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Risk factors for unplanned hospital admission in a specialist homeless general practice population – the relationship with tri-morbidity

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Risk Factors for Unplanned Hospital Admission in a Specialist Homeless General Practice Population – the Relationship with Tri-morbidity

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Abstract

Background

'Tri-morbidity' describes the complex co-morbidity of chronic physical illness; mental illness; plus, alcohol and /or drug dependence issues within the homeless population. Poor health outcomes of homeless people are reflected by the higher rate of unplanned hospital admissions compared to the non-homeless population.

Aim

To identify whether tri-morbidity is a risk factor for unplanned hospital admissions in the homeless population.

Design and Setting

A case-control study of subjects registered with a specialist homeless GP Surgery in Brighton (72 cases and 72 controls).

Method

Cases were defined as those who had ≥1 overnight hospital admission within a 12-month period. Controls were matched for demographics but with no hospital admission. The Primary Care record was analysed, and tri-morbidity entered into Binomial Logistic Regression with admission as the dichotomous dependant variable.

Results

The logistic regression analysis demonstrated that other enduring mental health disorders and/or personality disorder (OR (95% CI) 3.84 (1.56-9.44)), Alcohol use 2.92 (1.42-5.98)) and Gastrointestinal disorder 2.90 (1.06-7.98)) were independent

risk factors for admission. Tri-morbidity increased odds of admission by more than four-fold (OR (95% CI) 4.19 (1.90-9.27).

Conclusion

This study shows that tri-morbidity is an important risk factor for unplanned hospital admissions among the homeless population and provides an interesting starting point for the development of a risk stratification tool to identify those at risk of unplanned admission in this population.

Keywords

Homeless, unplanned admissions, tri-morbidity, general practice and risk factors.

How this fits in

Identification of risk factors for unplanned overnight hospital admissions in the homeless population has not been studied in a UK context. This study looked at the "tri-morbidity" of homelessness: chronic disease, substance misuse and mental health, to identify if it acts as a risk factor for ill health. Clinicians can use findings of study to proactively care for patients who are vulnerable of hospital admission.

Introduction

The health of the homeless population within the UK is a multifaceted interplay between long-term co-morbidities, mental ill health and substance misuse[1, 2]. The term tri-morbidity was coined by Hewitt and Halligan in 2010 to describe the complexity of presentation in chronically homeless people[3].   One point of particular interest has been the relationship between tri-morbidity and its consequences in terms of higher levels of unplanned hospital admissions.

In this study homelessness refers to single homeless people, who do not meet the statutory duty of care to be housed by their Local Authority(2). Homelessness in this context refers to street homeless, sofa surfers, hostel dwellers, squatters and those in temporary accommodation due to high needs.

Social factors such as social isolation, inability to access suitable healthcare services, difficulty in maintaining benefits with no fixed abode, poor nutrition, being a victim of violence or hate crimes, incarceration for drug crimes and unstable living conditions all have an impact on the health of homeless people(4-6).

Homeless people have on average 1.18 hospital admissions per year, compared to 0.28 per year in the general population, hence the rate of admissions is 4.21 greater in the homeless population(1) at a cost of £85 million per year(2). The average cost of a hospital admission is approximately £500 per day, with the average inpatient episode costing £1779. This compares to the average cost of a GP consultation being £45(1).

The purpose of this research was to investigate the interaction between morbidity (including tri-morbidity) in the homeless population and unplanned use of secondary health care services. This was achieved by examination of the Primary Care Record (PCR), a SystmOne database, for diagnoses that could be categorised as chronic physical or mental illness or substance misuse disorder from a cohort of Homeless people in Brighton, England.

These diagnoses were statistically analysed with regard to admissions data, to identify which act as predictive risk factors for unplanned hospital admissions. The results were compared with a recent study of predictive factors for A&E admissions

in a cohort of homeless people in Birmingham(7), with the aim to build up a body of evidence that reflects the current health needs of the UK homeless population.

Methods

This is a case-control study of patients with full GMS registration with a specialist homeless GP surgery (HGPS) in Brighton, UK. The HGPS is an NHS provider of Primary care which only registers patients who are homeless or temporarily housed. The clinical and administrative staff within the service are trained to deliver holistic care that meets the needs of this population, whilst ensuring that the model of care reduces barriers to accessing services. The practice had a list size of 1650 patients at the start of the study.

The primary care system in Brighton interacts largely with only 1 hospital trust (HT). The HT provided data identifying patients with ≥ 1 unplanned overnight admission (i.e. they were in bed at midnight) within the 12-month timeframe (01.06.15 and 31.05.16) to secondary care and registered with the HGPS at the time of admission. Overnight admissions demonstrate ill health, compared to A&E attendances that do not result in an admission and may not be due to medical ill health.

Cases were identified as having ≥1 unplanned overnight admission within the 12-month period. Controls had no admission in the same timeframe, but were matched to cases for year of birth, gender, type of homelessness and length of time registered with HGPS. Type of homelessness is a transient state, however evidence suggests that those who are street homeless do have much poorer health outcomes (1). Cases were matched for the length of registration as patients at this specialised practice tend to stabilise medically over time. Patients who are newly registered

tend to have lots of tests, and hence diagnoses, and so matching was necessary. Practice population is mainly white British, and hence ethnicity information would have enabled identification of individual patients.

The SHGPS Healthcare team cross checked admissions data and reviewed clinical information from the PCR. Clinical data relevant to the chronic disease, mental health and substance misuse categories of Tri-morbidity was extracted and recorded, if it had been entered prior to the date of unplanned admission. Data was recorded from clinical coded entries, free text information and correspondence. Unplanned admission data was extracted from PCR through discharge summaries. Any information shared with the researcher was fully anonymised and stored on an encrypted memory stick.

Prevalence data was compressed into groups (Table1), and clinical judgement plus ensuring adequate size of group was applied to determine which variables should be added to logistic regression with unplanned admission (yes/no) as the dichotomous dependant variable. Chronic respiratory, Gastrointestinal, Neurology, heroin, other drug use, alcohol, depression/anxiety, other enduring mental health and PD and suicide/self-harm were added as independent variables into the backwards step model (Table 2).

Each participant was given a Tri-morbidity (yes/no) score if they had a diagnosis in each of the chronic disease, mental health and substance misuse categories (Table 3). The tri-morbidity score was entered as the variable in a binomial logistic regression, with unplanned admission as the dependant variable. The analysis was carried out in SPSS version 25.

Results

There were 146 patients with an unplanned overnight admission in hospital during the study period. Of the identified 146 potentially eligible cases, only 72 were included due to participants moving to a new GP practice (n=45), participants who had died since their admission (n=10), patients who were under 18 (n=2), those unsuitable due to other reasons (n=1) and those who did not have adequate information in their discharge summary for inclusion (n=16) (Appendix 1).

Of the cases (n=72), 22.2% were female and 77.8% were male. The average age for a case with an overnight unplanned admission was 41 years old (SD=+/-11.46) (Table1). There was a small error in the matching process in that males and females were incorrectly matched, in that there were 75% males and 25 % females in the controls.

The prevalence data for each of the cases and controls is described in Table 1. The data was categorised into the 3 elements of the Tri-morbidity: chronic disease, substance misuse and mental health. Originally there were 41 clinical codes recorded: 15 within chronic disease, 14 within substance misuse and 12 within mental health (Appendix 2). The clinical codes were placed into broader categories to increase the size of each variable for the logistic regression.

The most prevalent chronic disease for cases with an unplanned admission was chronic respiratory disease at 27.8%, with the second being gastrointestinal disease at 23.6%.

Substance misuse was consolidated into 3 variables of which alcohol had the largest prevalence of 58.3% within the unplanned admissions group, followed by all other street drug use (44.4%) and heroin and/or opiate use (36.1%).

Within the mental health category 54.2% of cases had a diagnosis of depression and/or anxiety, 33.3% had an enduring mental health condition and/or personality disorder and 25.0% had experienced self-harm/suicidality (although accidental drug overdose was removed from this variable due to confounding).

Logistic regression analysis of the clinically relevant diagnoses demonstrated that other enduring mental health disorders and/or personality disorder (OR (95% CI) 3.84 (1.56-9.44)), Alcohol (OR (95% CI) 2.92 (1.42-5.98)) and Gastrointestinal (OR (95% CI) 2.90 (1.06-7.98)) all acted as independent risk factors for unplanned admissions. The greatest risk factor was other enduring mental health disorders and/or personality disorder, which increases the likelihood of admission by almost 4-fold.

Analysis was carried out to see whether tri-morbidity predicts unplanned hospital admission. The results show that the odds of unplanned hospital admission are over 4 times higher in those having tri-morbidity compared to those who did not have tri-morbidity (OR (95% CI) 4.19 (1.90-9.27).

Discussion

Summary findings

This study identified three independent risk factors that increased risk of admission spanned the tri-morbidity categories of chronic disease, substance misuse and mental health. Enduring mental health conditions (including personality disorder), was the biggest predictor increasing the odds of an overnight admission by almost four times, demonstrating that severe mental health issues impact on the likelihood of poor physical health outcomes, potentially due to lack of engagement or late

presentation to services. Similarly, individuals in this study with a previous diagnosis of alcohol use disorder or Gastrointestinal disease, are almost 3 times more likely to be admitted overnight. The extent of the incessant issue of alcohol dependence, and the effect this has on the systems within the body are well described(7, 8). It is not a surprise that history of alcohol dependence has been found to be a predictor of ill health in this homeless population. Gastrointestinal issues are a significant issue in the homeless community, as includes liver damage from Hep C, alcohol abuse and drug use.

The study demonstrates that the presence of tri-morbidity in a homeless person, as described by Hewett and Halligan(3), increases the odds of unplanned admissions in this homeless population by 4 times more than those without tri-morbidity (OR (95% CI)) 4.19 (1.90-9.27). This is an interesting result as it begins to quantify tri-morbidity and associated outcomes.

Comparison with existing literature

This is the first study, of which we are aware, to look specifically into factors influencing unplanned hospital admissions within a UK based homeless population. Bowen et al retrospectively analysed primary care data of patients registered with HGPS in Birmingham and compared the relationship with A & E attendance(7). Both studies have comparatively similar inner-city homeless population who are registered with a HGPS. The Birmingham methodology compared the homeless population with the general population rather than the Brighton case-controlled method, however both analysed a 12-month timeframe. Bowen et al used read codes and QOF codes for 21 key health conditions, whereas this study reviewed the entire medical record for codes and free text that were associated with tri-morbidity (41

conditions). The Birmingham research had a large sample size of 928, compared to 144 in Brighton.

The larger sample size in Birmingham allowed regression analysis of specific conditions for example epilepsy (OR 4.776, P = 0.013) and leg ulcers (OR 2.191, P = 0.004) to predict A and E attendance, allowing for greater clinical relevance in practice. As previously discussed, A&E attendance and unplanned overnight admission are different outcomes, however Hepatitis C (OR 2.735, P<0.001) was a risk factor in Birmingham, and GI disorders (which included HCV and cirrhosis) (OR (95% CI) 2.90 (1.06-7.98)), was a significant risk factor in Brighton. This also reflects the findings of a Boston based study that also found HCV infection a predictor of ED use(9).

 In Brighton enduring mental health disorders and/or personality disorder (OR (95% CI) 3.84 (1.56-9.44)) was found to be the largest predictor of unplanned admission, whereas in Birmingham enduring mental health disorders did not predict A&E attendances, perhaps reflecting how patients living with enduring mental health issues interact with health services. Alcohol dependence predicted both A&E attendance (OR 3.951, P<0.001) in Birmingham and unplanned admissions in Brighton (OR (95% CI) 2.92 (1.42-5.98)). These two studies begin to build a picture of the burden of alcohol dependence faced by homeless people living in English cities today and the impact that this has both on individual health, and the services that they access.

Russolillio et al (10) looked at whether different mental disorders were predictors for acute hospital admissions (both medical and psychiatric). Personality Disorder had an Adjusted Rate Ratio (95% CI) 1.6 (1.8, 2.6), with alcohol dependence

demonstrating an ARR (95% CI) 1.5 (1.2, 2.0), both of which are lower than in this study. The strongest risk factor was Schizophrenia ARR (95% CI) 4.7 (3.9, 5.6), followed by Bipolar disorder ARR (95% CI) 2.2 (1.8, 2.6), all the reported results from this Canadian study were significant.

<p style="text-align:center"><u>Strengths and limitations</u></p>

The strengths of this research are that it utilises admissions data from the hospital alongside the rich data recorded in the PCR. Disadvantages of using PCR include poor record keeping, and the potential for medical issues to have resolved and not be recorded as such.

The advantage of this study is that it seems to represent a closed system e.g. there is only one HGPS from which patients will only access one HT.

Further, this is the first study in the UK to quantify the medical risk of the 'tri-morbidity' of homelessness as a predictor for unplanned hospital admissions.

In this case-control study there is researcher bias on selection of the controls, as this could not be blinded. There was an error in the matching process in that males and females were incorrectly matched with cases having 77.8% males and 22.2% females, and controls had 75% males and 25% females. This has created an inherent inaccuracy within the study design and statistical model.

This is a retrospective study, and attrition from the sample was large, reducing the sample size and power of the study. This is due to the transient nature of the sample group and high death rate therein. The reduced size of the prevalence variables prevented the use of logistic regression on more specific disease diagnoses. An improved methodology would be a prospective cohort study, although this would require rigorous ethical governance and explicit consent from participants.

Unfortunately, not every individual had an adequate discharge summary for each admission, hence the admissions that had no, or inadequate, recording had to be excluded from the study thus altering the true picture. All of the unplanned admissions were included in an original dataset from the HT. However, if this dataset was inaccurate, due to poor coding, then it is possible that controls could have actually been cases, but without accurate coding/discharge summary.

Of course, the focus on GP-registered homeless people does raise questions about how far the results can be generalised across wider populations of homeless people. Specialist medical centres for homeless people are rare, and it simply has to be acknowledged that the research may not be directly applicable to all those other situations where homeless people have no such access to specialised homeless medical services. It is for this reason that claims about the wider possible application of the research findings are only very cautiously made.

Implications for Research and/or practice

The long-term aim of this piece of work is to create a risk stratification system that can quantify medical vulnerability in homeless people. There may be scope to combine tri-morbidity and weighting other risk factors to create a scoring system to predict ill health and so focus resources on those most in need, in line with NHS England's Long Term Plan(11). This has a broad value in reducing health inequalities in a population, creating equity in the delivery of health services and potential financial savings for the healthcare system.

Conclusion

Three significant risk factors for unplanned admission were discovered during this investigation; Enduring mental health disorders and/or personality disorder, Gastrointestinal disease and Alcohol Dependence Syndrome.

The presence of Tri-morbidity was shown to increase the odds of unplanned admission by 4-fold, which describes the complexities of treating multimorbidity in homeless patients.

This was a small-scale study, based on a specific cohort, which has offered an interesting starting point to potential future studies that can feed into the discourse on homeless health in the UK.

Additional Information

This piece of work was only made possible by the willingness of Arch Health CIC Homeless Healthcare and BSUH to provide anonymised patient data.

Tables

Table 1: Prevalence of Chronic disease, Substance Misuses and Mental Health diagnosis of cases (with admission) and controls (no admission).

	Cases n=72	Controls n=72
Mean Age (years+/-SD)	41.15+/-11.46	41.8 +/- 11.82
Male	77.78	75%
Female	22.22	25%
Chronic Disease		
Respiratory	27.7%	19.4%
Gastrointestinal	23.6%	9.7%
Neurology	11.1%	2.8%
Other	26.4%	9.7%
Substance Misuse		
Heroin/Opiate	36.1%	22.2%
Other Drug	44.4%	38.9%
Alcohol	58.3%	36.1%
Mental Health		
Depression	54.2%	58.3%
Other enduring Mental Health issue and/or Personality Disorder	33.3%	12.5%
Self-Harm/Suicidality	25%	18.1%
Behavioural Disorder	1.4%	5.6%

Note: Cases and controls were matched for age, sex, type of homelessness and length of time of registration with HGPS and so these demographic variables were not added to the model. There was a matching error with the sex of the cases and controls. Individuals with at least one condition were included in the prevalence data, individuals with more than one condition in each variable were counted only once.

Table 2: Binomial Logistic Regression to identify independent predictors of unplanned hospital admission

Independent Variable	Sig	OR	CI 95% Lower	CI 95% Upper
Gastrointestinal	0.04	2.90	1.06	7.98
Alcohol	0.00	2.92	1.42	5.98
Other enduring mental health disorder and Personality Disorder	0.00	3.84	1.56	9.44

Note: variables added to the original regression model: Chronic respiratory, gastrointestinal, neurological, heroin/opioid use, other drug use, alcohol, depression/anxiety, other enduring mental health and PD and suicide/self-harm. Cases and controls were matched for age, sex, type of homelessness and length of time of registration with HGPS and so these demographic variables were not added to the model. There was a matching error with the sex of the cases and controls.

Table 3: Binomial Logistic Regression analysis to determine whether Tri-morbidity acts as a predictive risk for unplanned hospital admissions.

|	Sig.	OR	95% CI Lower	95% CI Higher
Tri-morbidity	0.00	4.19	1.90	9.27

Note: Cases and controls were matched for age, sex, type of homelessness and length of time of registration with HGPS and so these variables were not added to the model. There was a matching error with the sex of the cases and controls.

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Diagram demonstrating attrition from the original unplanned admission group.
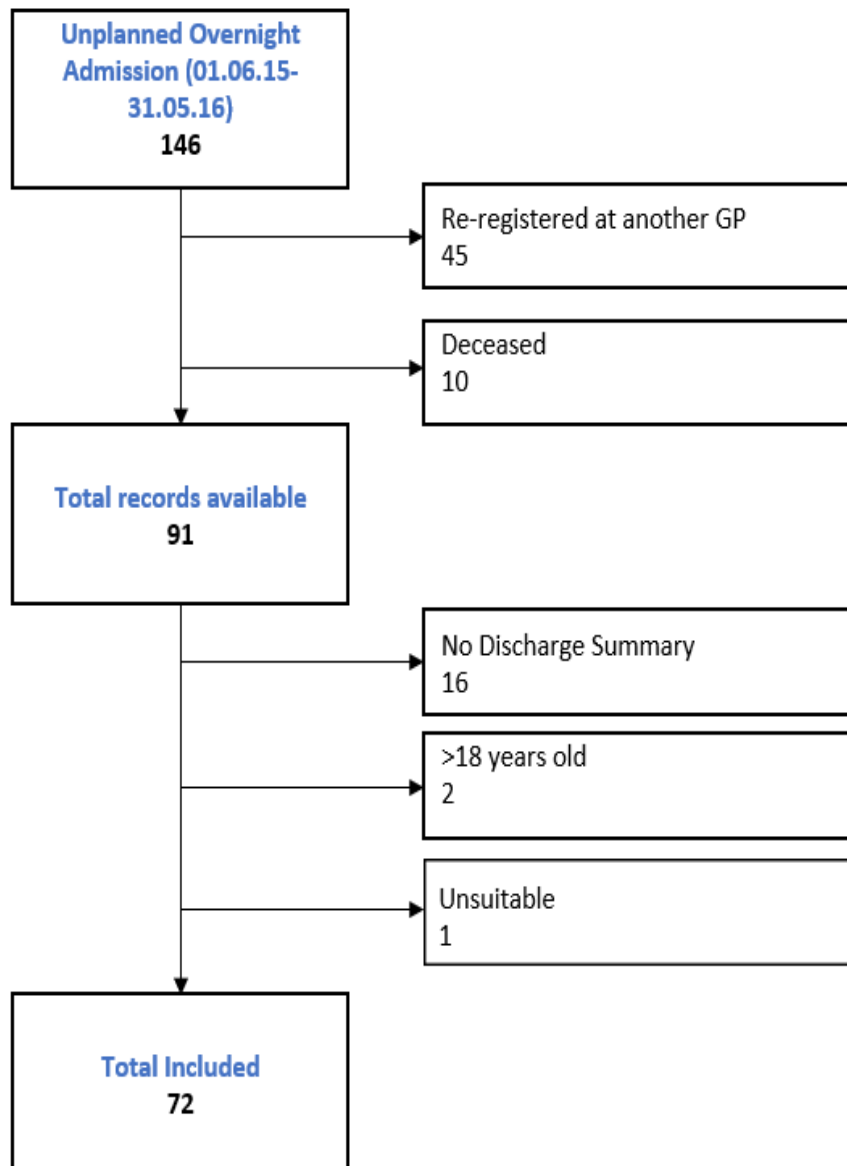
Table with all original variables that were recorded from SystmOne.

Clinical Variables that were recorded from PCR (SystmOne)
Chronic Disease
Asthma
COPD
HCV
HIV
Neurology
Cancer
Renal
Diabetes
Cirrhosis
Obesity
MSK
Angina
Hypertension
MI
Heart Failure
Substance Misuse
Alcohol dependence
Heroin/IV/Opioid
Amphetamine
Cocaine/Crack
Cannabis
Benzos
Novel psych
Ecstasy
Ketamine
Glue/solvent
LSD
Unspecified Drugs
Opiate Subs Therapy
Alcohol Detox
Mental Health
Depression/Anxiety
bipolar
Panic Disorder
PD
Self-harm

Suicidality
Suicide Attempt
Street Drug OD
Psychosis/Schizophrenia
ADHD/Autism/Tourette's'
Eating Disorders
Alcoholic Dementia