Reducing ambulance conveyance for older people with and without dementia: evidence of the role of social care from a regional, year-long service evaluation using retrospective routine data

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Abstract

Introduction: Older people, especially those with dementia, have a high risk of deterioration following admission to hospital. More than 60% of older people attended by South Central Ambulance Service (SCAS) clinicians are conveyed to hospital, although many conveyances may not have been due to life-threatening conditions. We aimed to understand patterns of conveyance and alternative referral pathways used following ambulance attendance to an older person.

Methods: Service evaluation, using routinely collected, anonymised electronic records.

Participants: Electronic records of people aged ≥75 years for whom an ambulance was dispatched between April 2016 and March 2017 within the geographical boundaries of SCAS NHS Foundation Trust, who were alive on arrival of the ambulance. Conveyance rates are described according to patient and emergency-call characteristics. Logistic regression was used to produce adjusted odds ratios for conveyance. Alternative referral pathways used are described.

Results: Of 110,781 patients attended, 64% were conveyed to hospital. Factors associated with reduced odds of conveyance included out-of-hours calls (adjusted odds ratio (aOR) 0.82 [0.79–0.85]), living alone with a care package or with family plus care package (aOR 0.66 [0.62–0.69]; aOR 0.58 [0.54–0.62] respectively) and a record of dementia (0.91 [0.87–0.96]). Living in a nursing home was associated with an increased risk of conveyance (aOR 1.25 [1.15–1.36]). Patients with dementia with more income were significantly less likely to be conveyed than those with less income. Alternative referral services were used in 22% of non-conveyed patients, most commonly GP, out-of-hours and falls services.

Discussion: People aged ≥75 years have high rates of conveyance, which are influenced by factors such as out-of-hours calls, dementia and receipt of social care. Low use of alternative referral services may reflect limited availability or difficulty in access. A better understanding of how these factors influence ambulance clinician decision-making is integral to improvement of outcomes for older people.

Keywords
dementia; emergency medical services; social care

Introduction

The number of older people requiring acute, secondary care services in the UK continues to rise, with an 11.3% increase in emergency department attendances and a 4.8% increase in hospital admissions between 2015 and 2017 (Care Quality Commission, 2018). Dementia is prevalent among older people, affecting one in six people over the age of 80, and it is estimated that over 1 million people will be living with dementia in the UK by 2025 (Alzheimer’s Society, n.d.). Emergency ambulance attendances for older people, particularly those with dementia, are common and often require provision of care not related to injury or urgent clinical need (Buswell et al., 2016; Pocock et al., 2018). Once the ambulance crew have addressed the patient’s immediate medical needs, a decision must be made as to whether the patient will be conveyed to hospital for further care and assessment. However, older people frequently have long hospital stays which reduce independence, and their complex medical and social care needs may result in delayed transfers of care and new care home admissions (Bradshaw et al., 2013; NHS Benchmarking Network, 2014; Timmons et al., 2015). Older patients with cognitive impairments or dementia have an even higher risk of deterioration in a hospital environment, and have higher mortality in hospital or shortly after discharge and more frequent readmissions (Fogg et al., 2018, 2019).

Between 2011/2012 and 2016/2017, the observed 70% increase in potentially avoidable emergency department attendances for people with dementia corresponded to cuts in social care funding (Hutchings et al., 2018). These instances of avoidable admissions may be better managed in a care setting appropriate to patient need, such as systems to support people to maintain their health and well-being at home (Care Quality Commission, 2018; Steventon et al., 2018). It is also suggested that patients with dementia requiring assistance with certain activities of daily living and those with a history of falls have more frequent ambulance attendances and are more likely to be hospitalised (Toot et al., 2013; Voss et al., 2018). Actions to address this may include Computerised Clinical
Decision Support – a series of menu-based decisions for call handlers, which has been shown to double patient referrals to falls services, while maintaining patient safety outcomes (Snooks et al., 2014).

A recent audit highlighted that around 60% of older people with dementia attended by the South Central Ambulance Service (SCAS) are conveyed to hospital (Pocock et al., 2018). Emergency ambulance clinicians’ conveyance decisions regarding this patient group may be influenced by the alternative care provision available, which may vary according to times of the day or week (O’Hara et al., 2015). We aimed to describe current care pathways for older people following emergency ambulance attendance and explore the association of patient and call characteristics with hospital conveyance to see if it was possible to identify ways to potentially decrease inappropriate emergency department admissions. We performed a service evaluation to explore associations between conveyance decisions made by ambulance staff for older people and factors such as out-of-hours periods, triage grade, social care provision and presence of dementia, and to describe the alternative referral pathways used during this period.

Methods

Objectives

1. To describe conveyance rates for older people with an emergency ambulance attendance.
2. To explore whether conveyance rates differed according to the characteristics of the call or the patient demographic, socioeconomic and clinical characteristics.
3. To describe alternative referral pathways used.

Design

Service evaluation using routinely collected, anonymised retrospective electronic records.

Setting

Patients with emergency ambulance attendances within the geographical boundaries of SCAS NHS Foundation Trust, including Hampshire, Berkshire, Buckinghamshire and Oxfordshire, serving more than 4 million people.

Population

Records from the following attendances were included: (i) patients aged ≥75 years; (ii) an electronic record with date and time of attendance available between 1 April 2016 and 31 March 2017; (iii) attendance by emergency ambulance clinicians, including registered paramedics, nurses or doctors, ambulance technicians and associate ambulance practitioners; (iv) within a Clinical Commissioning Group (CCG) area with ≥70% electronic records available (i.e. reflecting areas staffed mainly by SCAS crews rather than private providers). Records for patients who were known to be deceased at the time of ambulance arrival on scene and visits from Patient Transport Services were excluded.

Data sources and extraction of dataset

Electronic patient records (EPRs) are created at the scene by emergency ambulance staff using the MobiMed Smart electronic tablet (Orthivus, Sweden). The EPR system is used to collect patient clinical and social history, incident details and clinical information. Data are entered into the EPR via a touchscreen on a tablet at the scene, through menus and interactive, self-expanding boxes as well as sections of free text for additional detail about the examination where necessary. Data are transferred to a warehouse and downloaded daily to the SCAS Business Intelligence Team. The Microsoft SQL Server Management Studio was used to extract data from the SCAS data warehouse. Records with the term ‘dementia’ entered in the EPR were identified using queries of free-text fields, as described previously (Pocock et al., 2018). Additional contextual data from several data sources, such as the Clinical Commissioning Group (CCG) area, were accessed via Qlikview. The EPR dataset was anonymised, uploaded into a standalone application and matched with incident numbers using Computer Aided Dispatch (CAD) information to link to the triage grade.

Data analysis

Descriptive statistics were calculated for the total number of emergency attendances and the proportion of conveyances, and summarised according to: (1) a record of dementia; (2) year quarter (based on 3-month aggregations); (3) time period, that is (i) within GP opening hours, defined as 08:00 to 18:00 Monday to Friday, (ii) weekday ‘out of hours’ (18:00 to 08:00 Monday to Thursday, including 08:00 Friday morning), (iii) weekends (18:00 Friday evening to 08:00 Monday morning); (4) triage grade categorised as: ‘Urgent’ – healthcare professional pre-booked admissions where patient triage has already occurred, ‘Red’ – patient’s condition considered to be life-threatening, ‘Green’ – patient’s condition considered not to be life-threatening (National Audit Office, 2017); (5) care arrangements, categorised as: (i) living alone, (ii) living alone with a care package, (iii) with family/carer for dependent, (iii) with family/carer for dependent and care package, (iv) residential care, (v) nursing care (if two or more categories were ticked, the record was categorised as the one with the highest care needs); (6) measures of deprivation: (i) index of multiple deprivation (IMD)
rank, and (ii) Income Deprivation Affecting Older People Index (IDAOPI) rank, matched through the Lower Super Output Area (LSOA) on the patient’s home postcode, but if missing (n = 5431), matched to an ‘on-scene’ postcode where available, and categorised by quintiles. Univariable logistic regression was used to identify which factors were associated with conveyance. Categories for out-of-hours weekdays and weekends were combined due to similar results. A forward step-wise multivariable regression model was used to identify factors most relevant for consideration in adaptation of future care. Variables were retained in the model if both the Akaike and Bayesian Information Criterion (AIC/BIC) decreased following their introduction. As people with dementia have specific guidelines regarding conveyance which may influence conveyancing patterns (National Institute of Clinical Excellence, 2018), multivariable analyses were also stratified by presence of the term ‘dementia’ in the EPR. Analyses were performed using Stata version 15.1 (College Station, Texas).

### Patient and public involvement

The need for this work was identified by the SCAS Patient Forum, who were concerned that sometimes their family, friends or neighbours were taken to hospital due to a lack of alternative care and that, once in hospital, they took a long time to return home. A Patient Public Involvement group based in a large acute hospital in the region highlighted difficulties in knowing how to access appropriate care for increasing care needs and wanted to know how the current organisation of care impacts on people’s conveyance to hospital, and what could be done to improve the situation. The results of the evaluation will be shared with these groups, who will assist with dissemination to a public audience, and help to define next steps in the work.

### Results

#### Characteristics associated with conveyance

Most factors included in the service evaluation were associated with conveyance in the univariable analysis (Table 2). Characteristics significantly associated with reduced conveyance after adjustment included: out-of-hours calls; age groups 80–84 and 90 and above; being female; a record of ‘dementia’ in the EPR and a main complaint of a fall; a general medical complaint or mental health or social reasons (as compared to ‘injury/accident’). The presence of a care package for people living alone significantly decreased the risk of conveyance (odds ratio (OR) 0.66 [0.62 to 0.69]) and living with family and a care package decreased the conveyance (OR 0.66 [0.62 to 0.69]) and living alone significantly decreased the risk of conveyance (OR 0.58 [0.54 to 0.62]). While those in residential care had a similar risk of conveyance to those living alone, people in nursing homes were more likely to be conveyed to hospital. There was no strong evidence for an association between deprivation indicators and conveyance in the overall population, although the IMD quintile 3 showed a significant protective association.

When people with and without a record of dementia were considered separately, the factors associated with conveyance differed (Table 3). Factors such as older age, being female and a main complaint in the ‘general medical condition’ category were associated with reduced odds of conveyance in patients without dementia, but no association was seen in patients with dementia. Although there was no association seen with the IMD quintile in both groups, patients with dementia who were in quintile 3 and above (less deprived) quintiles for the income deprivation affecting older people’s index (IDAOPI) were significantly less likely to be conveyed.
Table 1. Characteristics of ambulance attendances and conveyancing decisions for the total population and stratified by a record of ‘dementia’.

| Characteristics of attendance | All patients aged 75+ | Patients with a record of ‘dementia’ | Patients with no record of ‘dementia’ |
|------------------------------|-----------------------|--------------------------------------|--------------------------------------|
|                              | N = 110,781           | N = 18,288                           | N = 92,493                           |
|                              | n                  | %a           | n                  | %b           | n                  | %b           |
| **Quarter**                  |                     |               |                     |               |                     |               |
| April–June 2004              | 27,043              | 24.4         | 17,256             | 63.8         | 2535               | 58.6         | 14,721         | 64.8         |
| July–Sept 2004               | 26,118              | 23.6         | 16,502             | 63.2         | 2443               | 57.7         | 14,059         | 64.3         |
| Oct–Dec 2004                 | 28,022              | 25.3         | 18,064             | 64.5         | 2832               | 59.7         | 15,232         | 65.4         |
| Jan–March 2005               | 29,600              | 25.7         | 19,230             | 65.0         | 2986               | 59.9         | 16,244         | 66.0         |
| **Day of the week**          |                     |               |                     |               |                     |               |
| Monday                       | 16,017              | 14.5         | 10,549             | 65.9         | 1532               | 60.5         | 9017           | 66.9         |
| Tuesday                      | 15,260              | 13.8         | 9,783              | 64.1         | 1486               | 59.1         | 8297           | 65.1         |
| Wednesday                    | 15,463              | 14.0         | 10,047             | 65.0         | 1468               | 57.6         | 8579           | 66.4         |
| Thursday                     | 15,367              | 14.1         | 10,206             | 65.3         | 1510               | 60.7         | 8696           | 66.1         |
| Friday                       | 16,389              | 14.8         | 10,766             | 65.7         | 1557               | 60.2         | 9209           | 66.7         |
| Saturday                     | 16,354              | 14.8         | 10,056             | 61.5         | 1689               | 58.5         | 8367           | 62.1         |
| Sunday                       | 15,661              | 14.1         | 9,645              | 61.6         | 1554               | 56.9         | 8091           | 62.6         |
| **Time category**            |                     |               |                     |               |                     |               |
| In hours                     | 46,532              | 42.0         | 32,325             | 69.5         | 4636               | 64.1         | 27,689         | 70.5         |
| Out-of-hours (weekdays)      | 25,399              | 22.9         | 15,023             | 59.2         | 2338               | 54.0         | 12,685         | 60.2         |
| Weekends                     | 38,850              | 35.1         | 23,704             | 61.0         | 3822               | 56.9         | 19,882         | 61.9         |
| **Triage grade**             |                     |               |                     |               |                     |               |
| Green                        | 55,064              | 50.0a        | 28,302             | 51.4         | 4908               | 47.9         | 23,394         | 52.2         |
| Red                          | 42,770              | 38.8         | 30,200             | 70.6         | 4055               | 66.0         | 26,145         | 71.4         |
| Urgent response              | 12,411              | 11.3         | 12,169             | 98.1         | 1775               | 97.5         | 10,394         | 98.2         |
| Missing                      | 536                 | –            | 381                | 71.1         | 58                  | 74.4         | 323            | 70.5         |
| **Characteristics of patient**|                     |               |                     |               |                     |               |
| **Age band**                 |                     |               |                     |               |                     |               |
| 75–79                        | 23,806              | 21.5         | 16,160             | 67.9         | 1417               | 60.3         | 14,743         | 68.7         |
| 80–84                        | 30,004              | 27.1         | 19,564             | 65.2         | 2587               | 59.2         | 16,977         | 66.2         |
| 85–89                        | 30,592              | 27.6         | 19,523             | 63.8         | 3561               | 60.0         | 15,962         | 64.7         |
| 90+                          | 26,379              | 23.8         | 15,805             | 59.9         | 3231               | 57.3         | 12,574         | 60.6         |
| **Sex**                      |                     |               |                     |               |                     |               |
| Male                         | 46,200              | 41.9a        | 30,611             | 66.3         | 4119               | 60.5         | 26,492         | 67.3         |
| Female                       | 64,122              | 58.1         | 40,193             | 62.7         | 6645               | 58.2         | 33,548         | 63.7         |
| Not recorded                 | 459                 | –            | 248                | 54.0         | 32                  | 52.5         | 216            | 54.3         |
| **Chief complaint**          |                     |               |                     |               |                     |               |
| Falls                        | 28,920              | 26.5a        | 13,837             | 47.9         | 2,994               | 46.9         | 10,843         | 48.1         |
| Cardiovascular/cardiac arrest| 95,12               | 8.71         | 8,168              | 85.9         | 593                 | 76.6         | 7,575          | 86.7         |
| Injury, accident             | 70,54               | 6.46         | 4,802              | 68.1         | 865                 | 63.6         | 3937           | 69.1         |
| General medical              | 60,242              | 55.2         | 42,349             | 70.3         | 5986               | 68.6         | 36,363         | 70.6         |
| Mental health                | 631                 | 0.58         | 219                | 34.7         | 76                  | 45.5         | 143            | 20.8         |
Social
Not recorded

Care/living arrangements
Alone
Alone plus care package
With family
With family plus care package
Residential care
Nursing home
Not recorded

Index of multiple deprivation (IMD) quintile
Quintile 1 (most deprived)
Quintile 2
Quintile 3
Quintile 4
Quintile 5 (least deprived)
Unavailable

Income Deprivation Affecting Older People Index (IDAOPI) quintile
Quintile 1 (most deprived)
Quintile 2
Quintile 3
Quintile 4
Quintile 5 (least deprived)
Unavailable

Table 2. Characteristics associated with conveyance: results from univariable and multivariable regression.

| Call details | Univariable Regression | Multivariable Regression |
|--------------|------------------------|--------------------------|
|              | Unadjusted odds ratio  | 95% CI                   | p-value | Adjusted odds ratio | 95% CI | p-value |
| Time category |                        |                          |         |                     |        |         |
| In hours a   | 1                      | (0.65 to 0.68)           | <0.001  | 0.82                | (0.79 to 0.85) | <0.001 |
| Out-of-hours | 0.67                   | (0.65 to 0.68)           | <0.001  | 0.82                | (0.79 to 0.85) | <0.001 |
| Triage       |                        |                          |         |                     |        |         |
| Green a      | 1                      | (2.21 to 2.23)           | <0.001  | 1.55                | (1.49 to 1.61) | <0.001 |
| Red          | 2.27                   | (2.21 to 2.23)           | <0.001  | 1.55                | (1.49 to 1.61) | <0.001 |
| Urgent response | 47.5                | (41.8 to 54.1)           | <0.001  | 40.7                | (34.6 to 47.9) | <0.001 |

a Column percentages, i.e. proportion of characteristic in the category, divided by total population.
b Row percentages, i.e. proportion of patients within each category characteristic who were conveyed, with the denominator for each column given in the header.
c Percentages calculated using the denominator of records with known values.
### Patient characteristics

#### Age band

| Age band          | Odds Ratio (95% CI) | P Value | Odds Ratio (95% CI) | P Value |
|-------------------|---------------------|---------|---------------------|---------|
| 75–79<sup>a</sup> | 1                   | 1       | 1                   | 1       |
| 80–84             | 0.89 (0.86 to 0.92) | <0.001  | 0.95 (0.91 to 0.99) | 0.024   |
| 85–89             | 0.83 (0.81 to 0.86) | <0.001  | 0.97 (0.93 to 1.02) | 0.249   |
| 90 and above      | 0.71 (0.68 to 0.73) | <0.001  | 0.88 (0.84 to 0.90) | <0.001  |

#### Sex

| Gender | Odds Ratio (95% CI) | P Value | Odds Ratio (95% CI) | P Value |
|--------|---------------------|---------|---------------------|---------|
| Male<sup>a</sup> | 1                   | 1       | 1                   | 1       |
| Female | 0.86 (0.83 to 0.88) | <0.001  | 0.95 (0.92 to 0.98) | 0.004   |

#### Care/living arrangements

| Arrangement | Odds Ratio (95% CI) | P Value | Odds Ratio (95% CI) | P Value |
|-------------|---------------------|---------|---------------------|---------|
| Alone<sup>a</sup> | 1                   | 1       | 1                   | 1       |
| Alone plus care package | 0.52 (0.50 to 0.55) | <0.001  | 0.66 (0.62 to 0.69) | <0.001  |
| With family | 1.23 (1.09 to 1.17) | <0.001  | 1.00 (0.96 to 1.04) | 0.986   |
| With family plus care package | 0.56 (0.52 to 0.59) | <0.001  | 0.58 (0.54 to 0.62) | <0.001  |
| Residential care | 0.94 (0.997) | 0.390   | 1.00 (0.94 to 1.07) | 0.956   |
| Nursing home | 1.42 (1.32 to 1.53) | <0.001  | 1.25 (1.15 to 1.36) | <0.001  |

#### Dementia

| Presence | Odds Ratio (95% CI) | P Value | Odds Ratio (95% CI) | P Value |
|----------|---------------------|---------|---------------------|---------|
| No<sup>a</sup> | 1                   | 1       | 1                   | 1       |
| Yes      | 0.77 (0.75 to 0.80) | <0.001  | 0.91 (0.87 to 0.96) | <0.001  |

#### Complaint

| Condition | Odds Ratio (95% CI) | P Value | Odds Ratio (95% CI) | P Value |
|-----------|---------------------|---------|---------------------|---------|
| Injury, accident<sup>a</sup> | 1                   | 1       | 1                   | 1       |
| Falls     | 0.43 (0.41 to 0.45) | <0.001  | 0.51 (0.48 to 0.55) | <0.001  |
| Cardiovascular/cardiac arrest | 2.85 (2.64 to 3.08) | <0.001  | 2.11 (1.92 to 2.32) | <0.001  |
| General medical | 1.11 (1.05 to 1.17) | <0.001  | 0.82 (0.76 to 0.87) | <0.001  |
| Mental health | 0.25 (0.21 to 0.30) | <0.001  | 0.15 (0.12 to 0.19) | <0.001  |
| Social    | 0.12 (0.11 to 0.14) | <0.001  | 0.13 (0.11 to 0.15) | <0.001  |

#### Index of multiple deprivation (IMD) quintile

| Quintile | Odds Ratio (95% CI) | P Value | Odds Ratio (95% CI) | P Value |
|----------|---------------------|---------|---------------------|---------|
| Quintile 1 (most deprived)<sup>a</sup> | 1                   | 1       | 1                   | 1       |
| Quintile 2 | 0.94 (0.88 to 0.99) | 0.023   | 0.94 (0.87 to 1.01) | 0.103   |
| Quintile 3 | 0.93 (0.88 to 0.98) | 0.009   | 0.93 (0.87 to 0.998) | 0.045   |
| Quintile 4 | 1.00 (0.95 to 1.05) | 0.945   | 0.98 (0.91 to 1.05) | 0.541   |
| Quintile 5 (least deprived) | 0.96 (0.91 to 1.01) | 0.121   | 0.95 (0.89 to 1.01) | 0.110   |

#### Income Deprivation Affecting Older People Index (IDAOPI) quintile

| Quintile | Odds Ratio (95% CI) | P Value | Odds Ratio (95% CI) | P Value |
|----------|---------------------|---------|---------------------|---------|
| Quintile 1 (most deprived)<sup>a</sup> | 1                   | 1       | 1                   | 1       |
| Quintile 2 | 0.95 (0.90 to 1.01) | 0.100   | –                   | –       |
| Quintile 3 | 0.97 (0.91 to 1.02) | 0.240   | –                   | –       |
| Quintile 4 | 1.01 (0.96 to 1.07) | 0.669   | –                   | –       |
| Quintile 5 (least deprived) | 1.01 (0.95 to 1.06) | 0.850   | –                   | –       |

<sup>a</sup> Reference category.

<sup>b</sup> Not included in multivariable model.
### Table 3. Characteristics associated with conveyance in multivariable regression stratified by a record of ‘dementia’

| Characteristics of call | Patients with a record of ‘dementia’ | Patients without a record of ‘dementia’ |
|-------------------------|-------------------------------------|--------------------------------------|
|                         | N = 13,424                          | N = 67,484                           |
| **Adjusted odds ratio** | **95% CI**                          | **p-value**                          |
| **Characteristics of call** | **95% CI**                          | **p-value**                          |
| Time category           |                                    |                                      |
| In hours               | 1                                   |                                      |
| Out of hours           | 0.86 (0.80–0.93)                     | <0.001                               |
| **Triage**             |                                     |                                      |
| Green                  | 1                                   |                                      |
| Red                    | 1.47 (1.34–1.61)                     | <0.001                               |
| Urgent response        | 34.0 (23.5–49.2)                     | <0.001                               |
| **Characteristics of patient** |                                    |                                      |
| Age band               |                                      |                                      |
| 75–79                  | –                                   |                                      |
| 80–84                  | –                                   | 0.94 (0.90–0.99)                     | 0.019 |
| 85–89                  | –                                   | 0.97 (0.92–1.02)                     | 0.178 |
| 90 and above           | –                                   | 0.87 (0.82–0.91)                     | <0.001 |
| **Sex**                |                                      |                                      |
| Male                   | 1                                   |                                      |
| Female                 | 0.98 (0.91–1.06)                     | 0.64 (0.91–0.98)                     | 0.002 |
| **Care/living arrangements** |                                    |                                      |
| Alone                  | 1                                   |                                      |
| Alone plus care package | 0.71 (0.62–0.83)                     | <0.001                               |
| With family            | 0.87 (0.76–1.01)                     | 1.01                                 | 0.97 (1.01) | 0.571 |
| With family plus care package | 0.60 (0.51–0.71) | <0.001 | 0.57 (0.52–0.61) | 0.178 |
| Residential care       | 1.00 (0.87–1.15)                     | 0.99                                 | 0.91–1.08 | 0.853 |
| Nursing home           | 1.25 (1.07–1.46)                     | 1.26                                 | 1.13–1.40 | <0.001 |
| **Complaint**          |                                      |                                      |
| Injury, accident       | 1                                   |                                      |
| Falls                  | 0.59 (0.51–0.68)                     | <0.001                               |
| Cardiovascular/cardiac arrest | 1.69 (1.31–2.18) | <0.001 | 2.13 (1.91–2.36) | <0.001 |
| General medical        | 0.93 (0.80–1.09)                     | 0.79                                 | 0.73–0.85 | <0.001 |
| Mental health          | 0.32 (0.20–0.50)                     | <0.001                               |
| Social                 | 0.20 (0.15–0.26)                     | <0.001                               |
| **Index of multiple deprivation (IMD) quintile** |                                    |                                      |
| Quintile 1 (most deprived) | –                                   |                                      |
| Quintile 2              | –                                   | 0.95                                 | 0.87–1.03 | 0.191 |
| Quintile 3              | –                                   | 0.94                                 | 0.87–1.02 | 0.125 |
| Quintile 4              | –                                   | 1.00                                 | 0.92–1.08 | 0.942 |
| Quintile 5 (least deprived) | –                                   | 0.97                                 | 0.90–1.04 | 0.412 |
| **Income Deprivation Affecting Older People Index (IDAOP1) quintile** |                          |                                      |
| Quintile 1 (most deprived) | 1                                   |                                      |

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*Lofthouse-Jones, C et al. British Paramedic Journal 2021, vol. 6(3) 58–69*
Alternative referrals

Use of an alternative referral service for patients who were not conveyed was 22.2% (Table 4). Referral to the GP was the most commonly used service (10.6%), followed by the out-of-hours service (6.6%). Social services and mental health services were used in <1% of non-conveyed cases, although conveyance rates for these main complaints were also very low. There were no differences in referral types for patients with or without dementia, although those with dementia had a slightly higher referral rate to falls services and social services.

Discussion

Principal findings

Overall, almost two-thirds of people aged 75 and above who called an ambulance were conveyed to hospital, of which almost 50% were ‘non-life-threatening’ calls. There was an association between the provision of a care package at home and reduced hospital conveyance, with a reduction in risk of 34% for people living alone plus care package and 42% for those living with family plus care package, compared to those living alone without a package. Significantly fewer patients were conveyed to hospital during out-of-hours periods. Patients with dementia were less likely to be conveyed to hospital regardless of time period, triage grade and care arrangement, and patients with dementia who had higher incomes were less likely to be conveyed to hospital. Alternative referrals were made for a fifth of patients not taken to hospital, with the most common pathways being to a GP, out-of-hours services or falls services.

Strengths and limitations

This evaluation reflects a large, generalisable region of the UK and includes a substantial dataset covering a calendar year, accounting for seasonal variation. Missing covariate data reflect the ‘real-world’ nature of information collected during front line emergency situations where the data are not being collected for the purposes of research. Nonetheless, such data provide essential information to inform practice or research. The use of the term ‘dementia’ in the EPRs to identify patients with a dementia diagnosis / suspected dementia could lead to misclassification, for example if dementia was recorded on the EPRs in relation to another household member. However, the proportion of records with ‘dementia’ was almost identical to that recorded in a study which hand-searched paper records (Voss et al., 2018). Bias could also be introduced by recording practices, for example an increased...
tendency to record ‘dementia’ on the EPR for patients who remain at home. Further prospective studies would be useful to support these results, also including patient acuity, for example NEWS2, linked data from secondary care and more definitive recording of living arrangements and care available at home.

Relation to other studies and implications

Social care, unlike medical care, is means tested, and studies suggest that hospital admissions and readmissions may increase among people unable to access social care, for example care home beds (Spiers et al., 2019; Steventon et al., 2018). Chronic underfunding, a separation of functions and a lack of information sharing have all contributed to a lack of holistic community-based care (Care Quality Commission, 2018). This evaluation found lower hospital conveyance in patients living at home and receiving additional care, highlighting the importance of investing in the provision of social care, and the co-ordination of social and healthcare in the community. This may be contrasted with findings from an ecological study that found no evidence to suggest that reductions in social care funding (and possibly reduced availability of social care) have led to increases in emergency hospital admissions (Seamer et al., 2019). However, our study uses individual-level data and focuses on emergency department attendances as a consequence of an ambulance attendance, suggesting social care is an important factor determining use of acute care services.

The higher risk of conveyance in patients in a nursing home probably reflects the request for an ambulance only when the home reached the limits of care that medically registered staff could provide. Wider implementation of schemes such as the ‘Red Bag’ (an easily accessible single source of information about the patient) in nursing/residential homes may better guide emergency ambulance clinicians decisions and thus reduce conveyance (NHS England, 2018b).

The lower rate of conveyance out of hours could reflect some services being better able to operate during this time, for example GP home visits, or that patients were less willing to be conveyed to hospital. Alternatively, given the publicity regarding increased mortality in hospital at weekends (Freemantle et al., 2015), ambulance clinicians may anticipate fewer in-hospital services and would prefer to maintain patients at home.

Although patients with falls were less likely to be conveyed, still nearly 50% were taken to hospital, in line with a recent UK study (O’Cathain et al., 2018). Service improvement in assessment of older people for frailty and linkage with specialised community frailty teams may decrease conveyance in future. Increased implementation of initiatives such as end-of-life care bundles, Respect and Advance Care Planning (NHS England, 2018a; ReSPECT, n.d.) and improved communication of this documentation with ambulance services should further reduce inappropriate conveyance for older people. Ambulance service-level factors, including attendance by paramedics with extended skills and the perceptions of risk of senior management, are also factors which may have an impact on decisions made (O’Cathain et al., 2018).

People with dementia were less likely to be conveyed at any time of day, in keeping with findings from another recent UK study (Voss et al., 2018). Deprivation has been associated with increased emergency bed use; and lack of money, both in itself and as a means to access support and equipment, is a barrier to achieving what matters to older people with high support needs (Imison et al., 2012; Katz et al., 2011). The increased conveyance with greater income deprivation in people with dementia in this evaluation suggests that staying at home may be precluded if patients or families cannot pay for additional care or home adjustments to ensure safety and well-being in case of acute illness. The lack of association between age and conveyance in patients with dementia suggests that Advance Care Plans may be more likely to be in place across all age groups for patients with dementia than for those without.

Unanswered questions and future work

In order to inform planning of additional services or care that may safely retain older patients with unforeseen medical issues in the community, we need to understand specifically what it is about social care provision that influences ambulance clinicians’ decisions, and how it influences patients/relatives’ decisions to stay at home. Further evaluation of the appropriateness of lower conveyance rates in out-of-hours periods is essential to inform equity of services and care over a 24-hour, 7-day week. Understanding how the composition of skills and experience in the attending team influences decision-making in older people’s care would also be valuable. The impact of other factors such as frailty assessments on conveyance decisions and referrals also needs to be considered, as well as the communication between emergency staff and Frailty Intervention Teams at Emergency Department ‘front doors’ (Maloney et al., 2017). Greater individual-level knowledge of the complete emergency journey of such older patients across the health and social care pathway, including data linkage to community and secondary care, is needed to more clearly identify the impact of conveyance decisions, and assess the cost-effectiveness of providing supportive services before, rather than after, the event.

Author contributions

All authors conceptualised the article and designed the service evaluation and analyses. PK and CF performed the analyses. CLJ, CF, HP and PK drafted the article. All authors contributed to the interpretation of the results.
and revising the article. CF acts as the guarantor for this article.

**Conflict of interest**
None declared.

**Ethics**
The service evaluation was approved by the SCAS Clinical Review Group in July 2018. All data were anonymised. The large dataset and group sizes used for analysis further precludes unintended identification of any individuals.

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