

Profiling the medical admissions of the homeless

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Abstract

Aim: to describe the characteristics and outcomes of homeless people admitted to our Internal Medicine service in St. James’s Hospital, Dublin (Ireland), between 2002 and 2011.

Methods: we interrogated an anonymized in-patient database.

Results: there were 1,460 homeless admissions (623 unique patients; 39% admitted more than once). Most patients were young, male, and had low comorbidity levels. Thirty-seven percent of the admissions were alcohol-related and 27% substance abuse-related. Thirteen percent had an active psychiatric illness. Their in-patient mortality rate was 5%. Seventy-two percent were discharged without the residential arrangement being explicitly documented, 15% self-discharged or absconded, and 8% were discharged to a residential facility.

Conclusion: results are novel in our context and will be relevant for local policy and practice.

Keywords

Homeless persons, patient admission, length of stay, mortality, patient discharge.

Key Points

- In the Republic of Ireland, information was lacking on the characteristics and outcomes of homeless people admitted to the acute hospital as medical emergencies. We contributed evidence from a single-centre perspective.
- The majority of in-patient homeless were young, male, and had low comorbidity levels. Thirty-seven percent of the admissions were alcohol-related and 27% substance abuse-related.
- Their mean LOS was 12 days, and their in-patient mortality rate was 5%. Seventy-two percent were discharged without the residential arrangement being explicitly documented, 15% self-discharged or absconded, and 8% were discharged to a residential facility. Thirty-nine percent were admitted more than once over the period.

Introduction

The health problems of homeless people can be complex and of diverse nature.¹ Homeless patients suffer disproportionately from medical disease and from barriers to healthcare, affecting their likelihood of presentation, severity of disease, long-term outcomes, and mortality.² In the acute hospital, homeless patients’ unstable social situation may challenge the usual systems of inpatient care and discharge.³

Homeless persons often present to emergency departments (ED) for food, shelter, and safety,⁴ and many are not admitted. Few studies have focused on the specific health conditions that trigger hospital admission in the homeless. In England, a recent report commissioned by the Department of Health attempted to draw together the direct experiences of patients and staff to provide an updated national picture of hospital admission and discharge practice for people who are homeless.⁵ This report highlighted alcohol use, drug use, mental health problems, infections, and neurological emergencies (e.g. seizures) as frequent contributors to admission.⁵ Homeless people are often admitted with traumatic

injuries.⁶ Furthermore, homelessness complicates the medical management of chronic conditions such as viral hepatitis (e.g. hepatitis B and C), infection by the human immunodeficiency virus (HIV)^{7–10} and pulmonary tuberculosis (TB),^{11,12} with potential poor individual health outcomes and public health implications.¹³

A previous study found that homeless in-patients remain hospitalized longer than their non-homeless counterparts.¹⁴ However, other studies have suggested the contrary.⁵ Little is known of which factors affect in-patient mortality in the homeless population, in the face of their (often young) age, (often male) sex, (often low) comorbidity profile, acute illness severity on presentation, and type of diagnosis.

In England, it is estimated that more than 70% of homeless people who are admitted to hospitals are discharged back onto the streets, sometimes prematurely and without having been sufficiently treated for their underlying health and psychosocial problems.^{5,15} A significant number of homeless patients are readmitted shortly after leaving the hospital,⁵ but the predictors of readmission are poorly understood.

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For some time, homelessness has been a growing challenge for medicine internationally,^{16,17} and the current economic downturn in Europe, which has markedly affected the Republic of Ireland,¹⁸ may result in increasing numbers of homeless seeking emergency healthcare. In the Republic of Ireland, previous attempts have been made at profiling the health status of the homeless living in the community¹⁹, but information was lacking on the characteristics and outcomes of homeless people admitted to the acute hospital as medical emergencies. That information would be helpful from a health policy and hospital planning point of view, and the present study aimed at addressing that gap from a single centre perspective.

St James's Hospital in Dublin (SJH) is the largest tertiary teaching hospital in the Republic of Ireland and operates a system of continuous unselected acute medical take. SJH serves an immediate catchment population of around 350,000. Many of the electoral divisions within the catchment area are amongst the most deprived in the country.²⁰ The aims of our study were the following: (1) to describe the temporal trend in the number of homeless admissions to our Internal Medicine service between 2002 and 2011; (2) to describe the demographic and clinical characteristics of the homeless admissions; (3) to describe their in-patient length of stay (LOS) and mortality and investigate their predictors; and (4) to audit our discharge practice and investigate predictors of readmission. We contrasted the information on the homeless with that of the non-homeless in-patient population, for comparative purposes.

Methods

Data collection

As previously described,^{21,22} we interrogated an anonymized in-patient database derived from linkage of the computerised patient administration system (PAS) to the hospital inpatient enquiry (HIPE) scheme. HIPE is an Irish national database of coded discharge summaries from acute public hospitals. Linking the HIPE dataset with the PAS dataset permits the application of routinely collected data for the purposes of audit, planning and quality control.²³

Subjects

We selected all homeless patients experiencing their last acute medical admission under the general medicine 'on-take' physician in SJH between 1st January 2002 and 31st December 2011. Their homeless status was determined from the hospital PAS (patient administration system) database: we searched for 'homeless' or 'no fixed abode (NFA)' labels, or other catchment area addresses known to provide emergency accommodation, such as hostels, temporary housing or projects targeting the homeless. All non-homeless patients admitted over the same period served as the comparison group.

Measures

1. Patient characteristics on medical admission:
 - *Demographics*: age and sex.
 - *Number of other admissions* over the period (2002 – 2011), besides the last admission.
 - *Comorbidity*: three increasing levels based on Charlson's comorbidity index (CCI).²⁴
 - *Major diagnostic categories* (MDC): formed by dividing all possible principal diagnoses (from the ICD-9-CM) into mutually exclusive diagnosis areas.²⁵
 - *Specific recorded diagnoses*: alcohol or substance abuse-related admission, presence of traumatic injury, HIV and viral hepatitis (i.e. hepatitis B or C) status, active psychiatric illness, or active pulmonary tuberculosis (TB).
 - *Acute illness severity* on presentation to the ED, as indicated by the *Manchester Triage System* (MTS). The MTS is a sensitive tool for detecting those who subsequently need critical care and are ill on arrival in the ED.²⁶ The MTS is a powerful tool for distinguishing between patients with high and low risk of short-term death as well as those who will stay in hospital for at least 24 hours and those who will return home.²⁷ The MTS results in five triage categories of decreasing urgency (1: immediate; 5: non-urgent). The validity and inter-observer reliability of the MTS triage scoring have been demonstrated on the SJH site through a series of internal validation exercises.²⁸ As a marker of acute illness severity, we also used the *Medical Admission Risk System* (MARS) score.²² The MARS was created in our centre using multivariable fractional polynomial logistic regression modelling. The MARS is an externally validated in-hospital mortality risk prediction tool for unselected acutely ill medical patients using routinely collected physiological and laboratory data.²²
2. Clinical course:
 - *Admission to the high dependency* (HDU) or the *intensive care unit* (ICU) (%).
 - *Length of stay* (LOS, days).
 - *Prolonged hospital stay*: defined as a length of stay (LOS) of more than 30 days (%).
 - *Death at any stage whilst an inpatient* (i.e. in-hospital mortality, %).
3. Discharge destination: discharge by the medical team without a documented residential arrangement; self-discharge or absconded; or discharge to a residential destination (e.g. transfer to another hospital, transfer to prison, discharge to hostel or homeless institution, convalescence home, or nursing home).

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Statistical analyses

Unless otherwise indicated, statistical analyses were conducted with SPSS 16.0. Descriptives were given as mean and standard deviation (SD) or count and percentage (%), as appropriate. To assess the yearly temporal trends in the study outcomes, we built Microsoft Excel® 2007 bar charts and automatically fitted linear trendlines. A trendline $R^2 \geq 0.5$ was considered suggestive of an overall (increasing or decreasing) temporal trend.

To contextualize the characteristics of homeless patients, they were compared with the last admission characteristics of all non-homeless patients from the same database. For the latter comparisons, the Chi-squared test was used for dichotomous variables and the non-parametric Mann-Whitney U test was used for continuous variables. Given the high number of comparisons, the level of significance was established at $P < 0.01$.

Multivariable analyses (i.e. to investigate predictors of prolonged hospitalization, mortality, and readmission status amongst the homeless) were based on *classification trees* (SPSS 16.0). The classification tree procedure creates a tree-based classification model. It classifies cases into groups or predicts values of a dependent (target) variable based on values of independent (predictor) variables. We chose the Chi-squared automatic interaction detection (CHAID) method. At each step, CHAID chooses the independent predictor variable that has the strongest interaction with the dependent variable. The same set of predictors was entered in each of the classification trees: age, sex, CCI (as ordinal variable), all the MDCs and specific diagnoses in Table 1, and the MTS (as ordinal variable).

For all statistical analyses, the analytic sample consisted of all homeless patients experiencing their *last* acute medical admission over the study period. The only exception to this was the analysis of the temporal trend in the number of homeless admissions, for which all admission episodes were considered.

Ethics and financial support

This work was carried out in compliance with the clinical audit standards of SJH Dublin. No financial support was required.

Results

Total number of homeless admissions and temporal trend

Between 1st January 2002 and 31st December 2011, there were 61,964 acute medical admissions in SJH, corresponding to 35,019 unique patients (last admissions). Of them, 623 (1.8%) were homeless and 34,396 non-homeless. The 623 homeless patients generated 1,460 admission episodes. Considering all admissions ($N = 1,460$), there seemed to be an overall growing yearly trend ($R^2 = 0.57$) (Figure 1).

Characteristics of the homeless admissions

Table 1 shows the characteristics of the 623 last homeless admissions, compared to the 34,396 non-homeless admissions. The mean age of the homeless was 43 years, significantly younger than the non-homeless. Whilst only 8% of the homeless were aged 65 or more, 46% of the non-homeless were in that age group. The vast majority of the homeless (87%) were male, in contrast to 48% of the non-homeless. Comorbidity levels in the homeless were lower than in the non-homeless (i.e. higher proportion of CCI-0 and lower proportion of CCI-2, as Table 1 shows).

As Table 1 shows, the most frequent reasons for admission in the homeless were alcohol-related (37%) and substance abuse-related (27%). Thirteen percent of the admitted homeless were carriers of viral hepatitides, and 3% were HIV-positive. Thirteen percent had an active psychiatric illness, commonly 'depression' and/or 'anxiety'. All these conditions were more frequent in the homeless (Table 1).

The most frequent MDCs in the homeless were those of the respiratory system (20%) with 'lower respiratory tract infection' and/or 'exacerbation of chronic obstructive pulmonary disease' being the most commonly recorded specific diagnoses. Diseases of the cardio-circulatory system were also frequent (20%) with 'syncope and collapse', 'phlebitis and thrombophlebitis', and 'other (i.e. non-cardiac) chest pain' being the most recorded. Diseases of the nervous system followed in frequency (18%) with 'convulsions/seizures' being the most frequent. Overall, the frequency of the latter three diagnostic groups was similar than in the non-homeless (Table 1).

In the homeless, digestive system diseases (7%) were dominated by 'oesophagitis/gastritis' and 'gastro-intestinal haemorrhage'. Diseases of the hepatobiliary system and pancreas (6%) were often recorded as 'alcoholic hepatitis' or 'alcoholic liver cirrhosis'. Diseases of the skin (5%) were dominated by 'cellulitis'. Musculoskeletal diagnoses (3%) often consisted of non-surgical fractures and soft tissue injuries. Infectious diseases (2%) were often recorded as 'unspecified septicemia', and endocrine diseases (2%) were often related to poorly controlled diabetes mellitus. Overall, digestive diseases were less common in the homeless, whilst skin diagnoses were more frequent in the homeless (Table 1).

In terms of acute illness severity on presentation to the ED, 58% of the homeless were triaged as 'urgent' (MTS category 3) and 31% as 'very urgent' (category 2). Only about 5% of cases were triaged as 'immediate', and just 6% were 'standard' or 'non-urgent' (Table 1). Overall, as indicated by the comparison of MARS scores, homeless patients had *lower* acute illness severity than non-homeless patients (Table 1).

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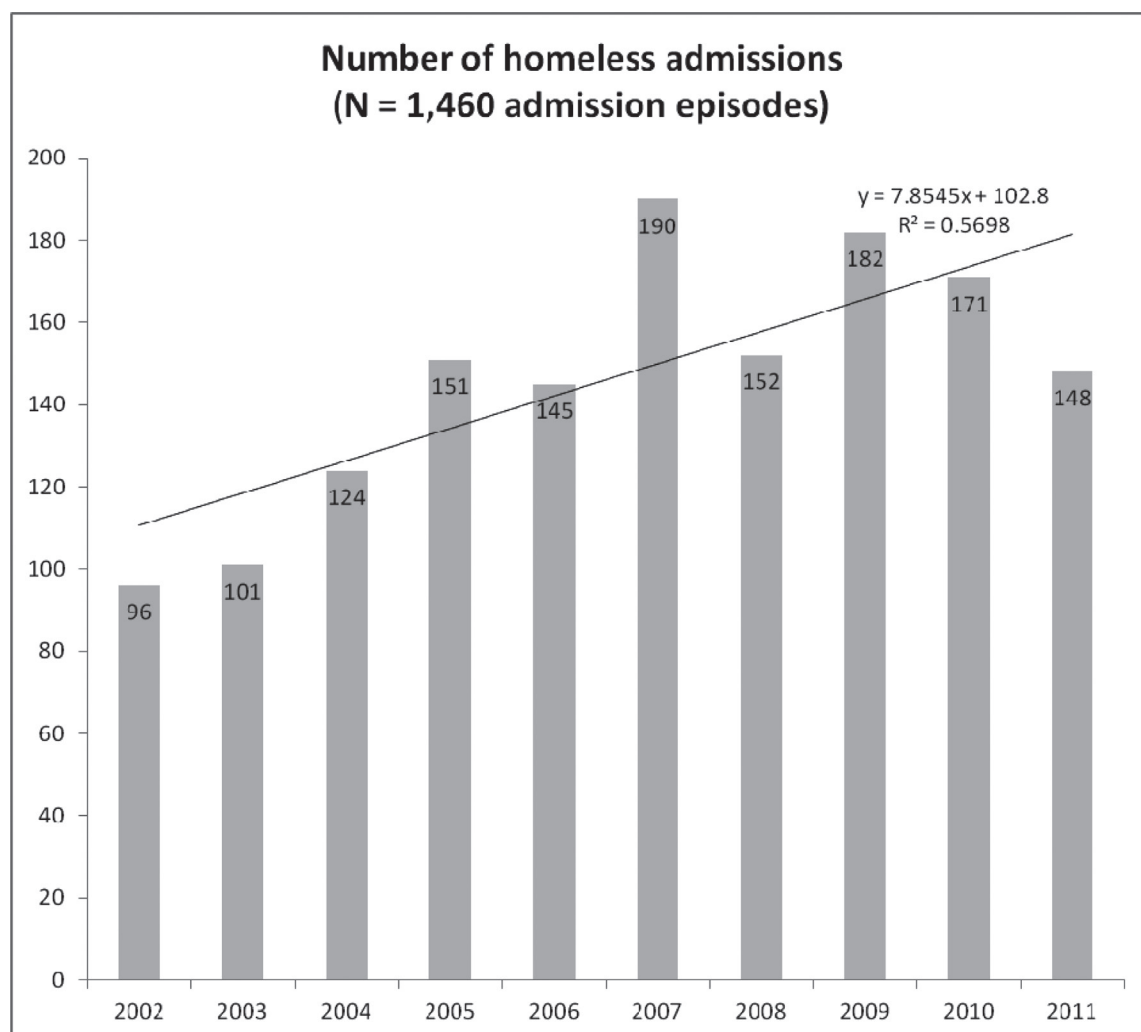


FIGURE 1. Temporal trend in the number of homeless admissions (all admission episodes).

LOS: temporal trend and predictors of prolonged hospitalization

In the homeless, the overall mean LOS was 12 days, and 7% had a prolonged admission. Non-homeless patients had higher mean LOS and prolonged admission rate (Table 1). Figure 2 suggests a decreasing yearly trend ($R^2 = 0.66$) in the proportion of homeless admitted for more than 30 days, but there were some important yearly fluctuations. The classification tree analysis identified age as the best predictor of prolonged admission in the homeless: 29% of those aged > 61 had a prolonged admission; and amongst those aged ≤ 61 , the proportion was 14% if the MTS was 'immediate' and 3% for MTS categories 2–5 (Figure 3).

In-patient mortality

In the homeless, the overall in-patient mortality rate was 5%, which is half of that of the non-homeless (Table 1). The classification analysis identified comorbidity as the best predictor of mortality in the homeless, with an incremental effect: 2% for those with CCI = 0; 7% for those with CCI = 1; and 24% for those with CCI = 2.

Discharge destination

As per Table 1, 72% of the homeless were discharged by the hospital without documentation of a specific residential arrangement, and 8% were discharged to a residential facility: hostel or homeless institution (4%), another hospital (2%), nursing home (1%), or convalescence home (1%). Fifteen percent of the homeless opted for self-discharge or absconded from the ward; the latter proportions were lower in the non-homeless (Table 1).

Readmission status and predictors

As Table 1 shows, 39% of the homeless experienced more than one admission over the period. The proportion of patients admitted more than 3 times was higher in the homeless than in the non-homeless. The classification analysis identified comorbidity as the best predictor of having more than one admission in the homeless: the proportion was 30% for those with CCI = 0 and 41% for those with CCI = 1 or 2.

Discussion

In the Republic of Ireland, information was lacking on the characteristics and outcomes of homeless

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TABLE 1. Characteristics of the homeless patients compared to those of the non-homeless (last admissions, 2002 – 2011).

Characteristic	Homeless (N = 623)	Non-homeless (N = 34,396)	Significance of the difference (P)
Demographics			
Mean (SD) age, years	43.4 (13.7)	58.7 (21.8)	<0.001 ^μ
Age < 18 years (%)	0.7	1.1	0.490 ^χ
Age 18 - 24.9 years (%)	6.6	6.8	0.847 ^χ
Age 25 - 34.9 years (%)	24.2	12.0	<0.001 ^χ
Age 35 - 44.9 years (%)	27.8	10.6	<0.001 ^χ
Age 45 - 54.9 years (%)	23.4	11.3	<0.001 ^χ
Age 55 - 64.9 years (%)	9.6	12.2	0.051 ^χ
Age ≥ 65 years (%)	7.8	46.0	<0.001 ^χ
Male sex (%)	87.3	47.5	<0.001 ^χ
Number of medical admissions			
Mean (SD) number of admissions over the period	2.3 (2.6)	1.8 (2.0)	<0.001 ^μ
Only 1 admission over the period (%)	60.6	68.8	<0.001 ^χ
2 admissions (%)	16.7	16.3	0.819 ^χ
3 admissions (%)	7.9	6.2	0.089 ^χ
More than 3 admissions (%)	14.8	8.7	<0.001 ^χ
Charlson Comorbidity Index (CCI)			
CCI-0 (%)	67.1	55.2	<0.001 ^χ
CCI-1 (%)	23.3	25.2	0.374 ^χ
CCI-2 (%)	9.6	19.7	<0.001 ^χ
Major diagnostic categories (MDC) and specific diagnoses			
Nervous system (%)	18.4	19.2	0.788 ^χ
Respiratory system (%)	20.0	21.9	0.250 ^χ
Circulatory system (%)	20.3	16.2	0.011 ^χ
Digestive system (%)	6.7	10.5	0.003 ^χ
Hepatobiliary system and pancreas (%)	5.5	5.3	0.933 ^χ
Musculoskeletal system and connective tissue (%)	2.7	3.4	0.504 ^χ
Skin, subcutaneous tissue and breast (%)	5.3	3.2	0.004 ^χ
Endocrine, nutritional and metabolic system (%)	1.7	3.2	0.063 ^χ
Infectious and parasitic disorders (%)	2.2	2.0	0.771 ^χ
Alcohol-related admission (%)	37.0	7.5	<0.001 ^χ
Substance abuse-related admission (%)	26.5	3.2	<0.001 ^χ
Injuries (%)	5.0	3.6	0.014 ^χ
HIV positive (%)	3.3	1.0	<0.001 ^χ
Viral hepatitis (%)	12.8	2.1	<0.001 ^χ
Psychiatric illness (%)	12.8	5.7	<0.001 ^χ
Pulmonary tuberculosis (%)	1.4	0.5	0.020 ^χ
Acute illness severity on presentation (Manchester triage system)			
Triage Category 1 – Immediate (%)	5.4	2.0	<0.001 ^χ
Triage Category 2 – Very urgent (%)	30.7	39.9	<0.001 ^χ
Triage Category 3 – Urgent (%)	58.3	56.4	0.373 ^χ
Triage Category 4 – Standard (%)	4.9	1.3	<0.001 ^χ
Triage Category 5 – Non-urgent (%)	0.7	0.4	0.232 ^χ
Acute illness severity on admission (MARS score)			
Medical Admissions Risk System score: mean (SD)	0.13 (0.17)	0.27 (0.28)	<0.001 ^μ
Clinical course			
Admission to the high dependency (HDU) or intensive care (ICU) unit (%)	7.2	8.6	0.026 ^χ
Mean (SD) length of stay, days	11.8 (33.9)	16.7 (41.7)	<0.001 ^μ
Prolonged hospital stay (>30 days) (%)	7.0	11.4	<0.001 ^χ
In-hospital mortality rate (%)	4.9	10.4	<0.001 ^χ
Discharge destination			
Deceased (%)	4.9	10.4	<0.001 ^χ
Hospital discharge with no documented residential arrangement (%)	71.7	-	-
Self discharge (%)	11.3	2.4	<0.001 ^χ
Absconded (%)	3.8	0.2	<0.001 ^χ
Transfer to another hospital (%)	1.6	4.1	0.003 ^χ
Prison (%)	0.2	0.0	0.075 ^χ
Hostel/homeless institution (%)	4.1	0.1	<0.001 ^χ
Convalescence home (%)	1.2	2.7	0.074 ^χ
Nursing home (%)	1.2	2.9	0.104 ^χ

^μ Mann-Whitney U test

^χ Chi-squared test

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people admitted to the acute hospital as medical emergencies. The present study contributed evidence from a single-centre perspective. A limitation of our study is that it did not capture the homeless who presented to the ED but were not referred for medical admission. Likewise, our findings may not apply to the homeless who were admitted to SJH under non-medical (e.g. surgical, orthopaedic) teams.

This pioneer study portrayed our local population of homeless medical in-patients as a small, but possibly growing, population. Our profiling results are consistent with previous research depicting the in-patient homeless as being typically young, male,²⁹ and having a high burden of substance (i.e. alcohol and drugs) use and mental health problems.^{30–32} In keeping with the literature, we found relatively higher prevalences of viral hepatitis and HIV infection,^{33,34} and a trend towards higher frequency of injuries.³⁵ Comorbidity levels in the homeless were lower than in the non-homeless, likely as a result of their younger age. On the other hand, acute illness severity (as per MARS score) was lower in the

homeless than in non-homeless patients, supporting the view that homeless persons may sometimes be admitted for ‘social’, rather than medical reasons.⁴

Our study disagrees with previous findings that homeless patients tend to remain hospitalized longer than their non-homeless counterparts;¹⁴ in fact, we found evidence of the opposite. Interestingly, despite the specific health issues affecting the homeless, our predictors of prolonged LOS, mortality and readmission tell us the *old tale* that age, comorbidity, and acute illness severity are the crucial contributors.^{36–38}

We audited our discharge practice to find, as in the recent English report,^{5,15} that more than 70% of the homeless were discharged without a clearly documented residential arrangement. However, this does not necessarily mean that patients were discharged onto the streets; in practice, discharge arrangements often occur at the last minute and many are documented in the social care record, or the nursing notes, but not uploaded onto the hospital computer system. Routinely, in our Internal

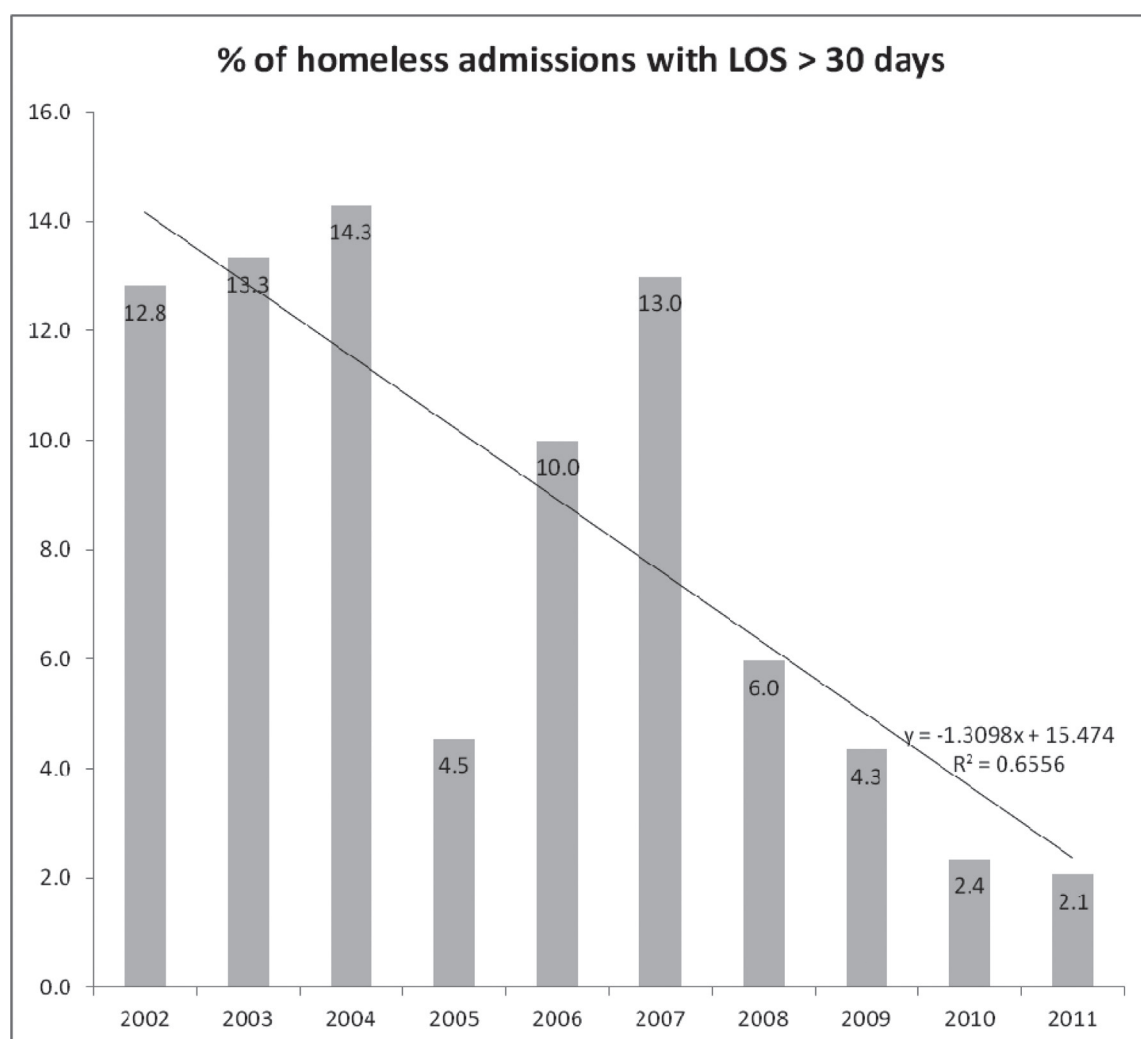


FIGURE 2. Temporal trend in the proportion of homeless admissions with prolonged length of stay (LOS > 30 days) (last admissions).

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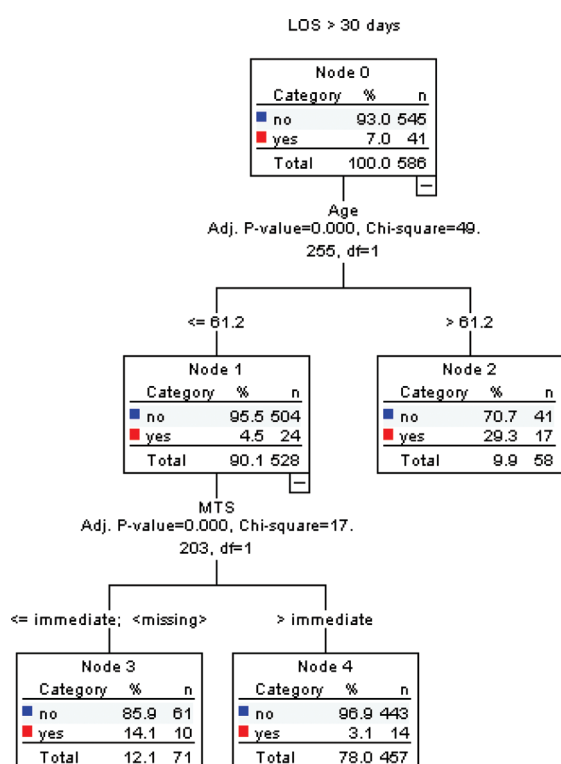


FIGURE 3. Classification tree with predictors of prolonged hospital stay in the homeless (last admissions).

Medicine department, homeless in-patients are offered an assessment by a Medical Social Worker

who will attempt to link them with available services such as the Homeless Persons Unit (run by the Health Service Executive), or other services provided by voluntary groups and Dublin City Council (<http://www.homelessdublin.ie/>). In a number of cases, this process cannot be completed due to self-discharge or abscondment. In the Irish context, as in other countries³¹, an added difficulty is the linkage of homeless patients with primary care; in the Irish health-care system, the majority of the population are required to pay out-of-pocket for primary care.³⁹ Poor access to primary care may result in frequent hospital readmissions in the homeless and, as seen in our study, a sizeable 'revolving door' phenomenon.³²

Internationally, there is growing evidence on the effectiveness of interventions to improve the post-discharge care of the homeless, including enhancing their access to intermediate care,⁴⁰ primary care,⁴¹ and promote their community integration⁴²⁻⁴⁴. Respite programs may reduce readmissions,⁴⁵ and the use of shelter-based convalescence units may provide step-down care, treat medical and mental illness, ensure adherence to treatments, decrease substance abuse and assist with housing.⁴⁶ In the Irish context, such options need consideration by the policy-makers, especially in the light of the evidence for potential savings of providing the homeless with community care, housing and case management programs.⁴⁷⁻⁴⁹ Our profiling results are novel in our context and will be relevant for local policy and practice.

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Erratum

Article name: Application of an age-adjusted D-dimer threshold for exclusion of pulmonary thromboembolism (PTE) in older patients: a retrospective study

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The final sentence should read "This suggests that use of the age-adjusted D-dimer threshold may reduce CTPA amongst patients aged > 50 years." not "concept patients 50 years"