 (18.6%)	476/4,367 (10.9%)	149/2,607 (5.7%)
RR (95% CI)	1.13 (0.92-1.40)	2.26 (2.03-2.51)	2.27 (2.07-2.48)	2.20 (1.78-2.73)	0.38 (0.23-0.65)

	Australasian Triage Scale category				
Female	1	2	3	4	5
Age group					
≥ 65 years	52/69 (75.4%)	360/536 (67.2%)	693/1,670 (41.5%)	104/404 (25.7%)	10/630 (1.6%)
< 65 years	44/77 (57.1%)	234/978 (23.9%)	662/4,579 (14.5%)	195/2,469 (7.9%)	77/1,907 (4.0%)
RR (95% CI)	1.32 (1.04-1.67)	2.81 (2.48-3.17)	2.87 (2.62-3.14)	3.26 (2.64-4.03)	0.39 (0.21-0.73)

Table 1c. Median triage-to-disposition intervals (hours) by all patients stratified for gender, age group, and Australasian Triage Scale category over six months.

	Australasian Triage Scale category				
Male	1	2	3	4	5
Age group					
≥ 65 years	3.4 (1.9-4.7)	3.8 (2.7-5.1)	4.0 (2.9-5.4)	2.7 (1.4-4.6)	1.0 (0.6-1.9)
< 65 years	3.0 (1.9-4.0)	2.4 (1.6-3.6)	2.7 (1.6-3.9)	1.7 (0.8-2.9)	0.9 (0.5-1.7)
P	0.470	0.001	0.001	0.001	0.001

	Australasian Triage Scale category				
Female	1	2	3	4	5
Age group					
≥ 65 years	3.7 (3.0-4.9)	3.6 (2.6-4.8)	4.2 (3.1-5.5)	2.7 (1.3-4.6)	1.0 (0.6-1.7)
< 65 years	2.7 (1.7-3.9)	2.3 (1.5-3.6)	2.9 (1.9-4.2)	1.7 (0.8-2.8)	0.9 (0.5-1.8)
P	0.001	0.001	0.001	0.001	0.044

Interquartile range in brackets.

Table 2a. Number of Emergency Department attendances by older patients stratified for gender, age group, and Australasian Triage Scale category over six months.

	Australasian Triage Scale category					
Male	1	2	3	4	5	Total
Age group						
≥ 80 years	23 (40.4)	168 (33.7)	428 (33.7)	85 (24.9)	100 (16.8)	804 (29.1)
65-79 years	34 (59.6)	330 (66.3)	841 (66.3)	257 (75.1)	495 (83.2)	1,957 (70.9)
Total	57	498	1,269	342	595	2,761

	Australasian Triage Scale category					
Female	1	2	3	4	5	Total
Age group						
≥ 80 years	35 (50.7)	250 (46.6)	866 (51.9)	154 (38.1)	179 (28.4)	1,484 (44.8)
65-79 years	34 (49.3)	286 (53.4)	804 (48.1)	250 (61.9)	451 (71.6)	1,825 (55.2)
Total	69	536	1,670	404	630	3,309

Column percentage in brackets.

Table 2b. Proportion of attendances by older patients admitted to in-hospital wards directly from the Emergency Department, stratified for gender, age group, and Australasian Triage Scale category over six months.

	Australasian Triage Scale category				
Male	1	2	3	4	5
Age group					
≥ 80 years	17/23 (73.9)	113/168 (67.3)	198/428 (46.3)	24/85 (28.2)	4/100 (4.0)
65-79 years	24/34 (70.6)	231/330 (70.0)	337/504 (66.9)	58/257 (22.6)	9/495 (1.8)
RR (95% CI)	1.05 (0.75-1.46)	0.96 (0.85-1.09)	0.69 (0.61-0.78)	1.25 (0.83-1.90)	2.20 (0.71-6.85)

	Australasian Triage Scale category				
Female	1	2	3	4	5
Age group					
≥ 80 years	30/35 (85.7)	164/250 (65.6)	391/866 (45.2)	37/154 (24.0)	1/179 (0.6)
65-79 years	22/34 (64.7)	196/286 (68.5)	302/804 (37.6)	67/250 (26.8)	8/451 (1.8)
RR (95% CI)	1.32 (1.01-1.74)	0.96 (0.85-1.08)	1.20 (1.07-1.35)	0.90 (0.63-1.27)	0.31 (0.045-2.23)

Table 2c. Median triage-to-disposition intervals (hours) of older patients stratified for gender, age group, and Australasian Triage Scale category over six months.

	Australasian Triage Scale category				
Male	1	2	3	4	5
Age group					
≥ 80 years	3.8 (3.1-5.2)	3.8 (2.9-5.2)	4.4 (3.2-5.7)	3.1 (1.7-5.1)	1.2 (0.7-1.9)
65-79 years	2.3 (0.9-4.0)	3.7 (2.6-5.1)	3.8 (2.8-5.2)	2.5 (1.3-4.4)	0.9 (0.6-1.8)
P	0.003	0.135	< 0.001	0.064	0.116

	Australasian Triage Scale category				
Female	1	2	3	4	5
Age group					
≥ 80 years	4.1 (3.2-4.9)	3.7 (2.8-4.8)	4.8 (3.2-5.7)	3.5 (1.8-5.4)	1.1 (0.7-1.5)
65-79 years	3.43 (2.4-4.9)	3.5 (2.6-4.8)	4.1 (3.0-5.3)	2.3 (1.1-3.9)	1.0 (0.6-1.8)
P	0.203	0.106	< 0.001	< 0.001	0.76

Interquartile range in brackets.

Table 3. Number of Emergency Department attendances by patients aged 65 years or older stratified for gender, time-of-presentation, and Australasian Triage Scale category over six months.

	Australasian Triage Scale category					
Male	1	2	3	4	5	Total
Office-hours	20 (35.1)	194 (39.0)	562 (44.3)	163 (47.7)	573 (96.3)	1,512 (54.8)
After-hours	37 (64.9)	304 (61.0)	707 (55.7)	179 (52.3)	22 (3.7)	1,249 (45.2)
Total	57	498	1,269	342	595	2,761

	Australasian Triage Scale category					
Female	1	2	3	4	5	Total
Office-hours	19 (27.5)	202 (37.7)	751 (45.0)	216 (53.5)	615 (97.6)	1,803 (54.5)
After-hours	50 (72.5)	334 (62.3)	919 (55.0)	188 (46.5)	15 (2.4)	1,506 (45.5)
Total	69	536	1,670	404	630	3,309

Office-hours were defined as 08:00-17:00 Monday to Friday. After-hours were defined as outside office-hours.

Column percentage in brackets.