

Emergency department falls interventions improve osteoporosis management in frail older adults

Dear Editor,

Singapore's population is ageing rapidly and by 2030, around 1 in 4 citizens will be aged 65 and above.¹ Older adults represent 21–40% of emergency department (ED) users and proportionally are the highest users of ED services.²

One-third of community dwellers over 65 years of age fall each year, and 50% will fall again, with 10% of falls resulting in serious injuries such as hip fractures, head injuries, injury-related disability and death.³ Frailty is common in older adults and can be prevented or at least delayed⁴ with ED frailty interventions and hospital avoidance.⁵ This letter describes Singapore's introduction of falls interventions and osteoporosis management in older adults attending an ED short stay unit (SSU) and describes integration of geriatric services in the ED.

The ED SSU is a protocol-led unit, staffed by emergency medicine physicians, with a 23-hour maximum length of stay. The falls protocol (FP) was introduced on 10 March 2019, and operates from Sunday 12pm to Friday 9am, following a service development collaboration between geriatricians and emergency medicine physicians. Inclusion criteria identify older adults with falls and aim to avoid acute hospital admission by undertaking comprehensive geriatric assessments (CGA) in the ED SSU administered by a consultant geriatrician, geriatric resident physician and an ED nurse who has received basic training in geriatric care, called a Geriatric Care Champion. A retrospective review was undertaken after 7 months to assess effectiveness of the FP, and a comparator group (CG) was identified in falls patients admitted to SSU under the Blunt Trauma and Head Injury Protocols at our institution between 1 January 2018 and 31 December 2018. Electronic patient records were reviewed, and data collection included demographics, functional assessments, hospital utilisation and mortality. Falls history and injurious fall defined by the presence of fracture, compliance to bone health recommendations, uptake of bone mineral density (BMD) scan and anti-resorptive treatment were reviewed and assumed compliant if anti-resorptive treatment was commenced following the SSU visit. Rockwood's Clinical Frailty Scale (CFS)⁶ was calculated from the CGA and/or Occupational Therapy assessments and categorised into: CFS 1–3; CFS 4–5; and CFS 6–9. Ethics review exemption was granted by the SingHealth Centralised Institutional Review Board. Descriptive

statistics of demographic and clinical variables were compared between FP group and CG. The categorical outcome measures were analysed using chi-squared or Fisher's Exact test and presented as proportions and percentages. T-test was used for continuous data and presented as means and standard deviations. Data were analysed using Stata version 14 (Stata Corp, College Station, TX, US).

The FP group comprised 96 patients and CG 121 patients. Between FP group and CG, there were similarities in average age (79.8 years vs 77.9 years, respectively; $P=0.092$) and median age (80 vs 78; $P=0.072$). There were also more females in both groups (61.5% vs 51.2%; $P=0.169$) (Table 1).

Comparing FP group vs CG, FP patients were more frail with CFS 1–3 (23.9% vs 37.2%, respectively), CFS 4–5 (38.5% vs 22.3%, $P=0.0001$) and CFS ≥ 6 (37.5% vs 19.0%; $P=0.0001$), and more dependent for instrumental and basic activities of daily living (Table 1; $P<0.0001$). Recurrent falls were more common in the FP group vs CG (70.8% vs 41.3%; $P=0.0001$); they also experienced more falls with fracture (43.8% vs 24.8%; $P=0.04$), which increased their likelihood of hospital admission (60% vs 30.8%, $P=0.027$). First falls occurred more frequently in the CG for those with CFS 4–5 (27% vs 55.6%, $P<0.037$), whereas recurrent falls were more common in FP patients with CFS 4–5 (72.9% vs 44.4%, $P<0.037$) (data not shown).

Osteoporosis was newly identified in more patients in the FP group vs CG (30.2% vs 7.4%, respectively; $P<0.0001$). The FP group also had a higher proportion of patients with known osteoporosis (28.1% vs 11.6%), and osteopenia (19.8% vs 2.5%; $P=0.0001$). BMD was undertaken for more patients in the FP group (82.3% vs 24.8%) with both vitamin D (95.8% vs 24.8%; $P<0.0001$) and serum calcium (96.8% vs 28.9%; $P<0.0001$) checked more frequently (Table 1). Following the ED visit, total antiresorptive use was much higher in the FP group, 58.3% vs 19%.

Home discharge was lower in the FP group vs CG (35.4% vs 63.9%, respectively; $P<0.0001$), but more patients transferred directly to St Andrew's Community Hospital, Singapore for subacute care (33.3% vs 3.4%; $P<0.0001$). Acute hospital admission was similar in both groups (31.3% vs 32.8%), as was hospital length of stay (15.3 SD 12.4 vs 11.6 days; SD 13.7 $P=0.164$). For both FP group and CG, there was low ED re-

Table 1. Demographics, bone health assessment, functional assessments, hospital utilisation and mortality (n=217).

	Falls protocol (FP) group	Comparator group (CG)	P value
	n=96 (44.2%)	n=121 (55.8%)	
Age, mean (SD), years	79.8 (7.3)	77.9 (8.2)	0.092
Ages, median (IQR), years	80 (74–85)	78 (71–84)	0.072
Age range, no. (%), years			
≤70	13 (13.5)	24 (19.8)	0.227
71–80	36 (37.5)	51 (42.2)	
>80	47 (48.9)	46 (38.0)	
Sex, no. (%)			
Female	59 (61.5)	62 (51.2)	0.169
Male	37 (38.5)	59 (48.8)	
BMI, no. (%) ^a			
Underweight (<18.5)	15 (18.1)	4 (19.1)	0.667
Normal weight (18.5–24.9)	45 (54.2)	12 (57.1)	
Pre-obesity (25–29.9)	16 (19.3)	2 (9.5)	
Obesity (≥30)	7 (8.4)	3 (14.3)	
Frailty and bone health			
Frailty groups, no. (%)			
Non-frail (CFS 1–3)	23 (23.9)	45 (37.2)	<0.0001
Very mildly and mildly frail (CFS 4–5)	37 (38.5)	27 (22.3)	
Frail (CFS 6–9)	36 (37.5)	23 (19.0)	
Not done	0 (0)	26 (21.5)	
Osteoporosis, no. (%)			
Normal BMD	4 (4.2)	4 (3.3)	<0.0001
New osteoporosis	29 (30.2)	9 (7.44)	
Prior osteoporosis	27 (28.1)	14 (11.6)	
Osteopenia	19 (19.8)	3 (2.5)	
No BMD	17 (17.7)	91 (75.2)	
Serum vitamin D (sufficient: ≥30µg/L), no. (%)			
≥30 replete	19 (19.8)	7 (5.8)	<0.0001
20 to <30 mild deficiency	39 (40.6)	11 (9.1)	
10 to <20 moderate deficiency	30 (31.3)	10 (8.3)	

Table 1. Demographics, bone health assessment, functional assessments, hospital utilisation and mortality (n=217). (Cont'd)

	Falls protocol (FP) group	Comparator group (CG)	P value
	n=96 (44.2%)	n=121 (55.8%)	
<10 severe deficiency	4 (4.2)	2 (1.7)	
Not done	4 (4.2)	91 (75.2)	
Serum calcium (normal range 2.10–2.60mmol/L), no. (%)			
2.1 to <2.6	92 (95.8)	34 (28.1)	<0.0001
2 to <2.1	1 (1.0)	1 (0.8)	
Not done	3 (3.2)	86 (71.1)	
Bisphosphonate initiation			
New antiresorptive treatment, no. (%)			
No	67 (69.8)	112 (92.6)	<0.0001
Yes	29 (30.2)	9 (7.4)	
Prior antiresorptive treatment, no. (%)			
No	69 (71.9)	107 (88.4)	0.003
Yes	27 (28.1)	14 (11.6)	
Functional assessments			
Barthel index, no. (%)			
Independent (20)	41 (42.7)	41 (33.9)	<0.0001
Mild disability (16–19)	38 (39.5)	18 (14.9)	
Moderate disability (11–15)	12 (12.5)	9 (7.4)	
Severe disability (≤10)	4 (4.2)	6 (5.0)	
Not done	1 (0)	47 (38.8)	
IADL, no. (%)			
Independent (7)	33 (34.4)	34 (28.1)	<0.0001
Assisted (1–6)	48 (50.0)	24 (19.8)	
Dependent (0)	14 (14.6)	12 (9.9)	
Not done	1 (1)	51 (42.2)	
AMT (cognitive), no. (%)			
Normal (≥7)	59 (61.5)	46 (38.0)	<0.0001
Cognitive impaired (0–6)	31 (32.3)	13 (10.7)	
Not done	6 (6.3)	62 (51.2)	
Discharge			
Discharge destination, no. (%)			

Table 1. Demographics, bone health assessment, functional assessments, hospital utilisation and mortality (n=217). (Cont'd)

	Falls protocol (FP) group	Comparator group (CG)	P value
	n=96 (44.2%)	n=121 (55.8%)	
Changi General Hospital, Singapore	30 (31.3)	39 (32.8)	<0.0001
St Andrew's Community Hospital, Singapore	32 (33.3)	4 (3.4)	
Home	34 (35.4)	76 (63.9)	
Admission to hospital, no. (%)			
Falls, no fracture	12 (40.0)	27 (69.2)	0.027
Falls, with fracture	18 (60.0)	12 (30.8)	
Outcome measures			
Mortality, no. (%)	2 (2.1)	5 (4.1)	0.468
ED re-attendance, no. (%)			
7-day	1 (1.0)	5 (4.1)	0.231
30-day	10 (10.4)	14 (11.6)	0.831
Hospital re-admission, no. (%)			
30-day	6 (6)	11 (9)	0.612
6-month	29 (30.2)	32 (26.5)	0.547
Length of hospital stay			
Mean (SD), days	15.3 (12.4)	11.6 (13.7)	0.164
Median (IQR), days	12 (8–18)	8 (5–13)	0.013
History of fall, no. (%)			
Prior fall	68 (70.8)	50 (41.3)	<0.0001
First fall	28 (29.2)	71 (58.7)	
Fall with fracture, no. (%)			
Falls, no fracture	54 (56.2)	91 (75.2)	0.004
Falls, with fracture	42 (43.8)	30 (24.8)	

AMT: abbreviated mental test; BMD: bone mineral density; BMI: body mass index; CFS: Clinical Frailty Scale; ED: emergency department; IADL: instrumental activities of daily living; IQR: interquartile range; SD: standard deviation

P values in bold are statistically significant.

^a BMI results available only for 83 cases in FP group, and 21 cases in CG group.

attendance at 7 days (1% vs 4.1%, $P=0.231$), 30 days (10.4% vs 11.6%, $P=0.831$), and 30-day unplanned hospital re-admission (6% vs 9%; $P=0.612$) that remained similar between both groups at 6 months (30.2% vs 26.5%; $P=0.547$). Mortality was low in both groups (2.1% vs 4.1%; $P=0.468$) at 6 months.

Geriatric emergency medicine is gaining traction as an opportunity to identify frailty and improve patients' function by avoiding hospital admission.⁵ A CGA undertaken at ED reduces both admission and re-admission rates.⁷ Adverse outcomes occur in one-third of older patients after ED discharge,⁸ but a CGA undertaken after discharge from the ED can lower 30-day hospital re-admissions (16.5% vs 22.2%; $P=0.048$), with improvements in both physical and mental functions compared to standard care.⁹ In this review, FP patients were more frail and functionally impaired compared with CG, experienced more recurrent falls (70.8% vs 41.3%, respectively; $P=0.0001$) and more falls with fracture (43.8% vs 24.8%; $P=0.004$), which typically result in hospital admissions. However, FP patients achieved the same low 7 and 30-day ED re-attendance, unplanned hospital re-admissions and mortality rates as the CG, suggesting geriatric assessment can help older patients destined for hospital admission to discharge safely from the SSU. The CG was discharged home more frequently than FP patients (35.4% vs 63.9%; $P<0.0001$), but over time home discharges from the SSU for FP patients increased from 35.4% to 75% (unpublished data from internal audit for the Geriatric Emergency Medicine Service, Changi General Hospital, January 2022). CG patients are not routinely screened for falls risk and osteoporosis, but many pre-frail patients frequently fall and would benefit from early interventions to prevent falls and osteoporotic fractures. Osteoporosis treatments have a strong evidence base¹⁰ and the FP enables earlier falls interventions, as well as higher rates of identification and treatment of osteoporosis.

The FP offers an opportunity to prevent hospital admission in older patients, provide treatment recommendations and onward referrals to mitigate falls risk and prevent future osteoporotic fractures.

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