

# EMERGENCY HOSPITAL ADMISSIONS IN OLDER ADULTS FROM RESIDENTIAL AND NURSING HOMES: FREQUENCY, CHARACTERISTICS AND OUTCOMES

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**Abstract:** We describe the frequency, characteristics and outcomes of emergency admissions to one large university hospital in England from residential and nursing homes. Any older adult ( $\geq 75$  years) admitted as an emergency over two years was included. Patient variables were retrieved from an electronic patient record and living status was established using an official register of care homes and manual inspection of medical records. The rate of emergency admission per bed-year was highest from residential homes (mean 0.68, SD 0.24), with lower rates from nursing (mean 0.49, SD 0.20) and dual-registered facilities (mean 0.49, SD 0.23). Older adults admitted from nursing beds had the highest frailty, illness acuity and inpatient mortality but those from residential beds had the highest odds of 30-day readmission, compared to older adults from their own homes (odds ratio 1.63, 95% confidence interval 1.30, 2.04). Residential home residents are frequent users of emergency inpatient services and may benefit most from enhanced community healthcare.

**Key words:** Care home, hospital outcomes, frailty.

## Introduction

Care home residents are frequent users of emergency hospital services and admission episodes are often complicated by factors such as delirium and deconditioning (1). However, the rates of emergency hospital admission from care homes vary considerably, suggesting that high rates are not inevitable. Some admissions may be avoidable, in that care could have been delivered equally well in the community, or inappropriate, in that the risks of hospital admission outweigh any potential benefits. Lowering the number of avoidable or inappropriate hospital admissions is not only better for patients but could also help reduce pressure on inpatient hospital services (2).

Several vanguard projects across England have sought to optimize the health of care home residents and reduce avoidable or inappropriate hospital admissions. These projects bring together medical, social and voluntary services in new models of care and this 'Enhanced Health in Care Homes' (EHCH) framework is due to be applied more widely (3). However, to date these projects have reported mixed success, with results suggesting care home type is an important consideration and interventions appear more successful in residential than nursing homes (4).

It would be helpful to understand more about the care home residents who access emergency hospital services, in order to better inform interventions aimed at reducing unnecessary hospitalization. The characteristics and outcomes of care home residents admitted to a large university hospital in England were previously described (5). However, older adults admitted from residential versus nursing facilities were not differentiated and this is emerging as an important factor. Therefore, we

now present updated results examining whether care home residents are homogenous in terms of their rates of admission, characteristics and hospital outcomes or whether nursing and residential home residents differ in these respects.

## Methods

All emergency inpatient admissions of adults aged  $\geq 75$  years presenting to one hospital were included in this retrospective, observational study approved by the hospital's Safety and Quality Support Department (Project register number 7368). Presentations to the Emergency Department (ED) without subsequent admission were not included. Data was collected prospectively over two years via an electronic patient record. Additional information on the methodology is available (Appendix 1).

In brief, age, sex, permanent address, admission weight, ED blood tests, discharge specialty, illness acuity (ED Modified Early Warning Score, ED-MEWS), Clinical Frailty Scale score (CFS) (6) and history of 'dementia or cognitive concern' were retrieved. A Charlson Co-morbidity Index (CCI) was retrospectively calculated from discharge diagnoses.

Admission post-code was cross-matched with addresses for care homes registered with the United Kingdom regulator, the Care Quality Commission (CQC), within five local counties. Patient records identified as a 'match' were further screened using the first line of the address and records were manually checked if this was discordant. The number of registered beds at each care home and care home type (residential, nursing or dual-registered) were ascertained from the CQC website. Patients from dual-registered homes were further investigated

# EMERGENCY ADMISSIONS FROM CARE HOMES

**Table 1**  
Patient Characteristics by Living Status (Own home vs residential bed vs nursing bed)

Characteristic <sup>#</sup>	Own Home (n=13,656)	Residential Bed (n=738)	Nursing Bed (n=372)	P Value
Age, years	83.7 (5.8)	88.4 (5.8)	86.5 (5.7)	0.94
Sex, % women (n)	55.2 (7,532)	74.4 (549)	65.1 (242)	<0.001
Weight, kg				
Men (n=4,972)	76.9 (15.2)	70.2 (15.2)	68.1 (13.5)	0.43
Women (n=6349)	63.3 (15.1)	58.5 (14.6)	59.9 (14.4)	0.48
CFS, % (n) ###				
Up to vulnerable	35.7 (4873)	3.5 (26)	1.9 (7)	
Mildly frail	14.1 (1,920)	5.9 (44)	3.0 (11)	
Moderately frail	14.8 (2,024)	26.8 (198)	16.9 (63)	
Severe/ very severely frail	7.0 (954)	36.6 (270)	46.8 (174)	
Terminally ill	0.5 (71)	0.9 (7)	3.8 (14)	<0.001
CCI <sup>##</sup>	1 (0,3)	1 (0, 2)	1 (1, 2.5)	0.03
Dementia or Cognitive Concern, % yes (n)	13.2 (1,797)	40.4 (298)	38.7 (144)	<0.001
ED-MEWS, % (n) ###				
≥4	26.3 (3,594)	41.1 (303)	47.3 (176)	
<4	64.3 (8,780)	53.0 (391)	46.8 (174)	<0.001
Discharge Specialty, % (n)				
Geriatric Medicine	22.1 (3,015)	31.8 (235)	28.8 (107)	
General Medicine	45.8 (6,251)	45.3 (334)	53.0 (197)	
Surgery	16.6 (2,260)	6.2 (46)	5.1 (19)	
Trauma/ Ortho	5.9 (805)	8.1 (60)	6.2 (23)	
Other	9.7 (1,324)	8.5 (63)	7.0 (26)	<0.001
White cell count <sup>##</sup> , 10 <sup>9</sup> /L	9.3 (7.2, 12.3)	9.7 (7.2, 12.8)	9.8 (7.4, 13.2)	0.02
CRP <sup>##</sup> , mg/L	12.2 (3.1, 49.7)	18.3 (5.7, 63.1)	26.8 (6.8, 72.7)	<0.001
Urea, mmol/L	8.4 (4.4)	9.1 (4.7)	9.2 (5.3)	<0.001
Creatinine <sup>##</sup> , μmol/L	84.3 (66.3, 113.1)	86.4 (68.7, 114.6)	85.8 (64.6, 110.1)	0.27
Haematocrit, %	41.1 (6.2)	40.4 (6.3)	40.7 (6.6)	0.30
Length of Stay, days <sup>##</sup>	4.9 (1.5, 12.0)	5.0 (1.1, 11.6)	4.0 (1.1, 8.9)	0.004
30 day Inpatient Mortality, % yes (n)	5.7 (780)	10.8 (80)	12.1 (45)	<0.001
Re-admission within 30 days, % yes (n)*	22.6 (3,087)	26.6 (196)	21.2 (79)	0.002
Delayed discharge, % (n)* ###				
Yes	27.2 (3,716)	25.3 (187)	20.7 (77)	
No	50.1 (6,844)	45.8 (338)	48.7 (181)	0.20

<sup>#</sup>characteristics described as mean (standard deviation) unless otherwise indicated; <sup>##</sup> median (interquartile range); <sup>###</sup>percentages may not add up to 100% due to missing data. \*figures exclude those who died during the inpatient admission episode (n=1014). Kg: kilograms. CFS: Clinical Frailty Score. ED-MEWS: Emergency Department Modified Early Warning Score. CRP: C-reactive protein; CCI: Charlson Co-morbidity Index; \* after the sentence ending kilograms. and before CFS.

to establish whether a nursing or residential bed was occupied and 30-day readmission. at the time of admission.

The following hospital outcomes were available: 30-day inpatient mortality; prolonged length of stay (≥10 days), delayed discharge (stay >1 day beyond the 'clinically fit date')

## Data analysis

Rates of admission to our hospital from each care home were calculated by: total number of admission episodes from the care

home/ (study time [years] x number of beds in the care home); and described by care home type (nursing / residential / dual-registered).

The sample size was then restricted to the first admission episode for each patient and patient characteristics were described as count with percentage (%), mean with standard deviation (SD) or median with inter-quartile range (IQR). Relationships between living status and hospital outcomes were evaluated using logistic regression (prolonged LOS, delayed discharge and 30-day readmission) and Cox proportional hazards regression (inpatient mortality). Living status was categorized as admission from 'own home' versus 'residential bed' versus 'nursing bed' rather than care home type, since the proportional hazards assumption was violated by those living in dual-registered care homes.

## Results

Out of 26,700 admission episodes, 2599 were older adults admitted from a care home (residential: 1365, nursing: 518, dual: 716). The majority were from one county (1933). On average the rate of admission from care homes to our centre was 0.59 admission episodes/bed-year (SD 0.25; median 0.59, IQR 0.42-0.77). Residential homes had the highest rate of admission (mean 0.68, SD 0.24; median 0.73, IQR 0.54-0.83), with lower rates from homes offering nursing care (Dual-registered homes: mean 0.49, SD 0.23; median 0.45, IQR 0.31-0.59; Nursing homes: mean 0.49, SD 0.20; median 0.51, IQR 0.41-0.65).

There were 14,766 first admission episodes with complete data for age, sex and living status (32 episodes deleted). Care home residents were more likely to be older, female, have cognitive impairment, higher frailty and present with higher illness acuity compared to older adults admitted from their own homes, with those occupying nursing beds exhibiting the highest frailty and illness acuity (Table 1).

Hospital outcomes varied by living status (Table 1) and these trends were further explored using multiple regression. Inpatient mortality was higher in those admitted from a nursing bed, then residential bed, then own home (Appendix 2, Figure 1) and associations persisted after adjustment for demographics, co-morbidity and illness acuity (Table 2). Adjustment for frailty completely attenuated associations between admission from a residential bed and inpatient mortality but admission from a nursing bed remained an independent predictor of inpatient mortality.

All care home residents had lower odds of prolonged length of stay and delayed discharge compared to older adults admitted from their own home, with the strongest associations in those admitted from nursing beds. However, there was no association between admission from a nursing bed and higher odds of 30-day readmission to hospital whereas admission from a residential bed was a strong predictor of this outcome (OR 1.63, 95% CI 1.30-2.04; Table 2).

## Discussion

We report findings consistent with other studies suggesting that residential home residents have higher rates of emergency hospital admission compared to nursing home residents (4). We also found that admission from a nursing bed is an independent risk factor for inpatient mortality and admission from a residential bed is an independent predictor of 30-day readmission.

Our data is not able to untangle why emergency hospital admission rates are highest from residential homes. It is possible that existing community healthcare resources, which are under considerable strain (7), are less able to support older adults in residential compared to nursing care. This is consistent with interim results from several EHCH vanguard projects, which suggest that strategies such as alignment of care homes with a named primary care practice and improved access to a range of community healthcare professionals are only effective in residential homes (8-11). Care homes that have a nursing component are likely to already have links with such community resources, limiting the benefit of additional resource allocation.

Older adults admitted from residential beds also had higher odds of 30-day hospital readmission, consistent with the higher admission rates from residential homes overall. Each admission is an opportunity to provide older adults access to multidisciplinary comprehensive geriatric assessment (12). For those admitted from residential care, our results suggest this should include a focus on factors influencing readmission. It is likely that residents may need extra support immediately after an acute illness episode, beyond the level normally provided by a residential home, mirroring the experience of older adults discharged back to their own homes (13). We have also observed anecdotally that residential homes sometimes continue to look after residents who develop nursing needs, e.g., during terminal decline. We were unable to find any literature describing the extent of this practice and very little evaluating available support, apart from some evidence of confusion around the roles and responsibilities of healthcare professionals providing end of life care in this setting (14). This is a significant knowledge gap.

Admission from a nursing bed was an independent predictor of inpatient mortality and both residential and nursing home residents presented with higher illness acuity and had higher inpatient mortality compared to older adults admitted from their own homes. This reinforces the need for early advanced care planning and development of personalized treatment plans in both residential and nursing home patients admitted to hospital (12). Our findings also support the development of specialized frailty measures to describe the heterogeneity of the nursing home population since it is likely that our measure of frailty, the CFS, exhibited a ceiling effect (15).

Our study has several limitations. We utilized routinely collected data from one hospital limiting the generalizability

## EMERGENCY ADMISSIONS FROM CARE HOMES

**Table 2**  
Associations between living status and hospital outcomes (N= 10 145)

	Hazard Ratio (95% Confidence Interval)		
	Model 1	Model 2	Model 3
Residential Status			
Own home	1.0	1.0	1.0
Residential bed	1.85 (1.38, 2.48)	1.81 (1.34, 2.45)	1.30 (0.95, 1.76)
Nursing bed	2.75 (1.88, 4.04)	2.73 (1.85, 4.04)	1.74 (1.17, 2.60)
Age (years)	1.04 (1.03, 1.06)	1.05 (1.03, 1.06)	1.04 (1.02, 1.05)
Sex			
Men	1.0	1.0	1.0
Women	0.77 (0.65, 0.91)	0.84 (0.71, 1.00)	0.84 (0.71, 1.00)
CCI		1.12 (1.07, 1.17)	1.09 (1.04, 1.13)
ED-MEWS			
<4		1.0	1.0
>4		2.88 (2.41, 3.44)	2.63 (2.20, 3.14)
Dementia/ cognitive concern			
No		1.0	1.0
Yes		0.57 (0.48, 0.70)	0.54 (0.44, 0.66)
Discharge specialty			
Medicine		1.0	1.0
Non-medical specialty		0.64 (0.49, 0.85)	0.73 (0.55, 0.96)
Clinical Frailty Scale			
Up to vulnerable			1.0
Mildly frail			1.13 (0.84, 1.54)
Moderately frail			1.63 (1.26, 2.11)
Severe/ v severely frail			2.26 (1.72, 2.96)
Terminally ill			10.58 (7.33, 15.25)
	Odds Ratio (95% Confidence Interval)		
	Model 1	Model 2	Model 3
Residential Status		Prolonged LOS	
Own home	1.0	1.0	1.0
Residential bed	0.83 (0.68, 1.01)	0.51 (0.42, 0.64)	0.41 (0.33, 0.51)
Nursing bed	0.63 (0.47, 0.84)	0.37 (0.27, 0.51)	0.28 (0.21, 0.39)
Residential Status		Delayed Discharge	
Own home	1.0	1.0	1.0
Residential bed	0.69 (0.56, 0.86)	0.44 (0.35, 0.55)	0.36 (0.28, 0.45)
Nursing bed	0.57 (0.42, 0.78)	0.36 (0.26, 0.50)	0.27 (0.20, 0.38)
Residential Status		30-day Readmission	
Own home	1.0	1.0	1.0
Residential bed	1.52 (1.23, 1.88)	1.71 (1.38, 2.13)	1.63 (1.30, 2.04)
Nursing bed	0.79 (0.56, 1.12)	0.89 (0.62, 1.27)	0.84 (0.58, 1.21)

Model 1: age and sex adjusted; Model 2: model 1 + CCI, ED-MEWS category (0–3 'low acuity' and ≥4 'high acuity'), discharge specialty (medical versus non-medical), and history of dementia or cognitive concern; Model 3: model 2 + clinical frailty scale category (0–4 'up to vulnerable'; 5 'mild frailty'; 6 'moderate frailty'; 7–8 'severe–very severe frailty'; and 9 'terminally ill'). Prolonged LOS: N=10,145; Delayed discharge: N=8,482; 30-day re-admission: N=9,527. CCI: Charlson Co-morbidity Index; ED MEWS: Emergency Department Modified Early Warning Score. Those who died during the admission episode were excluded from analyses of delayed discharge and 30 day readmission.

of results and our ability to capture all admissions from care homes in our area, although it is unlikely that care homes would routinely transfer residents to multiple different hospitals for urgent care. We also had more missing data than a traditional research study and we did not have data on all desired variables, e.g., admission diagnoses (5).

Misclassification of living status may also have occurred, although this error will be less than in other studies where manual inspection of individual patient records was not possible (4).

In summary, older adults living in residential homes have high rates of hospital admission and high odds of 30-day

## EMERGENCY ADMISSIONS FROM CARE HOMES

readmission. Residential home residents may benefit most from strategies to strengthen community healthcare resources.

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### References

- Romero-Ortuno R, O'Shea D, Silke B. Predicting the in-patient outcomes of acute medical admissions from the nursing home: the experience of St James's Hospital, Dublin, 2002-2010. *Geriatr Gerontol Int* 2012; 12: 703-13.
- Coster JE, Turner JK, Bradbury D, Cantrell A. Why Do People Choose Emergency and Urgent Care Services? A Rapid Review Utilizing a Systematic Literature Search and Narrative Synthesis. *Acad Emerg Med* 2017; 24: 1137-1149.
- National Health Service. NHS. New care models: the framework for enhanced health in care homes. 2016 [www.england.nhs.uk/wpcontent/uploads/2016/09/ehch-framework-v2.pdf](http://www.england.nhs.uk/wpcontent/uploads/2016/09/ehch-framework-v2.pdf).
- Wolters A, Santos F, Lloyd T, Lilburne C, Steventon A. Emergency admissions to hospital from care homes: how often and what for. 2019 [www.health.org.uk/sites/default/files/upload/publications/2019/Emergency-admissions-from-care-homes-IAU-Q02.pdf%0D](http://www.health.org.uk/sites/default/files/upload/publications/2019/Emergency-admissions-from-care-homes-IAU-Q02.pdf%0D).
- 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: 202-209.
- Rockwood K. A global clinical measure of fitness and frailty in elderly people. *Can Med Assoc J* 2005; 173: 489-495.
- Buchan J, Charlesworth A, Gershlick B, Seccombe I. A critical moment: NHS staffing trends, retention and attrition. 2019 [https://www.health.org.uk/sites/default/files/upload/publications/2019/A Critical Moment\\_1.pdf%0D](https://www.health.org.uk/sites/default/files/upload/publications/2019/A%20Critical%20Moment_1.pdf%0D).
- Lloyd T, Conti S, Santos F, Steventon A. Effect on secondary care of providing enhanced support to residential and nursing home residents: a subgroup analysis of a retrospective matched cohort study. *BMJ Qual Saf* 2019; 28: 534-546.
- Brine R, Conti S, Wolters A. Briefing: The impact of providing an enhanced package of care for care home residents in Nottingham City. 2019 [www.health.org.uk/publications/reports/impact-of-enhanced-supportfor-nottingham-care-home-residents](http://www.health.org.uk/publications/reports/impact-of-enhanced-supportfor-nottingham-care-home-residents).
- Conti S, Gori C, Caunt M, Steventon A. The impact of providing enhanced support for Sutton Homes of Care residents: findings from the Improvement Analytics Unit. 2018 [www.health.org.uk/publications/%0Athe-impact-of-providing-enhanced-support-for-sutton-homes-of-care-residents](http://www.health.org.uk/publications/%0Athe-impact-of-providing-enhanced-support-for-sutton-homes-of-care-residents).
- Vestesson E, Lloyd T, Santos F, Caunt M, Steventon A. Briefing: The impact of providing enhanced support for care home residents in Wakefield. 2019 [www.health.org.uk/publications/reports/impact-of-enhancedsupport-for-wakefield-care-home-residents](http://www.health.org.uk/publications/reports/impact-of-enhancedsupport-for-wakefield-care-home-residents).
- Ellis G, Whitehead MA, Robinson D, O'Neill D, Langhorne P. Comprehensive geriatric assessment for older adults admitted to hospital: meta-analysis of randomised controlled trials. *BMJ* 2011; 343: d6553.
- Beresford B, Mayhew E, Duarte A et al. Outcomes of reablement and their measurement: Findings from an evaluation of English reablement services. *Health Soc Care Community* 2019; 27: 1438-1450.
- Handley M, Goodman C, Froggatt K et al. Living and dying: responsibility for end-of-life care in care homes without on-site nursing provision - a prospective study. *Health Soc Care Community* 2014; 22: 22-9.
- Kaehr EW, Pape LC, Malmstrom TK, Morley JE. FRail-NH Predicts Outcomes in Long Term Care. *J Nutr Health Aging* 2016; 20: 192-8.