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TITLE PAGE

Urgent Care Axis for the Older Adult: Where is Best to Target Interventions?

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Abstract

BACKGROUND:

We explored the urgent care axis across EDs in Yorkshire and Humber(Y&H) for patients ≥75 years, to identify where interventions could be targeted to prevent ED attendances and inpatient admissions.

METHODS:

Hospital Episode Statistics (HES) data for attendances across 18 EDs in Y&H from April 2011-March 2014 were retrospectively analysed. HES A&E and Admitted Patient Care patient records data were linked to describe the entire patient pathway. The population studied was adult patients attending type 1 EDs, comparing those ≥75 years with under 75s. Data analysed included arrival mode, presentation time, time in ED, outcome (admitted/discharged), admission length of stay, ICD-10 and cause codes related to admission. Short-stay admissions and admissions with potentially avoidable conditions (identified by ICD-10 and cause codes) were identified. Comparative analysis was undertaken between sites.

RESULTS:

There were 3,736,541 ED attendances, of which 625,772(16.8%) were ≥75 years. Older patients were significantly more likely to attend via ambulance than the younger cohort (OR 7.7, 95%CI 7.6-7.7), had significantly longer median stays within ED (195 versus 136 mins, $p<0.001$) and increased likelihood of admission (OR 4.5, 95%CI 4.5-4.6).

Short stay-admissions accounted for 28.3% of older adult admissions. 37.3% of older adult admissions were with conditions that were potentially avoidable, accounting for 42.3% of short-stay admissions. There was regional variation in the proportions of older adults admitted (between 34.3% and 40.9%).

DISCUSSION:

Large numbers of older adults present to EDs mainly by ambulance. Significant proportions are admitted for short periods with conditions that might potentially be managed outside of hospital. Variation across the region warrants further study.

KEY WORDS: Aged; Emergency Care Systems, admission avoidance; Admission avoidance; Acute Care

What this paper adds…

What is already known on this subject:

1. The highest rate of ED attendance per head of population is in the oldest age group.

2. There is a lack of good quality data about the older adult patient journey across the whole urgent care axis - from ED arrival to discharge from hospital.

3. We analysed a large linked dataset to explore the older adult patient journey to identify potential points in the axis where interventions might be implemented to best serve this population.

What this study adds:

1. Older adults are more likely to arrive by ambulance, spend longer time in the ED and are more likely to be admitted. They also have longer admissions, but there is still a significant proportion that have short stay admissions.

2. A large proportion of short stay admissions in older adults are with conditions "rich in potentially avoidable admissions".

3. Admission rates for older adults vary markedly between hospitals and a large proportion may be avoidable admissions.

Introduction

Emergency Department (ED) attendances within England are increasing. In 2016 there were 23.57 million attendances, an increase of 5.2% compared to 2015 of which one fifth were aged over 65(1). The highest rate of ED attendance per head of population is in those aged 80 plus. Those aged 80-89 years have an annual attendance rate of 622 per 1000 population, increasing substantially to 860 per 1000 for those aged 90 and above. This compares to rates of between 274 and 436 per 1000 in the younger age groups (10 year cohorts between 20 and 79) (1). Demand on EDs to provide care for the ageing population is set to further increase over the coming years. In 2014 5.2 million (8.0%) of the population were over the age of 75, by 2029 this proportion is predicted to increase to 7.8 million (11.0%) (2).

Older, frail patients present challenges to EDs, both to the assessing clinician and to healthcare infrastructure. Older adult patients are more likely to present in a non-specific manner, have multiple chronic conditions prone to exacerbations and have significant cognitive, functional impairment and social problems that compound their presentation (3). This set of health care needs often goes beyond the remit of traditional ED facilities, staff training and behaviours, which are often more focussed on managing individual specific clinical conditions (4,5).

The potential mismatch between ED response and population need has prompted interventions to attempt to address this issue with varying degrees of success. These have been targeted across the whole urgent care axis, described by the British Geriatrics Society (BGS) as the pathway from GP, through community support and999 referral, to ED attendance, and ultimately, acute hospital admission (6). By providing urgent care need responses and interventions a step earlier in the unwell older adult patient's pathway, the patient may be prevented from progressing down the pathway, thus preventing ED attendances and admissions in a cohort of patients in whom these are of no benefit. Within the ED, . approaches to prevent unnecessary progression to admission have included bespoke education of ED teams on the needs of older people, and/or embedding geriatric teams within the ED to deliver their expertise alongside standard ED care (7-9). Although some of these mechanisms show promise, overall evidence to implement widespread changes in practice is limited.

The aim of our study was to explore the patient journey along the urgent care axis, from arrival at ED to discharge from ED/inpatient care by analysing Hospital Episode Statistics (HES) data in those aged 75 and over presenting across Yorkshire and the Humber (Y&H)

region to identify potential points where interventions might be implemented to prevent progression to ED attendance/admission unnecessarily.

Methods

The study took place within a single geographical area (Y&H), representing 13 acute hospital trusts and including 18 EDs (around 10% of EDs in England). It serves a population of 5.3 million and is a mixture of large urban, smaller urban, suburban and rural settings. In this respect we consider the setting likely to be generalisable to the whole UK population.

The population studied was adult patients attending type 1 EDs (i.e. consultant-led, multi-specialty 24-hour services with full resuscitation facilities and designated accommodation for the reception of ED patients) in Y&H between April 1st 2011 to March 31st 2014. Those aged 75 and over were compared to those aged under 75. This cut off was chosen as the BGS advises geriatric care should commence at the age of 75 (10).

The study team received pseudonymised HES data from NHS Digital for all Accident and Emergency (A&E) and Admitted Patient Care (APC) activity provided by all acute (not mental health or primary care) NHS hospital trusts in the Y&H region. HES A&E data detailed activity provided by Emergency Departments, Urgent Care Centres, Minor Injury Units, and Walk-in Centres. HES A&E data was provided at the attendance level; one attendance represented a single continuous contact at any NHS (or NHS commissioned) A&E-type facility.

HES APC data were provided at Finished Consultant Episode (FCE) level, representing the care received by a patient under the continuous care of one responsible healthcare professional. FCEs were aggregated into provider spells (continuous care under one healthcare provider) and further aggregated into Continuous Inpatient Spells (CIPSs, also known as super-spells) using an algorithm available from the authors. A CIPS represents an NHS patient's continuous inpatient care, from admission up to discharge, from all relevant care providers.

The A&E data included the following: age, gender, date of attendance, attendance category (first or follow up attendance), incident location (home, public place, work or educational

establishment), arrival mode (ambulance or other), source of referral (whether self-referred or referred by a professional in another organisation), disposal (including whether discharged, admitted or referred for follow up), time of arrival, time to assessment, time to treatment, time to departure, department type (1,2 or 3) clinical investigations, clinical treatment and diagnosis. HES APC data included date of admission, method of admission, source of admission, date of discharge, discharge destination, ICD-10 and cause codes.

Data linkage of HES A&E Attendances and admissions data

The separate HES A&E and Admissions data was provided with a (common) pseudonymised HES ID field which enabled the study team to link patient records in HES A&E data to the same patient's records in the HES APC data. The latest (by date and time of day of attendance) A&E attendance on either the day of-, or previous day of -, the earliest (by date of admission) CIPS was considered to be a linked A&E attendance - APC admission. The latest/earliest criteria ensured each attendance was linked to, at most, one (subsequent) admission and, similarly, each admission was linked to, at most, one (prior) attendance. This choice of duration was informed by examining the number of linked attendance-admissions using different maximum allowed durations between attendance and admission. After the process of linking was completed, A&E attendances at all facilities except Type 1 EDs were removed from the dataset.

Data Analysis

The patient pathway of those aged 75 and over was compared to those under 75 with the objective of identifying distinctive attributes of the older population and to give context when describing the characteristics of the older age group. Following comparative analysis, the older cohort was analysed in detail.

Cohorts of interest: short stay admissions and conditions rich in avoidable admissions

The first cohort were patients who had short stay admissions to hospital following their ED, defined as <2 nights. Analysis of these admissions focussed upon the regional variation in the management of these patients, in particular the rates of short stay admissions.

The second cohort were patients admitted with diagnoses/conditions identified as being rich in potentially avoidable admissions. Previous research identified this cohort in whom admission might be avoided through interventions in the emergency and urgent care system (11-13). These conditions included non-specific chest pain, angina, non-specific abdominal pain, acute mental crisis, chronic obstructive pulmonary disease (COPD), minor head injuries, urinary tract infections (UTI), DVT, cellulitis, epileptic fits, blocked catheters and diabetic/hypoglycaemia emergencies and falls not elsewhere classified. Patients with these conditions were identified in the dataset via the ICD-10 code assigned to their inpatient stay or relevant caused code (for falls not elsewhere classified). The proportion of admissions that these conditions accounted for was then calculated. It is acknowledged that the prevalence of serious conditions is higher for many of these diagnoses in the older adult cohort and that some scoring tools for ambulatory potential in these patients include age in their criteria. However, including this data was important, particularly in combination with the short-stay admission. This is further addressed in the limitations section.

Statistical Analysis

Statistical analysis was performed using statistical software R version 3.4.1 and Microsoft Excel. Descriptive analysis of the dataset was undertaken, describing: hospital attended, age of patient, mechanism of arrival, time of arrival, treatment, length of ED stay and patient outcomes (admitted, discharged, referred to outpatients, referral to other healthcare providers, left before being seen, or died in department). For those admitted, further analysis on length of stay and ICD-10 code was performed. Time of arrival was classified into four categories - 'weekday day time', 'weekend day time', 'weekday night time' and 'weekend night time' with day time between 8am and 6pm.

Comparative analysis of patients ≥75 years and patients <75 years was undertaken via the creation of binary outcomes, allowing binary logistic regression analysis to determine unadjusted odds ratios (ORs). Length of stay was analysed using Mann Whitney U, due to the non-parametric distribution of the data. Binary logistic regression was performed when comparing length of stay for patients with conditions rich in avoidable admission to those that were not.

Ethical review was obtained from the National Health Service Health Research Authority (HRA): National Research Ethics Service Committee South West Exeter (14/SW/1014).

Results

Urgent care axis: comparative analysis

HES A&E data were linked to Admissions data in 94.8% of cases. The total number of ED attendances in Y&H between April 2011-2014 was 3,736,541 of which 625,772 (16.8%) were aged 75 and above (see Table 1).

Table 1: Comparative analysis of the urgent care axis for those aged 75 and over compared to those under 75. Binary logistic regression analysis was performed for all variables, except length of stay within the ED.

Point of urgent care axis	***<75 years***	***≥75 years***	***Odds Ratio (95% confidence interval)***
Arrival			
MODE OF ARRIVAL			
Ambulance	845,381 (27.2%)	463,540 (74.1%)	7.66 (7.61-7.70)
Other	2,265,262 (72.8%)	162,204 (25.9%)	0.13 (0.13-0.13)
Unknown	126 (0%)	28 (0%)	-
HOURS OF PRESENTATION			
Weekday day time (08-18)	1,257,105 (40.4%)	276,781 (44.2%)	1.17 (1.16-1.18)
Weekday night time (18-08)	749,367 (24.1%)	134,702 (21.5%)	0.86 (0.86-0.87)
Weekend day time (08-18)	517,309 (16.6%)	111,934 (17.9%)	1.09 (1.08-1.10)
Weekend night time (18-08)	586,988 (18.87%)	102,355 (16.36%)	0.84 (0.83-0.85)
ED Management			
Median number of minutes within the ED (IQR)	136 (82-199)	195 (134-234)	
ED Outcome			
Admitted/Transferred	783,906 (25.2%)	379,108 (60.6%)	4.56(4.54-4.59)
Discharged or referred to other services	2,154,002 (69.2%)	236,969 (37.9%)	0.27 (0.27-0.27)
Did not wait or declined treatment	157,734(5.1%)	4,166 (0.7%)	0.13 (0.12-0.13)
Died	2,856 (0.1%)	3,202 (0.5%)	5.60 (5.32-5.89)
Other	9,930 (0.3%)	1,910 (0.3%)	0.96(0.91-1.00)
Unknown	2,341 (0.1%)	417 (0.1%)	0.89 (0.80-0.98)
TOTAL	**3,110,769**	**625,772**	

This equates to an annual attendance rate of approximately 478 per thousand for patients aged 75 and above (using population data Y&H as patient catchment data).

The majority of attendances were out of hours (59.6% of younger adults, and 55.8% of older adults), and a significant proportion of those aged 75 and over arrived by ambulance compared to the under 75s (74.1% versus 27.2%, odds ratio 7.7, 95% CI 7.6-7.7).

The older cohort had a significantly longer length of stay in the department: the median time in ED for younger patients was 136 (IQR 82-199) minutes, and 195 (IQR 134-234) minutes for older patients ($p<0.001$). Following assessment and management within the ED, a significantly larger proportion of older patients were then admitted: 379,108 (60.6%)of older patients were admitted , compared to 783,906 (25.2%) younger patients (OR 4.56, 95% CI 4.54- 4.59). Older patients were also significantly more likely to die in ED (OR 5.60, 95% CI 5.32-5.89).

Variation in features of admission across Y&H for older patients

The average admission rate for patients aged 75 and over , varied across the region between 47.6% and 71.9% (see Figure 1).

The median length of stay (los) for older patients was significantly longer than for the younger cohort (See table 2). Short stay admissions (<2 nights) accounted for significantly fewer older adult admissions than the proportion in younger patients (OR 0.37, 95% CI 0.36-0.37).

Table 2: Admission data for those aged 75 plus compared to those under 75.

Admission data	***<75 years (N=666,075)***	***≥75 years (N=359,395)***	***Odds Ratio (95% confidence interval)***
Median nights los (IQR)	1 (0-4)	4 (1-12)	
% Short stay admissions	345,489 (51.9%)	101,790 (28.3%)	0.37 (0.36,0.37)
% "Rich in potentially avoidable admissions"	218,247 (32.8%)	133,942 (37.3%)	1.22 (1.21, 1.23)

The proportion of short stay admissions for the older patients varied across different sites, from 18.8% to 41.2% (see Figure 1).

<u>Proportion with a condition "rich in potentially avoidable admission" in older adults</u>

Studying ICD-10 codes and cause code assigned to the older adult patient's admission further, 133,942 (37.3%) admissions were with a condition that was considered "rich in potentially avoidable admission" compared to 32.8% in the younger cohort (OR 1.22, 95% CI 1.21-1.23). There was moderate regional variation in the proportions of admissions in this category, between 34.3% and 40.9%

Conditions "rich in potentially avoidable admission" accounted for 43,019 (42.3%) of short-stay admissions in the older adults. The most common ICD-10 codes assigned to the older adults short-stay admissions were syncope, chest pain and UTI (Table 3).

Table 3: Top ICD-10 codes assigned to short-stay (< 2 night) admission data for older adult admissions in Yorkshire and Humber **(N=101,790)**

Name of Condition	**Code**	**Freq**	**%**
Syncope and collapse	R55X	5766	5.7
Chest pain, unspecified	R074	5566	5.5
Urinary tract infection	N390	2677	2.6
Other chest pain	R073	2247	2.2
Angina pectoris, unspecified	I209	2229	2.2
Atrial fibrillation and flutter	I48X	1853	1.8
Unspecified acute lower respiratory infection	J22X	1805	1.8
Precordial pain	R072	1673	1.6
Tendency to fall, not elsewhere classified	R296	1529	1.5
Lobar pneumonia, unspecified	J181	1427	1.4
Chronic obstructive pulmonary disease with acute lower respiratory infection	J440	1278	1.3
Chronic obstructive pulmonary disease with acute exacerbation, unspecified	J441	1225	1.20

Discussion

This research is one of the first projects to map the urgent care axis across a large population, encompassing multiple EDs. Previous research undertaken within this area has often been focussed at single sites, or focussed on a more specific cohort of patients within the older age group (14-15).

Our data demonstrates that compared to the younger population, large proportions of older adults present to the ED via ambulance, and once within the ED they are significantly more likely to spend longer periods of time within the department and be admitted following assessment. Once admitted, older patients are inpatients for significantly longer periods of time than younger patients, but a significant proportion have short stay admissions: 28.3% of all older patient admissions.

The large proportion of older patients who are discharged from ED who arrive via ambulance represent a cohort who could be amenable to targeted interventions capable of

reducing ED attendance and subsequent admission. Prior research has shown that employing practitioners with advanced skills in managing older people within an urgent healthcare system can reduce the need for subsequent onward referral to emergency and unscheduled care services for a large proportion of cases (15-18). Given the large numbers of patients presenting via these means the case for expanding the ability of pre-hospital emergency services in managing these cases or developing novel interventions, is strong.

Of those older patients who are admitted to hospital, 37.3% of older admissions are with conditions considered rich in potentially avoidable admissions, 42.3% of short stay admissions. These were identified using ICD-10 codes which do not give any indication of the illness/condition severity. There is definitely a cohort of this group that require inpatient management, but the large proportion of short stay admissions with these conditions suggest that more work could be done in this area within the ED to avoid the inpatient stay. Some centres have age cut offs for patients that can be managed using their ambulatory care pathways and perhaps this is one aspect that could be reviewed.

Variability in the proportion of patients admitted, and short stay admissions, across the region indicates that the differing healthcare structures across the region may lead to differing management pathways for patients. Some variation may be due to the way that centres record their data e.g. patients admitted to the Clinical Decision Unit (CDU) and discharged later that day would be recorded in some hospitals as a discharge from ED, in others as an admission with zero day length of stay. The King's Fund has previously reported variation across primary care trusts in admission rates to hospital from EDs, attributing this to different patient factors, variable access to community based resources and pathways to facilitate prompt admission and discharge, and differing capacity for onward care of patients (19). It is likely that a combination of these factors account for the patterns observed in Y&H. In 2014, Conroy *et al* published a study evaluating the role of comprehensive geriatric assessment (CGA) within the ED on admission rates for a targeted frail older adult cohort (20). This intervention showed that through geriatric and multidisciplinary input admission rates of this targeted population can be reduced, a similar targeted intervention could potentially offer similar benefits (20).

Further work is required to understand the number pre-hospital contacts, with either NHS111 or emergency services that do not result in ED attendance. This information, coupled with in-depth qualitative work within acute care organisations to understand the trends observed, would provide key information to further help identify other discrete populations with a range of outcomes that might be amenable to intervention within the ED.

Limitations

Although analysing large routine datasets offers benefits in identifying trends across large populations, there are also limitations. The dataset does not allow for in-depth analysis of observed trends: in order to further understand variability, additional qualitative analysis is required.

The use of ICD-10 codes to identify patients with conditions rich in potentially avoidable admissions may be considered simplistic. ICD-10 codes lack a way of documenting disease severity and might also miss out important elements of frailty such as weakness, polypharmacy and need for support in everyday living.

Conclusion

With the forecast for increasing numbers of older patients set to attend EDs in the coming years, population-based research to understand the urgent care axis is vital to allow for development of healthcare services that best serve this population. As the population ages, understanding this difference is required to develop services and interventions accordingly. This research has identified an opportunity to intervene in both the pre-hospital phase and within the ED, allowing for a shift in care away from acute hospital services to community-based management.

Contributorship

JB, SM, CO, SCo conceived the study, JB performed the background searches. Data linkage was performed by TS and statistical analysis of results by RJ, RS. Interpretation of data was performed by JB, SM, CO and SC. JB and SC drafted the initial manuscript and all authors contributed to its revision.

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Conflicts of interest

The authors report grants from NIHR, inside and outside the submitted work.

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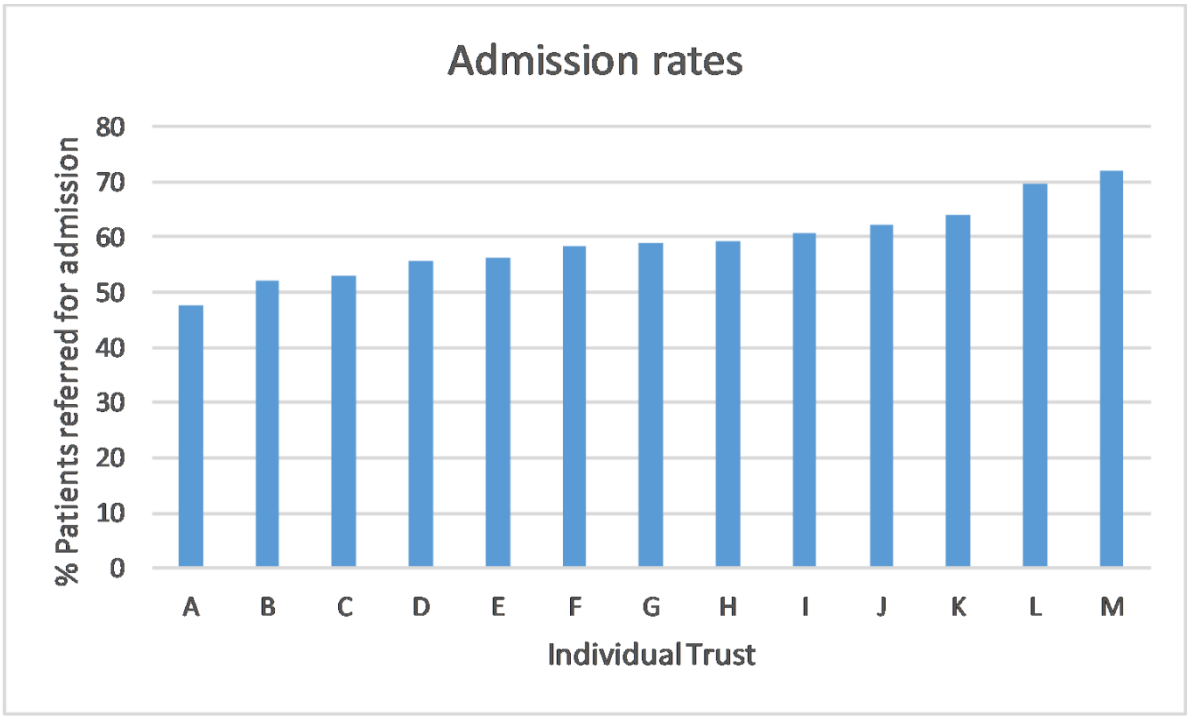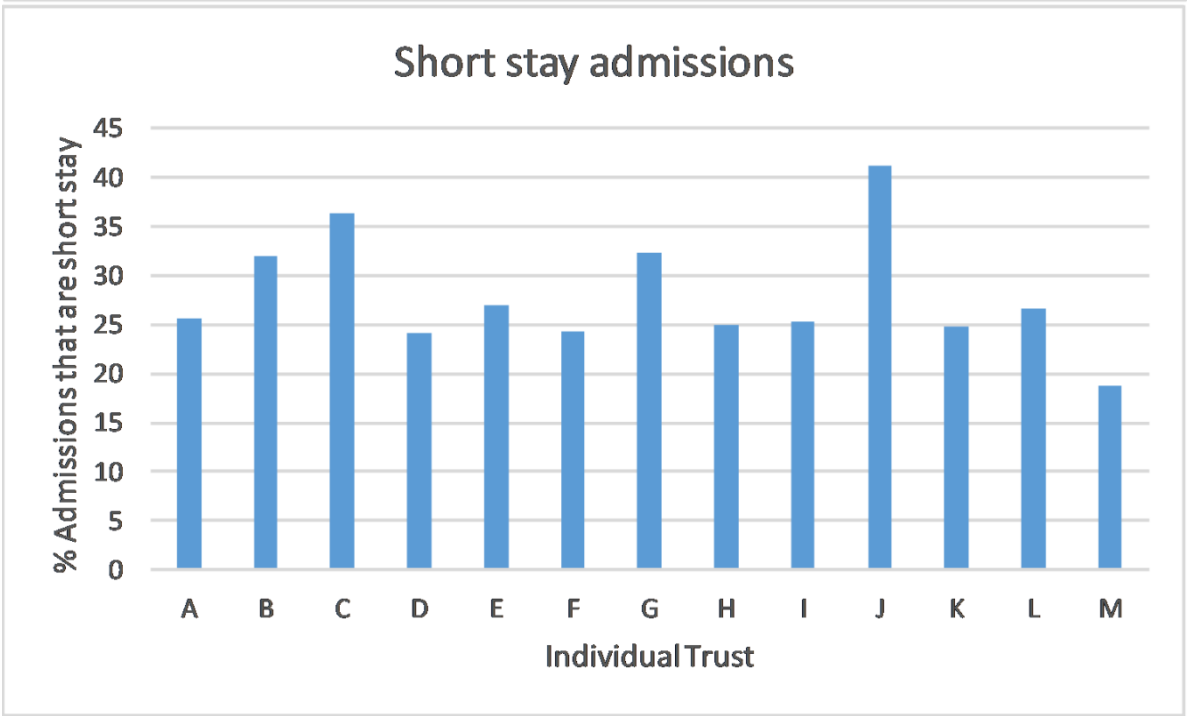
Figure 1: Graphs displaying ED admission rates for individual Trusts (top image) and the variation in short stay admissions (bottom image) for patients aged 75 and over. Individual Trust data has been anonymised.