European Journal of Internal Medicine xxx (xxxx) xxx

Contents lists available at ScienceDirect

European Journal of Internal Medicine

journal homepage: www.elsevier.com/locate/ejim

Original article

Home FIRsT: interdisciplinary geriatric assessment and disposition outcomes in the Emergency Department☆

Íde O'Shaughnessy [a,#], Roman Romero-Ortuno [a,b,c,#,*], Lucinda Edge [a], Aoife Dillon [a], Sinéad Flynn [a], Robert Briggs [a,b], Darragh Shields [d], Geraldine McMahon [d], Arthur Hennessy [d], Una Kennedy [d], Paul Staunton [d], Rosa McNamara [d], Suzanne Timmons [e], Frances Horgan [f], Conal Cunningham [a,b]

[a] Mercer's Institute for Successful Ageing, St James's Hospital, Dublin, Ireland
[b] Discipline of Medical Gerontology, School of Medicine, Trinity College Dublin, Ireland
[c] Global Brain Health Institute, Trinity College Dublin, Ireland
[d] Emergency Department, St James's Hospital, Dublin, Ireland
[e] Centre for Gerontology and Rehabilitation, School of Medicine, University College Cork, Ireland
[f] School of Physiotherapy, Royal College of Surgeons in Ireland, Dublin, Ireland

ARTICLE INFO

Keywords:
Emergency Department
Older people
Frailty
Illness Acuity
Delirium

ABSTRACT

Background: Older people in the Emergency Department (ED) are clinically heterogenous and some presentations may be better suited to alternative out-of-hospital pathways. A new interdisciplinary comprehensive geriatric assessment (CGA) team (Home FIRsT) was embedded in our acute hospital's ED in 2017.
Aim: To evaluate if routinely collected CGA metrics were associated with ED disposition outcomes.
Design: Retrospective observational study.
Methods: We included all first patients seen by Home FIRsT between 7th May and 19th October 2018. Collected measures were sociodemographic, baseline frailty (Clinical Frailty Scale), major diagnostic categories, illness acuity (Manchester Triage Score) and cognitive impairment/delirium (4AT). Multivariate binary logistic regression models were computed to predict ED disposition outcomes: hospital admission; discharge to GP and/or community services; discharge to specialist geriatric outpatients; discharge to the Geriatric Day Hospital.
Results: In the study period, there were 1,045 Home FIRsT assessments (mean age 80.1 years). For hospital admission, strong independent predictors were acute illness severity (OR 2.01, 95% CI 1.50-2.70, P<0.001) and 4AT (OR 1.26, 95% CI 1.13 – 1.42, P<0.001). Discharge to specialist outpatients (e.g. falls/bone health) was predicted by musculoskeletal/injuries/trauma presentations (OR 6.45, 95% CI 1.52 – 27.32, P=0.011). Discharge to the Geriatric Day Hospital was only predicted by frailty (OR 1.52, 95% CI 1.17 – 1.97, P=0.002). Age and sex were not predictive in any of the models.
Conclusions: Routinely collected CGA metrics are useful to predict ED disposition. The ability of baseline frailty to predict ED outcomes needs to be considered together with acute illness severity and delirium.

1. Introduction

With population ageing worldwide, the numbers of older people attending Emergency Departments (ED) continue to increase, which may lead to adverse operational and patient outcomes. [1] Older people in the ED are clinically very heterogenous and some presentations may be better suited to alternative out-of-hospital pathways. Where appropriate ambulatory services exist, specialist geriatric assessment in the ED

☆ All authors were involved in drafting the article, revising it critically for important intellectual content, and read and approved the final version of the manuscript.

* Correspondence to Prof. Roman Romero-Ortuno, Discipline of Medical Gerontology, 6th Floor, Mercer's Institute for Successful Ageing (MISA), St James's Hospital, Dublin 8, Ireland. Telephone: +353 1 896 3555. Fax: +353 1 896 3407.
E-mail address: romeroor@tcd.ie (R. Romero-Ortuno).
Joint first authors

https://doi.org/10.1016/j.ejim.2020.11.015
Received 10 October 2020; Received in revised form 8 November 2020; Accepted 15 November 2020

'interface' may improve outcomes by avoiding the adverse effects of potentially avoidable admissions. [2]

Research has shown that it is possible to embed Comprehensive Geriatric Assessment (CGA) within EDs [3] and a model of care delivered by interdisciplinary teams incorporating geriatric competencies into their service has been recommended. [4] Innovations in early assessment and 'front-loaded' geriatric ED interventions have become an important policy focus, [5]' [6] and hence multiple 'interface geriatrics' teams have emerged in EDs; these have variable interdisciplinary composition and modes of operation, but they all assess and address common geriatric syndromes encountered in the ED, for which feasible measurement tools exist. [7]

In our context, the Home FIRsT (Frailty Intervention & Response Team) was embedded in our acute hospital's ED from May 2017 [8] with the aim to embed CGA in the ED and maximise the patient-centered use of alternative out-of-hospital care pathways where appropriate. Home FIRsT provide specialist nursing, functional, cognitive and social needs assessments to older people in the ED, and liaise with the Emergency Medicine (EM) team to identify the optimal disposition, i.e. admission or discharge; in the latter case, Home FIRsT arrange referrals to the most appropriate out-of-hospital services.

Home FIRsT developed a common assessment form [9] incorporating key CGA metrics in the socio-demographic, diagnostic category, illness acuity, frailty and delirium domains. As ED-based geriatric evaluation and management programmes expand in our country and others, there is currently a gap in understanding who would benefit most from this type of care assessment. We hypothesised that these routinely collected metrics may help predict ED disposition, and as part of a service evaluation, we explored their predictive usefulness.

2. Methods

2.1. Background

St. James's Hospital (SJH) delivers services to the South Inner City of Dublin covering a population of almost 250,000. Parts of this area have significant socioeconomic disadvantage. In 2017, there were over 48,000 ED attendances [10] of which 25% were aged over 65 years.

The Home FIRsT (Frailty Intervention & Response Team) was embedded in SJH's ED from May 2017[8] and is comprised of an advanced nurse practitioner, clinical specialist physiotherapist, clinical specialist occupational therapist and senior medical social worker, all with specialist training and competencies in the care of the older person.

Patients' presenting complaint is first established by an ED triage nurse. As per Home FIRsT operational policy, persons who present to SJH's ED during Monday to Friday core working hours (8:00 – 18:00), are aged 70 years and older and have a Manchester Triage Score (MTS) [11] of urgent, standard or non-urgent are referred to Home FIRsT, who initiate CGA using validated tools. There are no other exclusions, including usual place of residence (e.g. nursing home patients in the ED are also considered). Where indicated, Home FIRsT begin the clinical/diagnostic and functional work-up before the EM doctor has been assigned to the patient. As part of their routine clinical work, Home FIRsT team members often liaise with families and/or caregivers; as in many cases, this is essential for the obtention of baseline (i.e. pre-attendance) patient information (e.g. socio-economic characteristics, frailty level prior to acute illness). Home FIRsT operate under the supervision of a Geriatrician (i.e. the Geriatrician on-call for the day), who provides advice and clinical review as required. After the geriatric assessment, Home FIRsT discuss their findings with the EM team, who take their recommendations into account in order to establish the disposition.

When the ED disposition is discharge, Home FIRsT recommend the most appropriate out-of-hospital pathway and facilitate referrals to and communication with those services. The main out-of-hospital pathways are:

- Discharge to GP and/or community services (e.g. community Occupational Therapy and/or Physiotherapy; Public Health Nurse; Integrated Case Manager; Community Intervention Team; primary care team Medical Social Work);
- Discharge to specialist geriatric outpatient clinics (e.g. falls and syncope unit, bone health clinic, memory clinic, general geriatric outpatient clinic), with a typical waiting time of weeks to months; and
- Discharge to the Geriatric Day Hospital. In Ireland and other countries [12], this has evolved to an 'Ambulatory Care Hub' model with access to outpatient diagnostics/therapy staff enabling 'rapid access' CGA and ongoing therapy to support and facilitate ED admission avoidance and hospital Early Supported Discharge schemes. [13]' [14] The typical wait for this is days to weeks.

2.2. Design and sample

This was an observational retrospective study. In this evaluation, we included all patients seen by Home FIRsT between 7th May and 19th October 2018. During this period, the Home FIRsT team underwent a systematic, structured collection of their routinely collected clinical data, as part of an overall service evaluation. A predetermined sample size calculation was not conducted. We only analysed first-time encounters (i.e. repeated encounters were excluded).

2.3. Clinical characterisation variables

As well as ED disposition, the following patient information was routinely collected by Home FIRsT:

- *Sociodemographic*: age, sex, living alone (yes/no), previous formal care package at home (yes/no), referred to ED from a nursing home (yes/no).
- *Frailty*: baseline (pre-admission) frailty was collected with the 9-point Clinical Frailty Scale (https://www.dal.ca/sites/gmr/our-tools/clinical-frailty-scale.html). [15,16] The CFS includes an overall estimation of patients' usual (i.e. pre-attendance) functional status.
- *Major Diagnostic Categories* (MDC: http://health.utah.gov/opha/IBIShelp/codes/MDC.htm) were generated by classifying all recorded principal ED presenting complaints into 25 mutually exclusive categories.
- *Acuity of illness* as indicated by the MTS. [11]
- *Delirium* as assessed by the 4AT score, with a score of 4 or more being indicative of delirium. [17]

2.4. Statistical analyses

Analyses were computed with IBM® SPSS® Statistics version 26. Descriptive statistics were given as mean with standard deviation (SD), median with interquartile range (IQR), or number with percentage (%). Missing data was reported without imputation.

For the prediction of each of the four disposition outcomes (i.e. admission, GP/community services, specialist geriatric clinics, geriatric day hospital), we used a multivariate binary logistic regression model that fulfilled the following premises:

a) There were at least 10 observations per predictor to avoid underpower; this was the reason for combining some MDCs (i.e. musculoskeletal/injuries/major trauma; circulatory/respiratory). This rule of 10 subjects per independent predictor was applied retrospectively and did not determine the original sample size.
b) There was no multicollinearity among predictors. This was checked with a correlation matrix of 2-sided Spearman correlation coefficients, where none was found to be ≥ 0.6.

The final set of predictors in each model was: age (continuous), sex, living alone, formal care package, CFS (continuous), musculoskeletal/injuries/major trauma, circulatory/respiratory; infections, MTS (continuous, inverse), 4AT (continuous). The overall probability level was saved to generate a regression Area Under the Curve (AUC) with 95% confidence intervals (CI). The multivariate regression Odds Ratios (OR) (per one-unit increase) and 95% CIs for age, CFS, MTS and 4AT were visualised with forest plots using Microsoft Excel. Models were repeated dichotomising the continuous predictors to increase ORs comparability. The P value to denote statistical significance was set at < 0.05 throughout.

2.5. Ethics

The study was approved by St James's Hospital/Tallaght University Hospital Research Ethics Committee (REC: 2018-12). The dataset was fully anonymised and data processing was in full compliance with Data Protection regulations.

3. Results

Between 7th May and 19th October 2018, there were 1,045 Home FIRsT assessments, all corresponding to unique patients seen by the service for the first time. Their characteristics are shown in Table 1. Patients' mean age was 80.1 (SD 6.6), with a range of 63-101 (14 under 70), and 59.5% were female. The mean CFS was 4 (very mild frailty). [16]

In terms of MDCs, the most common within musculoskeletal system were non fall-related injuries and musculoskeletal pain; falls were the leading presentation under injuries; chest pain, palpitations, cardiac arrhythmia (atrial fibrillation), congestive heart failure, deep vein thrombosis, syncope and pre-syncope were the most common circulatory presentations; shortness of breath was the most common respiratory presentation; under infections we classified patients who presented generally unwell; digestive presentations were often related to nausea/vomiting/diarrhoea or rectal bleeding; non-complicated urinary tract infections were classified under kidney and urinary tract; skin ulcers and rashes were most common under skin; nose bleeds under ENT; and seizures and possible TIA symptoms under nervous system.

The median MTS was 3 (urgent) and 6% had a 4AT of 4 or higher (Table 1). The 4AT had the most missing data (3%). The ED disposition was GP/community supports in most cases (56%), followed by hospital admission (33%), referral to rapid access Geriatric Day Hospital (6%), and specialist geriatric clinics: bone health (22 patients), general (18), and Falls and Syncope Unit (7).

In the correlation matrix between predictors, the largest bivariate association was between CFS and 4AT (2-sided Spearman's *rho* correlation coefficient = 0.514, P<0.001). The results of the multivariate binary logistic regression models are shown in Table 2. In terms of admission, independent predictors (by descending OR) were MTS (OR 2.01, 95% CI 1.50-2.70, P<0.001), systemic infections (OR 1.92, 95% CI 1.10 – 3.37, P=0.022), 4AT (OR 1.26, 95% CI 1.13 – 1.42, P<0.001), and CFS (OR 1.16, 95% CI 1.01 – 1.32, P=0.033). Discharge to GP/community services was less likely in the presence of systemic infection (OR 0.37, 95% CI 0.21 – 0.67, P=0.001), higher acuity (OR 0.57, 95% CI 0.43 – 0.75, P<0.001), cardio-respiratory condition (OR 0.59, 95% CI 0.38 – 0.92, P=0.019), higher 4AT (OR 0.76, 95% CI 0.67 – 0.87, P<0.001) and higher CFS (OR 0.79, 95% CI 0.69 – 0.89, P<0.001). Discharge to the Geriatric Day Hospital was only significantly predicted by CFS (OR 1.52, 95% CI 1.17 – 1.97, P=0.002); and referral to the above-mentioned specialist clinics was predicted by musculoskeletal/injuries/trauma (OR 6.45, 95% CI 1.52 – 27.32, P=0.011). Age or sex were not significant independent predictors of any of the ED disposition outcomes. Except for discharge to specialist geriatric clinics were the number of events was smallest, regression AUCs for the other outcomes were at least 0.7 suggesting reasonably good prediction.

Table 1
Sociodemographic, clinical characteristics and outcomes of 1,045 Home FIRsT assessments, including missing data. SD: standard deviation; n: number; %: percentage; CFS: Clinical Frailty Scale; MTS: Manchester Triage Scale; IQR: interquartile range; GP: general practitioner.

	Descriptive	Missing, n (%)
Sociodemographic		
Mean age, years (SD)	80.1 (6.6)	0
Females, n (%)	622 (59.5)	0
Lives alone, n (%)	451 (43.2)	2 (0.2)
Has formal care package at home, n (%)	230 (22.0)	9 (0.9)
Lives in a nursing home, n (%)	24 (2.3)	2 (0.2)
Baseline frailty (Clinical Frailty Scale)		
Mean CFS score (SD)	4.0 (1.5)	10 (1.0)
Very fit, n (%)	16 (1.5)	
Fit, n (%)	162 (15.7)	
Managing well, n (%)	269 (26.0)	
Very mildly frail, n (%)	190 (18.4)	
Mildly frail, n (%)	233 (22.5)	
Moderately frail, n (%)	120 (11.6)	
Severely frail, n (%)	42 (4.1)	
Very severely frail, n (%)	3 (0.3)	
Terminally ill, n (%)	0 (0.0)	
Major diagnostic categories		0
Musculoskeletal, n (%)	295 (28.2)	
Injuries, n (%)	246 (23.5)	
Circulatory, n (%)	110 (10.5)	
Respiratory, n (%)	105 (10.0)	
Infectious, n (%)	91 (8.7)	
Digestive, n (%)	56 (5.4)	
Kidney and urinary, n (%)	48 (4.6)	
Skin, n (%)	47 (4.5)	
Ear, nose and throat, n (%)	15 (1.4)	
Nervous system, n (%)	12 (1.1)	
Alcohol/drug use or induced mental disorders, n (%)	8 (0.8)	
Eye, n (%)	5 (0.5)	
Acuity of illness (Manchester Triage Category)		
Median MTS score (IQR)	3 (0.0)	1 (0.1)
Immediate, n (%)	0 (0.0)	
Very urgent, n (%)	55 (5.3)	
Urgent, n (%)	736 (70.5)	
Standard, n (%)	244 (23.4)	
Non-urgent (%)	9 (0.9)	
Cognition		
Median 4-AT score (IQR)	0 (1.0)	36 (3.4)
Delirium or severe cognitive impairment unlikely, n (%)	693 (68.7)	
1-3 Possible cognitive impairment, n (%)	256 (25.4)	
4+ Delirium, n (%)	60 (5.9)	
Emergency Department Disposition outcomes		
Hospital admission, n (%)	347 (33.2)	0
Discharge to GP and/or community services, n (%)	589 (56.4)	
Discharge to Geriatric Day Hospital, n (%)	62 (5.9)	
Discharge to specialist Geriatric outpatient clinics, n (%)	47 (4.5)	

Fig. 1 shows as forest plot the multivariate ORs with 95% CIs per one-unit increase in age, CFS, MTS (inverse) and 4AT to predict ED dispositions. The results and forest plot for the repeated binary-only models are shown in the Supplementary material.

4. Discussion

This evaluation set out to examine if CGA metrics routinely collected by Home FIRsT were associated with ED disposition outcomes. Only 33% of patients seen by Home FIRsT required hospital admission, and as expected this was mostly driven by acute illness severity and delirium, with baseline frailty being an additional predictor. Discharge to GP/community services seemed to be predicted by the opposite of the above; referral to a rapid access Geriatric Day Hospital 'hub' was predicted by frailty, suggesting the need to unravel its determinants and modifiable factors through further CGA; and referral to specialist geriatric clinics seemed to be driven by specific clinical presentations. It is reassuring

Table 2
Results of the multivariate binary logistic regression analyses to predict Emergency Department disposition outcomes. For the continuous predictors (i.e. age, CFS, MTS inverse, and 4-AT) ORs reflect a one-point increase in the respective scale. AUC: area under the curve; OR: odds ratio; CI: confidence interval; CFS: Clinical Frailty Scale; MSK: musculoskeletal; MTS: Manchester Triage Scale.

	OR	95% CI for OR (lower)	95% CI for OR (upper)	P
Hospital admission (n=1002, model AUC=0.71, 95% CI: 0.67-0.74, P<0.001)				
Age	1.01	0.99	1.03	0.450
Female sex	0.88	0.66	1.18	0.398
Living alone	1.21	0.90	1.62	0.211
Formal care package	1.02	0.70	1.48	0.914
CFS	1.16	1.01	1.32	**0.033**
MSK/injuries/ trauma	0.80	0.54	1.17	0.244
Cardio-respiratory	1.30	0.83	2.02	0.248
Infectious	1.92	1.10	3.37	**0.022**
MTS inverse	2.01	1.50	2.70	**<0.001**
4-AT	1.26	1.13	1.42	**<0.001**
Discharge to GP and/or community services (n=1002, model AUC=0.72, 95% CI: 0.69-0.75, P<0.001)				
Age	0.98	0.96	1.01	0.199
Female sex	1.04	0.79	1.38	0.776
Living alone	0.84	0.63	1.12	0.230
Formal care package	1.15	0.80	1.67	0.451
CFS	0.79	0.69	0.89	**<0.001**
MSK/injuries/ trauma	0.85	0.58	1.23	0.378
Cardio-respiratory	0.59	0.38	0.92	**0.019**
Infectious	0.37	0.21	0.67	**0.001**
MTS inverse	0.57	0.43	0.75	**<0.001**
4-AT	0.76	0.67	0.87	**<0.001**
Discharge to Geriatric Day Hospital (n=1002, model AUC=0.70, 95% CI: 0.64-0.76, P<0.001)				
Age	1.01	0.96	1.05	0.733
Female sex	1.27	0.71	2.26	0.426
Living alone	1.27	0.72	2.22	0.408
Formal care package	0.86	0.45	1.64	0.639
CFS	1.52	1.17	1.97	**0.002**
MSK/injuries/ trauma	1.79	0.72	4.43	0.207
Cardio-respiratory	2.36	0.88	6.35	0.088
Infectious	2.15	0.69	6.69	0.184
MTS inverse	0.97	0.57	1.63	0.896
4-AT	0.99	0.82	1.19	0.894
Discharge to specialist Geriatric outpatient clinics (n=1002, model AUC=0.66, 95% CI: 0.58-0.73, P<0.001)				
Age	1.02	0.97	1.07	0.492
Female sex	1.00	0.53	1.88	0.996
Living alone	0.81	0.43	1.53	0.517
Formal care package	0.55	0.22	1.36	0.195
CFS	1.10	0.83	1.48	0.499
MSK/injuries/ trauma	6.45	1.52	27.32	**0.011**
Cardio-respiratory	2.87	0.57	14.55	0.202
Infectious	3.34	0.53	20.96	0.198
MTS inverse	0.81	0.46	1.41	0.453
4-AT	0.96	0.73	1.25	0.737

that high acuity and delirium, which are often associated to adverse outcomes in the short term (e.g. early ED reattendance [18]), were not predictive of the use of out-of-hospital pathways, suggesting appropriate clinical decision making and highlighting the value of these routinely collected metrics for ongoing service monitoring and quality improvement. Also reassuring, is the fact that decisions on most appropriate service use were not based on age or sex, suggesting that decisions were based on clinical need.

Our results emphasise that frailty is not the only CGA dimension that matters in the ED; [19] as also highlighted in the acute inpatient geriatric setting, [20] the measurement of other dimensions such as acuity and delirium can help better explain operational outcomes and support clinical decision making. [21] The different prognostic implications of illness severity and baseline frailty in acute care settings are attracting increasing attention, [22]' [23] and a strength of our study is that it illustrates their independent value to support decision-making in the interface setting.

Overall, 70.5% and 5.3% of patients arrived at ED for urgent or very urgent conditions, respectively, but only 33.2% of patients were hospitalised. This may not only reflect the ability of the EM team to quickly stabilise and treat many acute medical presentations, but also the availability of rapid access, ambulatory care services where there can be a timely medical follow up. Yet, the fact that a minority of patients seen by Home FIRsT required hospital admission reflects specific patient selection. The data demonstrated some flexibility around the referral/acceptance criteria (i.e. 55 patients initially triaged as very urgent and 14 under 70 years of age), which reflects that Home FIRsT staff are senior professionals with discretion to be flexible in their work processes when it seems appropriate. However, patients triaged as MTS 2 (very urgent) are normally seen by an EM doctor before Home FIRsT see them, and in most of those cases the ED treatment focuses exclusively on medical care and CGA will take place later on the ward once patients have been admitted and stabilised. The latter patients are not recorded by Home FIRsT as part of their activity.

In our evaluation, the very small proportions of missing data suggest that the measures chosen were feasible in our setting. A systematic review focusing on the feasibility of frailty identification in the ED showed that commonly used risk-stratification tools do not cover much more than 50% of the potential population eligible for screening in practice. [24] The fact that in our series only 1% of CFSs were missing could be related to the conscientiousness of the Home FIRsT team, but also to patient selection criteria; indeed, a study in acute inpatients found that greater proportions of missing CFS were associated with high illness severity in patients who were admitted to critical care areas. [25] Naturally, in life threatening situations professionals focus on medical care first, but even in these situations, the assessment of frailty may still be useful as a focus for discussion around goals and expectations of care. [26]

The correct use of the CFS incorporates cognition in its scoring, and hence the bivariate correlation between CFS and 4AT in our sample was of moderate strength, but not incurring multicollinearity. A previous study in an ED setting found a weak-to-moderate association between frailty and delirium, [27] and another one reported that cognitive impairment and physical frailty had synergistic effects on hospitalisations and ED visits. [28] Our results are in keeping with those studies in that CFS and 4AT seemed to have complementary value to predict ED disposition in our setting. As regards MTS as our acuity metric, even though its performance has been reported to be inferior in older patients, [29] we found it to be the best predictor of admission, supporting its value in our setting.

Our study has important limitations. The single centre, retrospective observational design makes findings not necessarily generalisable to other settings. For example, in our context, direct access to post-acute and intermediate care services, inpatient rehabilitation services, long-term care facilities and hospices is not readily available from our ED but may be more available in other countries. The direct allocation to some of these pathways (e.g. long-term facilities for patients with severe dementia or hospice for patients with terminal diseases) was not within the mission of Home FIRsT.

Even though patients were consecutively evaluated, once one excludes most of those aged between 65-69, most of those with an MTC of very urgent or immediate, and those who presented out of core working hours (Monday to Friday, 08:00-18:00), the sample analysed was clearly not representative of the total older population presenting to ED (i.e. 1,045 out of potentially 5,500). Unfortunately, we did not have information on the characteristics and outcomes of those not seen by Home FIRsT during the same period. Even though the focus of our report was to

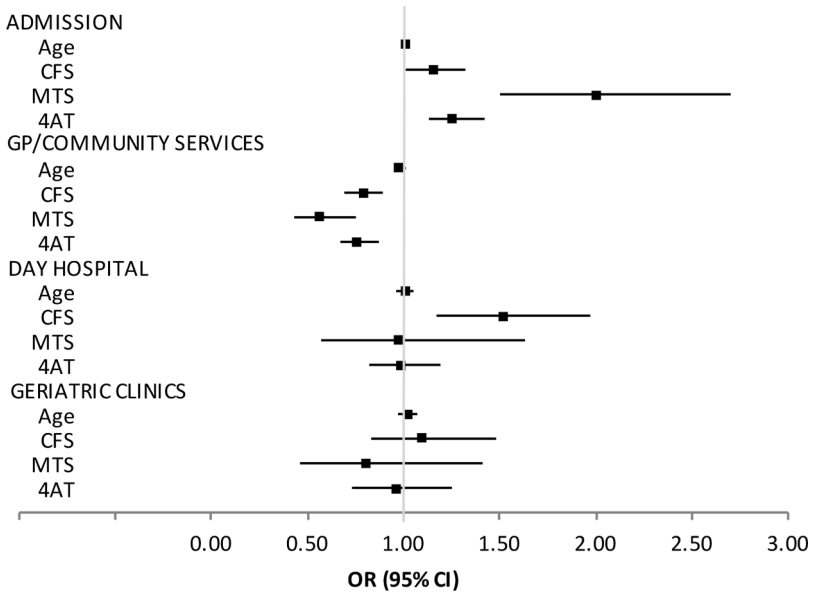

Fig. 1. Forest plot of multivariate Odds Ratios (OR) with 95% Confidence Intervals (CIs) (from Table 2) for one-point increase in age, Clinical Frailty Scale (CFS), Manchester Triage Score (MTS, inverse) and 4AT in the prediction of Emergency Department disposition outcomes.

establish predictors of ED disposition, in this same cohort we identified that 17.8% had an unscheduled ED revisit within 30 days, with the best predictor being delirium. [18] Delirium in the ED may be a marker of acute illness and higher risk of short-term mortality; [30] those with delirium who are discharged may have inadequate diagnostic workups and difficultly following discharge instructions, which may explain Home FIRsT/EM's tendency to consider higher 4ATs for admission.

Another potential limitation of our study is that other than capturing the pre-attendance overall functional status via the CFS, objective functional measures (e.g. mobility or balance scales) were not routinely evaluated on ED presentation and/or at the time of ED discharge. Our study captured a low proportion of nursing home residents, but these patients are often referred at high levels of acuity [31] during out of hours, [32] so many may have been outside Home FIRsT's criteria; in addition, for those not needing admission, their discharge disposition tends to be clear to EM (i.e. return to care home after medical treatment). The fact that we saw relatively low numbers of people who were very severely frail or terminally ill may also be reflective as to how the MTS is used as part of the Home FIRsT referral criteria. Similarly, the proportion of delirium seemed low, which may also be due to only seeing MTS 3-5 patients. Having said that, another limitation may be the recognised importance of subclinical and atypical symptoms of disease at advanced age, and how they may influence the assessment of illness severity in ED triage, before clinical input by trained geriatric professionals. [33]

Home FIRsT interventions aim to positively influence patient experience times in older ED attendees, but assessments can take a few hours at a time (especially when Medical Social Worker interventions are necessary) and a limitation is that we did not have data as to how long Home FIRsT's assessments took. However, it is likely that in settings where there is a rigid disposition time target (e.g. 4-hour NHS target) it would be very challenging to run a service such as Home FIRsT. Overall, our study contributes important observations but does not provide causal evidence as to whether and to what extent geriatric assessment within the ED may influence disposition. Indeed, our results are only applicable to our centre and cannot help systematically identify *a priori* who would benefit from an admission avoidance (e.g. delirium may be manageable at home with the appropriate supports). Rather, the benefits of a CGA-driven, individualised patient approach are suggested.

In the future, there may be potential for a reduced number of 'multi-skilled professionals' (including a suitable trained physician) to be able to deliver Home FIRsT-like services 24 hours a day, seven days a week. However, a limitation of such development may be that rapid access to social supports (which often 'save the day' in terms of avoiding admissions) are not normally available out of hours; hence, for such service to be successful, the out-of-hospital system (including community services) should also be able to offer a continuous service.

'*Geriatric giants are large and powerful; if they are to be confronted, they must be taken seriously; for this, recognition is an essential first step*'. [34] Our study illustrates the importance of the routine measurement of multiple geriatric dimensions in the ED. However, well-designed trials of interface geriatrics models are still needed to generate high quality evidence. [35] Indeed, identifying out-of-hospital pathways according to a CGA is a step towards better clinical practice within the ED. However, further to our retrospective observational study, a prospective observational design is necessary to assess longitudinal outcomes such as re-attendance, re-hospitalisation and/or mortality in the months (or years) following patients' baseline visit. Formal research studies (randomised or at least with a case-control design) are needed in order to demonstrate 1) the extent to which this approach affects the ED admission and the out-of-hospital pathway; and 2) whether there is a clinical benefit for patients compared with ED usual care.

Funding

None.

Declaration of Competing Interest

The authors declare they have no conflict of interest.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ejim.2020.11.015.

References

[1] Carter EJ, Pouch SM, Larson EL. The relationship between emergency department crowding and patient outcomes: a systematic review. J Nurs Scholarsh 2014;46(2):106–15.

[2] Conroy S, Ferguson C, Woodard J, Banerjee J. Interface geriatrics: evidence-based care for frail older people with medical crises. Br J Hosp Med (Lond) 2010;71(2):98–101.
[3] Conroy SP, Ansari K, Williams M, Laithwaite E, Teasdale B, Dawson J, et al. A controlled evaluation of comprehensive geriatric assessment in the emergency department: the 'Emergency Frailty Unit'. Age Ageing 2014;43(1):109–14.
[4] Conroy SP, Turpin S. New horizons: urgent care for older people with frailty. Age Ageing 2016;45(5):577–84.
[5] Adams JG, Gerson LW. A new model for emergency care of geriatric patients. Acad Emerg Med 2003;10(3):271–4.
[6] Kenny RA, McGarrigle C. Health and Wellbeing: Active Ageing for Older Adults in Ireland: Evidence from The Irish Longitudinal Study on Ageing. Chapter 1: Introduction. Available online: https://tilda.tcd.ie/publications/reports/W3KeyFindings/index.php [accessed 28 June 2020]. TILDA Reports. 2016.
[7] McCabe JJ, Kennelly SP. Acute care of older patients in the emergency department: strategies to improve patient outcomes. Open Access Emerg Med 2015;7:45–54.
[8] Cullen P. Plan to keep frail A&E patients out of hospital saves almost 4,000 bed nights: St James's Hospital initiative also ensures well patients are discharged promptly. The Irish Times; 2018 [published: 7 December 2018]Available online, https://www.irishtimes.com/life-and-style/health-family/plan-to-keep-frail-a-e-patients-out-of-hospital-saves-almost-4-000-bed-nights-1.3722978. accessed 14 June 2020.
[9] O'Shaughnessy I, Edge L, Dillon A, Flynn S, Cunningham C, Briggs R MR. Home FIRsT - Outcomes of a Frailty Intervention and Response Team in the Emergency Department of a Large Acute Teaching Hospital. Age and Ageing 2018;47:v13–60.
[10] SJH. St James's Hospital Annual Report 2017. Available online: http://www.stjames.ie/media/SJH%20Annual%20Report%202017.pdf (accessed 11 November 2020). 2017.
[11] Cooke MW, Jinks S. Does the Manchester triage system detect the critically ill? J Accid Emerg Med 1999;16(3):179–81.
[12] Aliberti MJ, Suemoto CK, Fortes-Filho SQ, Melo JA, Trindade CB, Kasai JY, et al. The Geriatric Day Hospital: Preliminary Data on an Innovative Model of Care in Brazil for Older Adults at Risk of Hospitalization. J Am Geriatr Soc 2016;64(10):2149–53.
[13] O'Caoimh R, Kennelly S, O'Shea D. Can the Geriatric Day Hospital Act As a Hub for Services for Older People across the Spectrum of Ageing from Active Ageing to Advanced Frailty? Front Med (Lausanne) 2018;5:23.
[14] NC&ICP. Making a start in Integrated Care for Older Persons guide. Available online: https://www.icpop.org/single-post/2018/11/14/Making-a-start-in-Integrated-Care-for-Older-Persons-guide. Accessed 2 July 2020. 2017.
[15] Rockwood K, Song X, MacKnight C, Bergman H, Hogan DB, McDowell I, et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173(5):489–95.
[16] Rockwood K, Theou O. Using the Clinical Frailty Scale in Allocating Scarce Health Care Resources. Can Geriatr J 2020 Sep 1;23(3):210–5.
[17] Bellelli G, Morandi A, Davis DH, Mazzola P, Turco R, Gentile S, et al. Validation of the 4AT, a new instrument for rapid delirium screening: a study in 234 hospitalised older people. Age Ageing 2014;43(4):496–502.
[18] Í O'Shaughnessy, R Briggs, Timmons S, Cunningham C. 286 Predictors and Outcomes of Older Persons Attending the Emergency Department of a Large Acute Dublin Teaching Hospital. Age and Ageing 2019;48(Supplement_3):iii17–65.
[19] Hastings SN, Purser JL, Johnson KS, Sloane RJ, Whitson HE. Frailty predicts some but not all adverse outcomes in older adults discharged from the emergency department. J Am Geriatr Soc 2008;56(9):1651–7.
[20] Romero-Ortuno R, Forsyth DR, Wilson KJ, Cameron E, Wallis S, Biram R, et al. The Association of Geriatric Syndromes with Hospital Outcomes. J Hosp Med 2017;12(2):83–9.
[21] Alabaf Sabbaghi S, De Souza D, Sarikonda P, Keevil VL, Wallis SJ, Romero-Ortuno R. Allocating patients to geriatric medicine wards in a tertiary university hospital in England: A service evaluation of the Specialist Advice for the Frail Elderly (SAFE) team. Aging Med (Milton) 2018;1(2):120–4.
[22] Pulok MH, Theou O, van der Valk AM, Rockwood K. The role of illness acuity on the association between frailty and mortality in emergency department patients referred to internal medicine. Age Ageing 2020.
[23] Romero-Ortuno R, Wallis S, Biram R, Keevil V. Clinical frailty adds to acute illness severity in predicting mortality in hospitalized older adults: An observational study. Eur J Intern Med 2016;35:24–34.
[24] Elliott A, Hull L, Conroy SP. Frailty identification in the emergency department-a systematic review focussing on feasibility. Age Ageing 2017;46(3):509–13.
[25] Wallis SJ, Wall J, Biram RW, Romero-Ortuno R. Association of the clinical frailty scale with hospital outcomes. QJM 2015;108(12):943–9.
[26] So RKL, Bannard-Smith J, Subbe CP, et al. The association of clinical frailty with outcomes of patients reviewed by rapid response teams: an international prospective observational cohort study. Crit Care 2018;22:227.
[27] Choutko-Joaquim S, Tacchini-Jacquier N, Pralong D'Alessio G, Verloo H. Associations between Frailty and Delirium among Older Patients Admitted to an Emergency Department. Dement Geriatr Cogn Dis Extra 2019;9(2):236–49.
[28] Wang J, Kong D, Yu F, Conwell Y, Dong X. Cognitive deficit, physical frailty, hospitalization and emergency department visits in later life. Aging Ment Health 2019:1–7.
[29] Brouns SHA, Mignot-Evers L, Derkx F, Lambooij SL, Dieleman JP, Haak HR. Performance of the Manchester triage system in older emergency department patients: a retrospective cohort study. BMC Emerg Med 2019;19(1):3.
[30] Kakuma R, du Fort GG, Arsenault L, Perrault A, Platt RW, Monette J, et al. Delirium in older emergency department patients discharged home: effect on survival. J Am Geriatr Soc 2003;51(4):443–50.
[31] Keevil VL, Martin GJ, Biram R, Wallis S, Romero-Ortuno R. Care home residents admitted to hospital through the emergency pathway: characteristics and associations with inpatient mortality. J R Coll Physicians Edinb 2018;48:202–9.
[32] Briggs R, Coughlan T, Collins R, O'Neill D, Kennelly SP. Nursing home residents attending the emergency department: clinical characteristics and outcomes. QJM 2013;106(9):803–8.
[33] Rutschmann OT, Chevalley T, Zumwald C, Luthy C, Vermeulen B, Sarasin FP. Pitfalls in the emergency department triage of frail elderly patients without specific complaints. Swiss Med Wkly 2005 Mar 5;135(9-10):145–50.
[34] Rockwood K. Translating Isaacs. Available online: https://britishgeriatricssociety.wordpress.com/2016/07/28/translating-isaacs/ (accessed 2 July 2020). 2016.
[35] Conroy SP, Stevens T, Parker SG, Gladman JR. A systematic review of comprehensive geriatric assessment to improve outcomes for frail older people being rapidly discharged from acute hospital: 'interface geriatrics'. Age Ageing 2011;40(4):436–43.

SUPPLEMENTARY DATA

Results of the multivariate binary logistic regression analyses to predict Emergency Department disposition outcomes. All predictors are binary.

Hospital admission (n=1002, model AUC=0.71, 95% CI: 0.67-0.74, P<0.001)				
	OR	95% CI for OR (lower)	95% CI for OR (upper)	P
Age ≥ 80	1.18	0.87	1.60	0.284
Female sex	0.86	0.64	1.16	0.320
Living alone	1.16	0.86	1.56	0.330
Formal care package	1.11	0.77	1.61	0.575
CFS ≥ 5	1.56	1.12	2.20	0.010
MSK/injuries/trauma	0.85	0.58	1.26	0.418
Cardio-respiratory	1.31	0.84	2.04	0.238
Infectious	2.00	1.13	3.51	0.016
MTS urgent or very urgent	3.33	2.22	5.00	<0.001
4AT ≥ 4	3.64	1.95	6.78	<0.001
Discharge to GP and/or community services (n=1002, model AUC=0.71, 95% CI: 0.68-0.75, P<0.001)				
Age ≥ 80	0.76	0.57	1.02	0.065
Female sex	1.08	0.81	1.43	0.607
Living alone	0.88	0.66	1.16	0.356
Formal care package	1.04	0.72	1.51	0.820
CFS ≥ 5	0.48	0.35	0.67	<0.001
MSK/injuries/trauma	0.79	0.54	1.15	0.217
Cardio-respiratory	0.58	0.38	0.90	0.015
Infectious	0.35	0.19	0.62	<0.001
MTS urgent or very urgent	0.39	0.27	0.54	<0.001
4AT ≥ 4	0.24	0.11	0.51	<0.001
Discharge to Geriatric Day Hospital (n=1002, model AUC=0.69, 95% CI: 0.63-0.76, P<0.001)				
Age ≥ 80	1.66	0.89	3.08	0.110
Female sex	1.25	0.70	2.23	0.444
Living alone	1.15	0.66	2.00	0.627
Formal care package	0.93	0.49	1.77	0.828
CFS ≥ 5	2.45	1.30	4.61	0.006
MSK/injuries/trauma	1.82	0.74	4.48	0.193
Cardio-respiratory	2.28	0.85	6.11	0.101
Infectious	2.47	0.81	7.59	0.114
MTS urgent or very urgent	1.29	0.63	2.65	0.492
4AT ≥ 4	0.60	0.20	1.80	0.367
Discharge to specialist Geriatric outpatient clinics (n=1002, model AUC=0.66, 95% CI: 0.59-0.74, P<0.001)				
Age ≥ 80	1.06	0.55	2.03	0.870
Female sex	1.02	0.54	1.91	0.962
Living alone	0.83	0.44	1.58	0.575
Formal care package	0.52	0.21	1.29	0.158
CFS ≥ 5	1.57	0.76	3.27	0.226
MSK/injuries/trauma	6.45	1.53	27.25	0.011
Cardio-respiratory	3.00	0.59	15.18	0.185
Infectious	3.40	0.54	21.40	0.192
MTS urgent or very urgent	0.72	0.37	1.43	0.352
4AT ≥ 4	1.07	0.30	3.86	0.919

Forest plot of multivariate Odds Ratios (OR) with 95% Confidence Intervals (CIs) (from Supplementary Table) for age 80 or more, Clinical Frailty Scale (CFS) 5 or more, Manchester Triage Score (MTS) urgent or very urgent, and delirium (4AT 4 or more) in the prediction of Emergency Department disposition outcomes.