Admission variables predicting short lengths of stay of acutely unwell older patients: relevance to emergency and medical short-stay units

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Abstract

Objective: To help develop criteria to identify older patients suitable for admission to medical short-stay units, by determining predictors of length of stay (LOS) of 3 days or less.

Methods: The data were prospectively collected from consecutive older patients admitted from the emergency department of a university hospital to an acute geriatric medicine service. Data included active medical diagnoses, the Modified Barthel Index (MBI), the Timed Up and Go (TUG) test, and demographic information. Logistic regression was used to model the probability of LOS of 3 days or less (short LOS).

Results: Among 2036 patients discharged alive from hospital (mean age, 82 years; median LOS, 7 days), 398 had a short LOS (median, 2 days), while 1638 had a long LOS (median, 9 days). In logistic regression analysis, the main independent predictors of short LOS were an MBI score >15/20 (OR, 2.98; 95% CI, 1.97–4.49), ability to perform the TUG test (OR, 2.08; 95% CI, 1.34–3.24) and absence of delirium (OR, 2.66; 95% CI, 1.56–4.54). Patients without infection, anaemia, gastrointestinal disorder and stroke were also more likely to have a short LOS in multivariate analysis (all $P<0.05$).

Conclusion: Preserved function, measured using the MBI and TUG, and the absence of delirium are strong predictors of short LOS. In conjunction with early, skilled clinical evaluation, these criteria could be used to select older patients presenting to the emergency departments for admission to short-stay units.

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What is known about the topic?

Medical short-stay units are an alternative to standard hospital care for older persons. Because intra-hospital room transfers have been linked to delirium and increased length of stay (LOS), it is desirable to identify patients likely to be discharged home directly from the unit. While many predictors of prolonged LOS are known, less is known about predictors of short LOS.

What does this paper add?

We report predictors of hospital LOS of 3 days or less among older patients admitted to an acute geriatric medicine unit through the emergency department of a university hospital. In logistic regression analysis, the strongest predictors of short LOS were preserved function (measured using the Modified Barthel Index and the Timed Up and Go test) and the absence of delirium. These findings could assist in developing criteria to select patients suitable for admission to short-stay units. They also reinforce the importance of assessing function and identifying delirium in the emergency department.

What are the implications for practitioners?

In conjunction with early, skilled clinical evaluation, these criteria could be used to rapidly select older patients presenting to emergency departments for admission to short-stay units. This strategy may improve the care of older patients, and their transition through the emergency department.

THE INCREASING NUMBER and proportion of older persons is having profound consequences and far-reaching implications, especially for health care systems. Older persons visit the emergency department and are admitted to hospital in greater numbers than their proportion in the total population.[1] Due to escalating demands on a limited health workforce and budget, pressures on emergency departments and hospitals are growing,[2] leading to increasing scrutiny and evaluation of systems of care.

For many older persons, hospitalisation results in functional decline,[3] with up to 65% experiencing a decline in mobility by day 2 of hospitalisation.[4] By preventing rapid functional decline and iatrogenic complications such as infection, an emphasis on minimising length of stay (LOS) in carefully selected patients should lead to better clinical and economic outcomes.

The emergence of short-stay units as an alternative to standard hospitalisation is one approach to improve systems of care for older persons needing hospital care.[5-6] Short-stay units may target patients with specific conditions, such as chronic obstructive pulmonary disease[7] and low-risk myocardial infarction,[8] or they may be more generic. They can be attached to the emergency department or located elsewhere in the hospital. In descriptive studies, they appear to reduce the need for admission to hospital[6] and LOS,[9] though a sizable proportion may need re-presentation for the same problem after discharge.[10] Medical short-stay units may function as rapid evaluation units for all patients requiring admission to hospital, or they can be more selective by targeting those likely to be discharged rapidly,[11] without the need for transfer to another hospital unit or ward. The latter approach may be preferable, because intra-hospital room transfers in older persons have been linked to delirium and increased LOS.[12-13]

If direct discharge from the short-stay unit is the preferred model of care, criteria to select patients appropriate for admission to the unit are needed. While many predictors of prolonged hospital LOS are known,[14] their absence does not necessarily translate directly to short LOS. Predictors of short LOS in non-surgical patients have been reported, though rarely. In lower limb cellulitis, a score emphasising less oedema predicted an LOS of 3 days or less.[15] In chronic obstructive pulmonary disease, a low comorbidity score, fewer number of breaths per minute and a lower P_{CO_2} predicted an LOS of 4 days or less.[16] Few other authors report predictors of short LOS, and none in the context of selecting patients suitable for admission to short-stay units.

In this paper, we report predictors of LOS of 3 days or less among older patients presenting to the emergency department of a university hospital, to assist in the development of criteria to select those most appropriate for admission to short-stay units.

Methods

Study participants

The study involved consecutive older patients admitted through the emergency department of a busy university hospital in south-western Sydney, under the care of any of four geriatricians between November 2000 and December 2005. Most patients were selected based on geriatric targeting criteria that included functional impairment, gait abnormality and falls, multiple medical problems, psychosocial problems, delirium, polypharmacy, deconditioning, malnutrition, and multiple unplanned admissions. The institutional review committee of the Sydney South Western Area Health Service approved the study.

Measurements

A multidisciplinary team comprehensively assessed all patients. The attending geriatrician prospectively coded up to 10 active medical diagnoses per patient (those impacting on physical, social or psychological function, or needing medication changes or investigations to treat symptoms and guide management). Diagnoses identified in previous publications as being related to LOS[14] were selected for further analysis, provided they could realistically be made on admission to hospital. The LOS was the number of days a patient stayed in hospital, calculated as the number of days from the admission date to the discharge date. The Modified Barthel Index (MBI)[17] comprises 10 basic activities of daily living and takes 5–10 minutes to administer. These include bowel continence, bladder continence, grooming, toilet use, feeding, transfer ability, mobility, dressing, use of stairs, and bathing. It is scored out of 20, with higher scores indicating better function. The MBI was administered by an occupational therapist within 24 hours of admission to the hospital, or on the next working day

after a weekend. A physiotherapist administered the Timed Up and Go (TUG) test[18] within a similar time frame. The TUG is a widely used and simple measure of basic mobility that compares well with other measures of balance and function.[18] It involves a person standing from a 46 cm-high chair, walking 3 metres, turning, walking back to the chair and sitting down. Other variables collected on admission were current domicile, whether known to a community-based aged care team, whether recently discharged from our service (within 3 or within 28 days), and demographic information. Professional interpreters were used when necessary (or family members when interpreters were unavailable).

Sample size

We calculated the sample size for a cohort study designed to test whether an LOS of ⩽ 3 days was related to the MBI score. In acutely unwell, targeted older patients, the probability of an LOS of ⩽ 3 days was estimated at 10%. To detect an odds ratio of 1.5 for an individual with an MBI score of one standard deviation above the mean using a one-tailed test with a significance level of 5% and a power of 90%, a minimum of 630 patients is needed. A minimum of 840 patients is needed to detect the same effect while controlling for the effects of the TUG score, assuming that the correlation coefficient between the MBI score and the TUG score is 0.5.[19] Our sample size of more than 2000 was more than sufficient to detect the same effect with a power of 95% (minimum sample size 1050), even while controlling for the effects of other variables in the logistic regression model.[19]

Statistical analysis

Multiple logistic regression was used to model the probability of an LOS in hospital of 3 days or less (v 4 days or longer). The primary aim of the study was to determine predictors of early discharge from hospital (alive), in order to identify patients suitable for admission to an emergency short-stay unit. Patients who died in hospital were therefore excluded from analysis. Differences between patient groups were tested using *t* tests for continuous, normally distributed variables, Fisher's exact tests for dichotomous variables, and Kruskal-Wallis tests for ordinal variables.

While Rasch analysis has been used to transform an ordinal scale (such as the MBI) to an interval scale, such an analysis requires the data to represent the influence of a single underlying unidimensional variable.[20] As this is not the case with the MBI, its effect was evaluated by treating it as an interval scale variable, a categorical variable (four categories, based on first, second and third quartile) and a dichotomous variable. We used receiver operating characteristic (ROC) curve analysis[21] to determine the best cut point to dichotomise the MBI score. The sensitivity, specificity, positive likelihood ratio (LR) and negative LR of the MBI were calculated at this cut point. The TUG was also dichotomised, primarily to simplify its use in the emergency department, into patients able to undertake the test (perform all components independently) compared with those who were unable.[22]

In the logistic regression model in which all significant variables were dichotomised, the Wald χ^2 values were used to assign relative weights to each variable. The relative weights were then used to assign scores of 0–20 to all patients, with higher scores indicating an increased likelihood of a short LOS. ROC curve analysis was used to evaluate the scores. ROC curve analysis was performed using MedCalc for Windows version 9.3.0.0 (MedCalc Software, Mariakerke, Belgium). SAS software (version 9.1, SAS Institute, Inc., Cary, NC, USA) was used for all other analyses.

Results

Patient characteristics and LOS

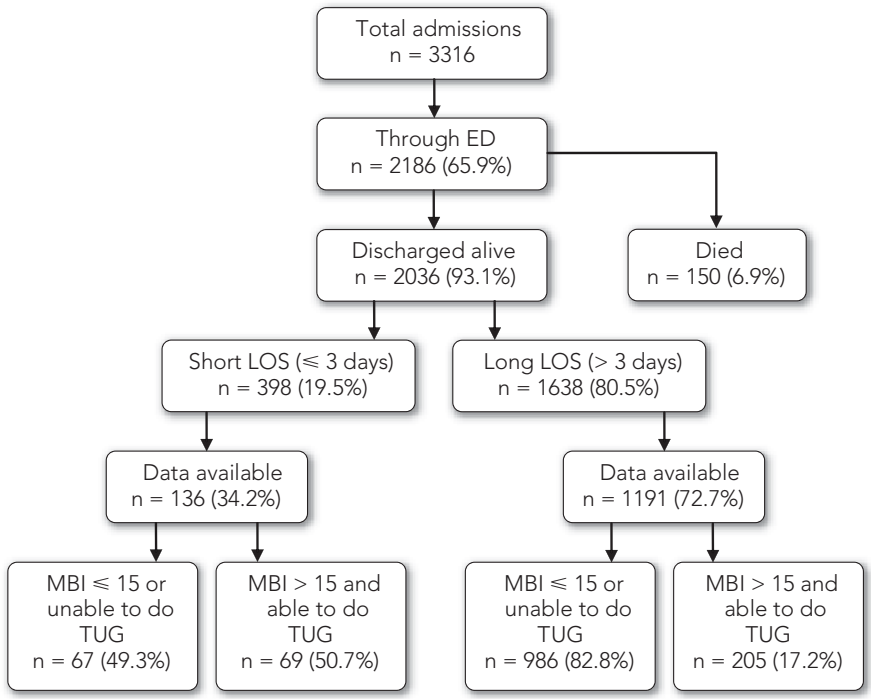
The characteristics of 2186 consecutive patients are shown in Box 1. Although 1172 (53.6%) were born in one of seven English-speaking-background countries, the study population was multicultural, with 662 (30.3%) born in one of 31 European non-English-speaking-background countries, 212 (9.7%) in one of 15 Asian countries, and the remaining 120 (5.5%) in one of 22

1 Characteristics of 2186 patients by length of stay (LOS), >3 days v ⩽3 days

	LOS>3 days (*n*=1745)		LOS⩽3 days (*n*=441)	
Characteristic	**No. data**	**Measure**	**No. data**	**Measure**
Demographics on admission				
Age (mean ±SD, in years)	1745	82.6±7.5	441	82.6±7.1
Female (%)	1745	60.2	441	62.1
English-speaking COB (%)	1730	54.4	436	53.2
English-speaking (%)	1576	77.7	403	75.4
Known to ACAT (%)	1707	53.1	433	49.9
Admission from nursing home (%)	1497	9.2	260	14.2
Readmission within 3 days (%)	1745	2.5	441	2.7
Readmission within 28 days (%)	1745	10.7	441	11.6
Diagnoses (active) on admission				
Anaemia (%)	1745	19.0	441	12.0
Arthritis (%)	1745	21.9	441	21.8
Cardiac failure (%)	1745	25.7	441	22.0
Cardiac ischaemia (%)	1745	23.0	441	22.5
Chronic airflow limitation (%)	1745	15.2	441	12.0
Delirium (%)	1745	37.1	441	19.5
Dementia (%)	1745	36.6	441	36.5
Fracture pelvis (%)	1745	2.1	441	0.5
Fracture vertebral (%)	1745	5.9	441	2.3
Fracture other (%)	1745	6.4	441	2.5
GIT bleeding (%)	1745	8.5	441	4.5
GIT disorder not bleeding (%)	1745	21.7	441	12.9
Infection cellulitis (%)	1745	9.1	441	5.4
Infection respiratory tract (%)	1745	30.4	441	21.8
Infection urinary tract (%)	1745	22.6	441	12.5
Infection NOS (%)	1745	8.0	441	2.7
Injury intracranial (%)	1745	1.4	441	1.6
Injury other (%)	1745	10.0	441	10.7
Renal failure (%)	1745	25.1	441	20.0
Psychiatric disorder (%)	1745	15.6	441	14.3
Stroke (%)	1745	10.3	441	5.7
Syncope or collapse (%)	1745	4.1	441	9.8
Urine retention (%)	1745	6.4	441	1.1
Function on admission				
MBI score (median, Q1–Q3)	1315	11, 6–15	167	16, 11–19
MBI score > 15 (%)	1315	21.1	167	53.9
TUG time (median, Q1–Q3)	637	29, 19–42	143	22, 15–30
Able to perform TUG (%)	1579	40.3	215	66.5
Assistance from staff to walk (%)	1484	46.6	216	26.9
Mobility aid to walk (%)	1481	75.5	213	65.7
Outcomes of hospitalisation				
LOS (median, Q1–Q3)	1745	9, 6–14	441	2, 1–3
Death (%)	1745	6.1	441	9.8
New nursing home placement (%)	1509	10.3	274	2.9

No. data = number of patients with data for variable; COB = country of birth; ACAT = Aged Care Assessment Team; GIT = gastrointestinal tract; NOS = not otherwise specified; MBI = Modified Barthel Index; TUG = Timed Up and Go test.

2 Study flow chart



ED = emergency department; LOS = length of stay; MBI = Modified Barthel Index; TUG = Timed Up and Go test. Data available refers to MBI, TUG, sex, age, and medical diagnoses (shown in Box 3 and Box 4).

South American, African or Middle Eastern countries. The country of birth was unknown for 20 patients (0.9%). Four hundred and forty-one stayed in hospital for 3 days or less (short LOS; median, 2 days), while 1745 stayed for 4 days or longer (long LOS; median, 9 days). One hundred and fifty patients died in hospital (9.8% short-stayers, 6.1% long-stayers) (Box 2).

ROC curve and likelihood ratios for MBI in predicting short or long LOS

The area under the ROC curve (AUC) for the MBI was only moderately high at 0.71 (95% CI, 0.68–0.73). At the optimal cut point of more than 15/20, the sensitivity of the MBI for detecting a short LOS was 57.0% (95% CI, 48.9%–64.8%), while the specificity was 78.1% (95% CI, 75.7%–80.4%). MBI scores more than 15/20 multiply the pre-test odds of a short LOS by 2.6 (positive LR), while lower scores divide the pre-test odds by about 1.8 (negative LR, 0.55).

Logistic regression analysis

After excluding patients who died, the univariate predictors of a short LOS in our dataset were syncope, ability to perform the TUG, MBI score, and MBI score more than 15 (all $P < 0.05$). The univariate predictors of a long LOS were delirium, presence of an infection, gastrointestinal tract (GIT) disorder other than bleeding, renal failure, urine retention, anaemia, stroke, fracture, dysphagia, GIT bleeding, cardiac failure and liver disorder (all $P < 0.05$).

Box 3 and Box 4 show the multiple logistic regression models for detection of short lengths of stay, treating MBI as an interval scale variable and as a dichotomous variable, respectively. All other variables, except age, are dichotomous variables.

3 Logistic regression for short length of stay (LOS): MBI treated as an interval scale variable

Variable measured on admission	PE	SE	*P* value	OR (95% CI)
Sex (male)	–0.06	0.20	0.74	0.94 (0.64–1.38)
Age	–0.01	0.01	0.28	0.99 (0.96–1.01)
MBI score	0.10	0.02	< 0.0001	1.10 (1.05–1.15)
Able to do TUG	0.68	0.23	0.004	1.97 (1.25–3.11)
No delirium	0.92	0.27	0.0007	2.52 (1.48–4.29)
No infection	0.45	0.20	0.02	1.58 (1.07–2.31)
No anaemia	0.67	0.29	0.02	1.95 (1.10–3.48)
No GIT disorder	0.59	0.26	0.02	1.81 (1.08–3.02)
No stroke	1.13	0.53	0.03	3.10 (1.09–8.80)

N = 1327; No. staying 3 days or less = 136; –2 log L = 755.7; R-square = 0.09; Adjusted R-square = 0.18; MBI = Modified Barthel Index; TUG = Timed Up and Go test; GIT disorder = gastrointestinal tract disorder (excludes bleeding and liver disease); PE = parameter estimate; SE = standard error; OR = odds ratio; CI = confidence interval.

4 Logistic regression for short length of stay (LOS): MBI treated as a dichotomous variable

Variable measured on admission	PE	SE	*P* value	OR (95% CI)
Sex (male)	–0.10	0.20	0.61	0.90 (0.61–1.34)
Age	–0.01	0.01	0.42	0.99 (0.96–1.02)
MBI score > 15	1.09	0.21	< 0.0001	2.98 (1.97–4.49)
Able to do TUG	0.73	0.22	0.001	2.08 (1.34–3.24)
No delirium	0.98	0.27	0.0003	2.66 (1.56–4.54)
No infection	0.46	0.20	0.02	1.59 (1.08–2.34)
No anaemia	0.68	0.30	0.02	1.98 (1.11–3.53)
No GIT disorder	0.59	0.26	0.03	1.81 (1.08–3.03)
No stroke	1.15	0.53	0.03	3.15 (1.11–8.95)

N = 1327; No. staying 3 days or less = 136; –2 Log L = 745.2; R-square = 0.09; Adjusted R-square = 0.20; MBI = Modified Barthel Index; TUG = Timed Up and Go test; GIT disorder = gastrointestinal tract disorder (excludes bleeding and liver disease); PE = parameter estimate; SE = standard error; OR = odds ratio; CI = confidence interval.

If the MBI score is treated as a categorical variable (four categories, based on first, second and third quartile), a score > 15 ($P = 0.02$; OR 2.30; 95% CI, 1.17–4.53) is an independent predictor of short LOS (compared with a reference score of 0–7), while scores of 8–12 ($P = 0.39$) and 13–15 ($P = 0.43$) are not (data not shown in tables).

Among the 2036 survivors, the overall median LOS was 7 days (Q1–Q3, 4–12). Patients with delirium (median, 9 days; Q1–Q3, 6–15), infection (8 days; 5–15), anaemia (9 days; 5–15), GIT disorder (excluding bleeding) (8 days; 5–14) and stroke (9 days; 6–14) had longer median lengths of stay.

LOS and patient stratification score

In the logistic regression model in which all significant variables were dichotomised, the Wald χ^2 values of the variables were used to develop and assign scores of 0–20 to all patients, with higher scores indicating increased likelihoods of short lengths of stay (Box 5).

5 Scores based on Wald χ^2 values of dichotomous variables

	Wald χ^2		Score	
Variable	**Value**	**% total**	**Raw**	**Rounded**
MBI score > 15	27.1	38.1 %	7.6	8
Able to do TUG	10.7	15.0 %	3.0	3
No delirium	13.0	18.3 %	3.7	4
No infection	5.4	7.6 %	1.5	2
No anaemia	5.3	7.5 %	1.5	1
No GIT disorder	5.0	7.0 %	1.4	1
No stroke	4.6	6.5 %	1.3	1
Total	71.1	100 %	20	20

MBI = Modified Barthel Index; TUG = Timed Up and Go test; GIT disorder = gastrointestinal tract disorder (excludes bleeding and liver disease).

The AUC for the scores was moderately high at 0.75 (95% CI, 0.73–0.77). Various cut points can be chosen to stratify patients for admission to a short-stay unit. Box 6 shows the sensitivities and specificities at each cut point, together with associated likelihood ratios and percentages of patients at each cut point score.

Patients without functional impairment

Sixty-nine of 136 short-stay patients (50.7%) with available functional data (MBI and TUG) had an MBI score greater than 15 and could perform the TUG. Their most common principal medical diagnoses were adverse drug reaction ($n = 8$), syncope ($n = 6$) and cardiac failure ($n = 4$). Common non-principal, but active medical diagnoses included adverse drug reaction ($n = 17$), degenerative arthritis ($n = 15$), renal failure (mostly due to dehydration and medications, $n = 14$), cardiac arrhythmia (mostly atrial fibrillation, $n = 13$), diabetes ($n = 12$), dementia ($n = 11$), unstable cardiac ischaemia ($n = 11$) and poorly controlled hypertension ($n = 11$).

Two hundred and five of 1191 long-stay patients (17.2%) with available functional data had an MBI score greater than 15 and could perform the TUG. Their median LOS was 7 days (interquartile range, 5–10 days). Their most common principal medical diagnoses were respiratory infection ($n = 20$), delirium ($n = 19$), adverse drug reaction ($n = 17$), cardiac failure ($n = 13$), stroke ($n = 12$) and cellulitis ($n = 11$). Common non-principal, but active medical diagnoses included adverse drug reaction ($n = 86$), dementia ($n = 57$), unstable cardiac ischaemia ($n = 52$), renal failure (mostly due to dehydration and medications, $n = 48$), poorly controlled hypertension ($n = 44$), gastrointestinal disorder (not including bleeding, $n = 41$) and cardiac arrhythmia (mostly atrial fibrillation, $n = 40$). Compared with short-stayers, these long-stayers were more likely to be delirious ($P = 0.003$) and malnourished ($P = 0.005$). They also had more active diagnoses per patient (median, 7 v 5; $P < 0.0001$).

Missing data

A complete set of data was available for 34.2% of short-stayers, compared with 72.7% of long-stayers ($P < 0.0001$) (Box 2). This discrepancy was due to missing functional data (Box 1). Eighty-five short-stay patients (21.4%) were admitted on a Saturday or Sunday. Of these, 73 (85.9%) were discharged either on the same weekend or on the following Monday (usually early in the day), making collection of functional data difficult (study personnel responsible for its collection did not work on weekends). Compared with short-stay patients, functional data were successfully collected in most of the 297 (18.1%) long-stay patients admitted on the weekend (Box 1).

6 ROC curve analysis of patient stratification scores and percent of patients at MBI cut point

	ROC curve analysis				Patients at cut point	
Cut point	Sensitivity (95% CI)	Specificity (95% CI)	+LR	–LR	%	Cumulative %
0	100.0 (98.0–100.0)	0.0 (0.0–0.3)	1.0	–	3.9	3.9
1	97.3 (93.9–99.1)	15.4 (13.5–17.4)	1.2	0.2	10.0	13.9
3	97.3 (93.9–99.1)	15.9 (14.1–17.9)	1.2	0.2	0.5	14.4
4	95.7 (91.8–98.1)	23.1 (20.9–25.3)	1.2	0.2	6.5	20.9
5	92.0 (87.2–95.5)	40.1 (37.5–42.7)	1.5	0.2	15.4	36.3
7	91.5 (86.5–95.1)	41.5 (38.9–44.1)	1.6	0.2	1.3	37.6
8	84.6 (78.6–89.4)	50.9 (48.2–53.5)	1.7	0.3	9.1	46.7
9	75.5 (68.7–81.5)	62.3 (59.7–64.8)	2.0	0.4	11.2	57.9
11	73.4 (66.5–79.6)	64.3 (61.8–66.8)	2.1	0.4	2.1	60.0
12	60.6 (53.3–67.7)	73.8 (71.4–76.0)	2.3	0.5	9.8	69.8
13	54.8 (47.4–62.0)	77.8 (75.5–79.9)	2.5	0.6	4.2	74.0
15	53.2 (45.8–60.5)	80.0 (77.8–82.0)	2.7	0.6	2.1	76.1
16	36.7 (29.8–44.0)	88.1 (86.3–89.7)	3.1	0.7	9.1	85.2
17	30.3 (23.8–37.4)	91.3 (89.7–92.7)	3.5	0.8	3.6	88.8
19	26.1 (19.9–33.0)	93.3 (91.9–94.5)	3.9	0.8	2.2	91.0
20	0.0 (0.0–2.0)	100.0 (99.7–100.0)	–	1.0	9.0	100.0

AUC = 0.75 (95% CI 0.73–0.77); N = 1606; No. staying 3 days or less = 188; ROC = receiver operating characteristic; MBI = Modified Barthel Index; AUC = area under ROC curve; + LR = positive likelihood ratio; –LR = negative likelihood ratio.

Compared with short-stay patients with complete data, those with missing data were older (mean age, 82.0 v 80.1 years; $P = 0.03$) and had shorter lengths of stay (median 2 v 3 days; $P < 0.0001$). They were similar in regard to sex and to medical diagnoses shown in Box 3 and Box 4 (all $P > 0.05$). Long-stay patients with missing data had shorter lengths of stay than those with complete data (median 7 v 9 days; $P < 0.0001$), but were similar in regard to age, sex and medical diagnoses (all $P > 0.05$). Furthermore, in both short-stay and long-stay groups, those with missing data were similar to those with complete data in their ability to speak English, their readmission rates to our service within 3 or 28 days, and their need for new nursing home placement (all $P > 0.05$).

Discussion

Medical short-stay units of varying form have been around for many years.[23] Although evidence supporting their effectiveness comes mostly from descriptive studies following the establishment of individual units,[5,6,9-11] medical short-stay units are seen by many as a viable alternative to standard hospital care for older persons. While some see them as rapid evaluation units for all patients requiring admission to hospital, others prefer them to be more selective, by targeting those likely to be discharged home directly from the unit. If the latter approach is the preferred model of care, then criteria to select patients appropriate for admission to the unit are needed.

Our study suggests that, among targeted older patients admitted for acute geriatric care, preserved function, measured using the MBI and the TUG, and the absence of delirium are strong predictors of LOS of 3 days or less. Although the absence of infection, stroke, gastrointestinal disease and anaemia also independently predicted short LOS, their contributions, individually and collectively, were considerably weaker.

In contrast to predictors of short LOS, many predictors of long LOS are known. These include functional impairment, illness severity, poor cognition, malnutrition, greater comorbidity, diagnosis or presenting illness, polypharmacy, and possibly age and gender.[14] While their absence does not translate directly to short LOS, it does provide indirect support. Functional impairment is also a consistent and strong predictor of mortality and discharge destination.[14] These findings reinforce the importance of assessing function and mobility in all older patients presenting to the emergency department, where the focus is often, by necessity, on more acute issues. While function can be assessed in a number of ways, both the MBI and the TUG are objective measures that are widely accepted, reproducible and easy to administer, requiring no special equipment and training.[17-18,24]

Medical short-stay units have emerged as one solution to address the difficulty in the early assessment of older people presenting to the emergency department. Older people often have complex health problems and medical needs, and their presentations are often atypical.[25] For example, cognitive impairment, including delirium, is highly prevalent in older patients and is associated with adverse outcomes,[14] yet recognition is poor, even by emergency physicians.[26] Without comprehensive assessment, patient care is compromised in those with cognitive impairment, even when screening tools are used.[26] While comprehensive assessment can be undertaken by a trained nurse practitioner,[27] a brief case-finding approach takes almost 20 minutes to complete.[28] Clinicians skilled in geriatric medicine, such as Aged Care Services in Emergency Teams (ASET), are better suited for this task.

Many older persons can readily access a range of services that do not involve inpatient care, including those provided by ambulatory care departments, day hospitals, outpatient clinics, and general practitioners. Given these options, it could be asked why patients with preserved function need hospital care at all. Most of our short-stayers required detailed evaluation and close monitoring that could only be provided safely within the hospital setting, including those with serious drug reactions, syncope, arrhythmia, decompensated cardiac failure and ischaemia, renal failure and poorly controlled hypertension. In contrast, long-stayers with preserved function were frequently delirious, a known predictor of long LOS,[29] and often had infections involving the respiratory tract, urinary tract and skin. While many older patients with infections can be safely discharged within 3 days, those without comorbid disease were admitted under the care of other services, if at all, in keeping with our policy of targeted geriatric care. Similar reasons underlie the longer lengths of stay of patients with anaemia and gastrointestinal disease, a broad category that included patients with gastroesophageal reflux disease, mesenteric ischaemia, diverticulitis, and bowel obstruction not requiring surgery. Most patients with stroke are hospitalised for more than 3 days, with LOS and costs dependent on additional variables, such as stroke severity and level of functioning after the stroke, comorbidity and complications.[30-31]

With multiple care systems in place in modern hospitals, matching the needs of individual patients to services best able to meet these needs is important. On admission to the hospital, clinicians are asked to estimate the date of discharge of their patients. This may be more difficult in older patients. Because intrahospital room transfers have been linked to delirium and increased LOS in older persons,[12-13] it is important to attempt to place each patient in the most appropriate ward on admission, with direct discharge from that ward whenever possible. Our predictors of short LOS should help to address this issue, and the patient stratification scores (Box 6) are an exploratory attempt to quantify decisions regarding admission. In Box 6, various cut points can be chosen to stratify patients for admission to a short-stay unit. Short-stay units with few beds may choose a cut point with high specificity (to minimise patients staying longer than 3 days), while units with more beds may be prepared to trade high specificities for greater sensitivities. However, any scoring system must be used in conjunction with skilled clinical evaluation to

safely identify patients suitable for early transfer to the short-stay unit.

As we selected patients for admission to our service based on geriatric targeting criteria (outlined earlier), a limitation of our study is that our findings cannot be generalised to all older patients presenting to an emergency department. Older patients with single system problems and many from nursing homes were excluded. Accordingly, our method to stratify patients for admission to a short-stay unit by the scores shown in Box 6 is exploratory. The effects of infection, anaemia, gastrointestinal disorder and stroke on LOS of patients admitted to a geriatric medicine service are clearly dependent on the admission criteria of that service. This is unlikely to be the case with functional impairment and delirium, both of which are consistent and strong predictors of many outcomes, including LOS.[14] Decisions regarding admission to a short-stay unit could therefore be simplified by considering function and delirium only. However, some flexibility must exist, because many patients from nursing homes could also be admitted to short-stay units, as could groups of patients with selected problems, such as those with vertebral fracture undergoing early vertebroplasty. A second limitation is that a substantial proportion of patients had missing functional data. Short-stayers with missing data were older and had shorter lengths of stay (compared with short-stayers with complete data). Long-stay patients with missing data also had shorter lengths of stay than those with complete data. No other systematic differences were identified between those with and without missing data.

In summary, our study suggests that, among older patients admitted from the emergency department for acute geriatric care, preserved function, measured using the MBI and the TUG, and the absence of delirium are strong predictors of LOS of 3 days or less. These criteria could be used to help select patients appropriate for admission to short-stay units, particularly where the hospital has a policy to place each patient in the most appropriate ward on admission, with direct discharge from that ward whenever possible.

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Competing interests

The authors declare that they have no competing interests.

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