Randomised controlled trial of General Practitioner led in-hospital management of homeless people ('Pathway')

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Background
Homeless people admitted to hospital have multiple medical and social problems with high rates of premature morbidity. They are large consumers of health care resources. A program of general practitioner enhanced care ('Pathway') has been developed and shown benefits in uncontrolled studies. This study assessed whether the 'Pathway' approach to management of homeless people in hospital reduced duration of admission.

Methods
Randomised, parallel arm, trial in two hospitals (Brighton and London) in which homeless adults admitted to hospital were randomly allocated 'normal' care or 'enhanced care' with input from a homeless health care team ('Pathway' approach). Health care usage was determined using the hospital data system and quality of life and accommodation were assessed by questionnaires at admission and after discharge.

Findings
206 patients were randomly allocated to enhanced care and 204 to usual care, using a web-based system, after completion of baseline assessment. Overall length of stay (including re-admissions 90 days post admission) did not differ - standard care length of stay was 14·0 days compared with 13·3 days with enhanced care (adjusted difference -0·4 (-3·9 to 3·1)). Quality of life scores post discharges were available in 108 patients and improved in those receiving enhanced care (EQ-5D-5L score increased by 0·12 (0·032 to 0·22) in patients receiving enhanced care compared to 0·03 (-0·1 to 0·15) with standard care (p=0·076)). The proportion of people sleeping on the streets post discharge was reduced from 14·6% in the control arm to 3·8% in the intervention arm (p=0·034). The intervention provided an increased quality of life at a cost of £26,000 per QALY

Interpretation
The 'Pathway' approach does not alter length of hospital stay but improves the quality of life of homeless people at a cost deemed cost effective under current guidelines.

The trial was registered on the UKCRN Portfolio Database – ISCRTN06481116 and funded by the UK National Institute for Health Research.

Abbreviations

GP = General Practitioner
ICER = incremental cost-effectiveness ratios
CEAC = cost-effectiveness acceptability curve

Introduction

Chronic homelessness is associated with multiple health problems and premature death. Health services have traditionally regarded homelessness as a housing and social care issue, but there is a growing understanding that long-term homelessness is a health issue [1-3]. Failure to treat and prevent the health outcomes of homelessness leads to increased expenditure in secondary care with a minority of homeless people making very frequent use of emergency departments as their major health care resource [4]. Annual in-patient costs for a homeless person in England are estimated to be eight times higher than for the housed population [5]. Homelessness is common and increasing and almost 1 in 10 people report that they have been homeless at some point in their lives[6]. In 2013, 113,260 people in England approached their local authority as homeless, an increase of 11% over 2 years[6].

Chronic homelessness is characterised by physical and mental ill health and, often, substance misuse. Primary care physicians (general practitioners (GP)) have the skills to address all of these issues in one consultation and most of the innovations in this field have arisen in primary care [7]. In 2010 a GP and nurse led intervention involving a hospital 'in reach' team engaging with homeless people admitted to University College Hospital London was developed. This intervention 'Pathway' involved a regular GP 'ward round' of homeless in-patients with a nurse practitioner providing day-to-day support and a weekly multi-agency meeting. A service review indicated reduced in-patient stay and an improvement in the quality of care [8]. However, the Pathway approach is expensive and although a number of hospitals have introduced similar approaches the intervention has not been appraised. To address this we assessed the costs and benefits of the Pathway in a randomized controlled clinical trial in two UK centres.

Methods

Randomised, parallel arm trial in two English hospitals, The Royal London Hospital (London) and the Royal Sussex County Hospital (Brighton). Patients who were homeless and admitted to hospital were randomised to receive either 'standard care' or 'enhanced care' (GP supported care using the 'Pathway' approach). The GPs and nurse practitioners were trained by a Charity set up to improve health care for homeless people ('Pathway').

Hospital ward staff notified the homeless nurse of all admitted patients over 18 who did not have somewhere to stay when they left hospital (including people living with a friend or in a hostel and those who became homeless as in-patients). Patients who only spent time in the Accident and Emergency Department were not considered. Exclusion criteria were visitors with a permanent address elsewhere and patients who were not consented within seven days of admission. Patients who had previously been randomised to the study were assigned to their original group when re-admitted.

Following informed consent and baseline assessment patients were randomly allocated to receive either 'standard care' or 'enhanced care', using a web based system, Randomization WS in a 1:1 ratio, stratified by centre. Random sized blocks (2,4 or 6) were used to control workload for the intervention team and achieve balance across centres. Neither participants nor health professionals were blinded to allocation but primary outcome data was obtained electronically from hospital records and cleaned masked to allocation.

Patients assigned to 'standard care' were visited once by the homeless health nurse following the randomisation visit. They and their named ward nurse were provided with an information leaflet describing local services for people who were homeless, but the homeless health team played no further role.

The 'Pathway' approach has been described elsewhere [8]. In brief, patients randomized to 'enhanced care' were visited regularly by the homeless nurse who supported the patient in hospital whilst developing links with community providers of housing and support. A general practitioner (PB and CS) performed thrice weekly ward rounds and visited patients randomised to the 'enhanced care' arm and provided advocacy advice and medical input. A weekly multi-agency homelessness meeting was attended by the Pathway Team, local council housing team and hostel managers, outreach workers, hospital drug and alcohol nurses, homeless day centre staff and social and palliative care workers as well as hospital consultants and therapists. Patients randomised to the enhanced care arm who had challenging discharge needs were discussed and multi-agency care plans devised. Patients randomised to 'standard care' were not discussed.

All patients prior to randomization were asked to complete a questionnaire detailing their current lifestyle and health status, assisted by the homeless health care practitioner as necessary (see Supplementary data).

Patients were contacted within 6 weeks (+/- four weeks) of discharge by a research fellow and completed a second questionnaire, either by face to face interview or by telephone. Patients who were contacted after the planned observation period were included. We planned to contact 25% of patients at random but following initial attempts showing that only 25% of patients responded, we attempted to contact everyone.

<u>Outcome data</u>
Data on patients admitted to the hospital is collected by the hospital data system and this was obtained by regular downloads directly from the hospital database. The trial team 'cleaned' the data, removed duplication and resolved queries by discussion with the clinical team.

All analysis was performed in Stata 11 SE

Study end points

The primary outcome was cumulative duration of hospital stay measured as time between admission and discharge summed up across all admissions within 90 days of initial admission. Total length of stay was censored at 90 days. Secondary outcomes included re-attendance in the Accident and Emergency Department over the three months post discharge, re-admission in the first month and three months post discharge, patient quality of life post discharge as assessed by the EQ-5D-5L [9] questionnaire, quality of accommodation post discharge, self assessed 10 point sliding scale score for coping with money, relationships, drugs and alcohol, accommodation and cost effectiveness.

Statistical analysis

An uncontrolled observational study at University College Hospital [8] in 250 patients showed that the average length of stay fell from 12·7 to 9·5 days i.e. a 23% fall. Our primary outcome was length of stay, likely to follow a skew distribution. Using a log transformation, reduction in length of stay of around 18%, with standard deviation in both groups of around 1·0, will be detected with 80% power at the 5% significance level if there are 400 participants in each group. In an average year over 800 homeless people are admitted to The Royal London Hospital and Brighton and we assumed that fewer than 5% of patients would decline to participate. We therefore planned to include all eligible admissions over a 12 month period starting in December 2011. Following administrative delays in setting up the trial in Brighton (enrolment commenced June 2012) and slower than predicted recruitment in London, recruitment at The Royal London Hospital was extended for 6 months until June 2013.

All randomised patients were included in the analysis. A regression model was used to analyse length of stay, adjusting for age, sex and site using bootstrapping to allow for non-normality in the outcome data. The intervention effect is presented as difference in mean length of stay with 95% confidence interval. Percentage of patients re-admitted post discharge was analysed using a logistic regression model adjusting for age, sex and site. Quality of accommodation was assessed as 'living on the street' or 'in accommodation' (including a hostel).

Cost effectiveness analysis

Cost effectiveness was modelled from the hospital perspective. We assessed staffing costs from national pay scales and determined the costs of in-patient activity by reference to the hospital coding, using spell-based NHS reference costs for 2011/12 and 2012/13. Each spell was assigned a unit cost based on its Health Resource Group (HRG), and a total cost for each patient calculated as the sum of costs across all spells during the period from their index admission to follow-up questionnaire. We adjusted these costs for the differential price of inputs (staff etc.) in London and Brighton, using the Market Forces Factor. To match spells to reference costs, data for 2011/12 and 2012/13 were merged

with the relevant year's reference costs using the HRG code derived from the hospital records and the episode was costed based upon the method of admission (elective/emergency etc). Where no match was found for a 2012/13 spell, the data were merged into the 2011/12 reference costs (i.e. we assumed that the cost was unchanged). As the costs and benefits were incurred over a 12-18 month period no discounting for time was invoked.

Non-parametric bootstrapping was used to account for uncertainty in calculating incremental cost-effectiveness ratios (ICERs), using 1000 replications.

Results

Figure 1 shows the flow of participants through the study. 1009 patients were referred to the homeless nurse, 387 were ineligible and of the 622 eligible patients 66% agreed to participate. 414 patients were consented, 3 of these had already been randomized and one could not be traced on the hospital database leaving 410 for analysis.

Table 1 shows the baseline characteristics. The majority (81%) of patients were male and of British nationality (71%). 178 (43%) had been living on the street immediately prior to admission and most (n=331) had been admitted to hospital in the last 12 months. The commonest medical disorder was infection (~40%) and alcohol related problems were common (>30% of patients). Illicit drug use was admitted in a minority of patients (4% in the control arm and 13% in the intervention arm). Mental health disorders were very common with 74% of patients in both arms reporting depression. Supplementary Table 1 details these health disorders.

Figure 2 illustrates the total number of days in hospital during the initial admission and in the 90 day period since that admission. There was a tendency for patients allocated to enhanced care to have longer stays in the short term but fewer very long stays. 204 patients allocated to standard care had 324 admissions and stayed an average of 8·8 days per admission, while 206 patients allocated to enhanced care had 324 admission and stayed an average of 8·5 days. The total length of time spent in hospital in 90 days was 14 and 13·3 days respectively, (adjusted difference = -0·4 (95% CI -3·88 to 3·07)). Readmissions to hospital and re-attendances at the Accident and Emergency Department did not differ between the two groups (Table 2). Planned hospital readmissions as opposed to emergency re-admissions did not differ between the groups (Supplementary Table 2). Ten deaths were notified to the trial team – seven in the enhanced care arm and two in the standard care arm.

The impact of the intervention on quality of life and housing status was assessed in 52 (25%) patients allocated to standard care and 57 (27%) in the enhanced care group who completed a follow up questionnaire. The patients who completed the questionnaire tended to be more recently made homeless and less likely to be 'street homeless', although the differences were not significant (Supplementary Table 3). There was no relationship between the follow-up

duration (time between baseline and follow-up questionnaires) and either the follow-up EQ-5D-5L index or the gain in EQ-5D-5L scores (Supplementary Figure 1, Supplementary Table 4), suggesting that the benefits of the intervention did not decline with time post discharge. Table 3 compares the EQ-5D-5L scores from the admission and post discharge questionnaires. There was an increase in EQ-5D-5L scores in patients who had received the intervention, although this did not reach statistical significance. Quality of accommodation post discharge (Table 3) was assessed as living on the street or in accommodation and the proportion of people living on the streets decreased in the intervention arm (14·6% of patients randomized to the control arm were street homeless at discharge compared to 3·8% of patients in the intervention arm (odds ratio 0·14 (0·02 to 0·86), p= 0·034). To analyse the self assessed sliding scale data we used a bootstrapped linear regression model for the 4 questions, follow-up score on baseline score, adjusted for age sex and site and the intervention significantly improved the scores for money and relationships, improved the scores for accommodation but did not affect the scores for 'drugs/alcohol'. Taken together these data indicate that the intervention improved post discharge accommodation and quality of life.

Cost effectiveness

The costs of the intervention are staff and hospital costs. Additional staff costs included one full time nurse and four, four hour, GP sessions per week. We estimate that the intervention costs £154,228 to operate per year (equivalent to £67 per patient bed day in London and £150 in Brighton) with the salary costs (Supplementary Table 5) added to the 'Pathway' training costs (£11,120). The impact of the intervention on inpatient activity was assessed by comparing average cost per inpatient spell using all spells for which data were available. We found no significant impact on inpatient costs and therefore we compared operating costs of the intervention with the effect on patient health gain, measured in QALYs. At baseline, health-related quality of life was similar across the two arms. Since there was no correlation between EQ-5D-5L change and duration of follow up we translated the EQ-5D-5L index scores into QALYs by assuming that the patient stay at their baseline health state for the shortest follow-up duration in our sample (6 days) and the patient is assumed to move to their follow-up health state for a duration given by the difference between the longest and shortest follow-up durations (235 days-6 days = 229 days). This is likely to underestimate the health gain from the intervention, as QALYs are censored at 235 days but the benefits (e.g. being housed) may last longer. Based on these assumptions we estimate an incremental cost-effectiveness ratio of £26,431. Supplementary Figure 2 summarises the uncertainty around our point estimate in a cost-effectiveness acceptability curve (CEAC).

Discussion

This is the first randomised controlled trial of an intervention in a homeless population. The study identifies difficulties engaging with people who are homeless but shows that a majority are willing to participate. We found no

significant difference in the duration of hospital stay in patients receiving enhanced care or standard care, refuting previous studies indicating a reduction of hospital stay but rebutting the suggestion that the intervention prolongs hospitalisation. On a number of different measures assessed by a post discharge questionnaire the intervention was shown to improve quality of life and this was deemed cost effective using a highly conservative series of assumptions.

Limitations of the study

We found an unexpectedly low rate of recruitment. We assumed that patients would be willing to enrol in a study giving them a chance of enhanced care and were surprised by the number who declined. Future studies in this population should be aware of the reluctance of homeless people to participate in trials and our study in the self selected population who agreed to participate should be interpreted with caution. We provided support during the working week and not at week-ends and during holidays. Therefore patients admitted on a Friday evening were not seen until Monday morning and this may have reduced the opportunity for a beneficial impact in these patients reducing the value of the intervention. However providing a seven day service may prove unduly expensive.

In this mobile population with no fixed reference point it is challenging to maintain contact with patients and we envisaged difficulties contacting patients. To address this we used full time research fellows to contact patients post discharge. Despite these efforts fewer than 30% of patients could be contacted, reducing the power of the QALY assessments. We found no evidence that the patients we contacted were atypical and as patients from both trial arms were contacted with equal frequency we believe that the quality of life changes are valid. Given the difficulties in contacting patients post follow up future studies should consider focussing on other end points that indicate quality of care – such as contact with homeless services, interactions with the clinical justice system and repeat attendances at hospital.

Quality of life data analysis typically assumes that the benefits accrue during the observation period. In our study the quality of life scores did not vary by duration of follow up and patients questioned long after discharge showed the same benefits as those questioned shortly after leaving hospital. We therefore assumed that the benefits accrued during admission persisted until the duration of the longest period of follow up. Since we have no data beyond this we capped the quality of life benefits at the latest questionnaire completion and this may reduce the benefits of the intervention as the observed improvements in accommodation are likely to last significantly longer. Our data on QALY benefits from the intervention are therefore rigorous, but likely to underestimate the true health gains.

Generalisability

The study was conducted at two sites within the UK representing an inner city population and a provincial sea-side town. The characteristics of the patients

were similar in both sites and conform to previous studies in this area. As the impact was similar in both sites we anticipate similar findings in other hospitals.

Interpretation

This randomised controlled trial of an intervention in patients who are homeless indicates that rigorous assessment in difficult to reach populations is feasible. We evaluated a complex intervention and assessed the impact on length of stay, quality of life and costs. Previous studies have suggested that a homeless intervention team may reduce overall length of stay but hospitals considering the 'Pathway' approach have expressed concerns about a negative impact on length of stay. Neither assumption is correct – the homeless intervention team did not increase the duration of stay but a reduction in length of stay was not observed. Although the study recruited fewer patients than planned the close similarity of the length of stay in the two groups indicates that a very large study would be required to identify any difference in length of stay and we do not believe that the Pathway approach is likely to impact upon use of hospital resources. Scrutiny of the length of stay data suggested that patients admitted for a short duration tended to stay in hospital a little longer if seen by the homeless team whilst patients admitted for longer periods were discharged earlier. However this post hoc analysis was not statistically significant. We attempted to identify patient characteristics that would discriminate between patients admitted for short or long periods of time but no distinguishing criteria were identified and we do not believe that targeting resource on patients likely to stay in hospital for a long period of time is feasible nor appropriate, although we accept that it may improve the cost effectiveness of the intervention.

Previous studies [10] have shown that a variety of health based interventions do not lead to improvements in housing status. Our data indicate that for patients receiving the 'Pathway' intervention the proportion of people who return to the streets is reduced. However, the number of patients returning to the streets after a period of hospitalisation was relatively few and further studies will be required to confirm this important benefit. Over the duration of this study the improvement in housing status did not manifest as a reduction in the use of health care services although longer durations of follow up may change this picture and long term follow up of this cohort may identify much greater quality of life benefits than demonstrated in the relatively short follow up of this trial.

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Author contributions

PB,JM,CS,PJ, KA, LG, EO managed the patients, obtained consent and completed the data collection. CE and BM designed and completed the health economic data. NM and SK acted as data managers and trial statisticians and analysed the data. AH provided managerial support and assistance. NH helped design and develop the proposal and grant application and managed the study. GRF designed the study, obtained funding, managed the project and is the trial guarantor. All authors contributed to the writing of the manuscript.

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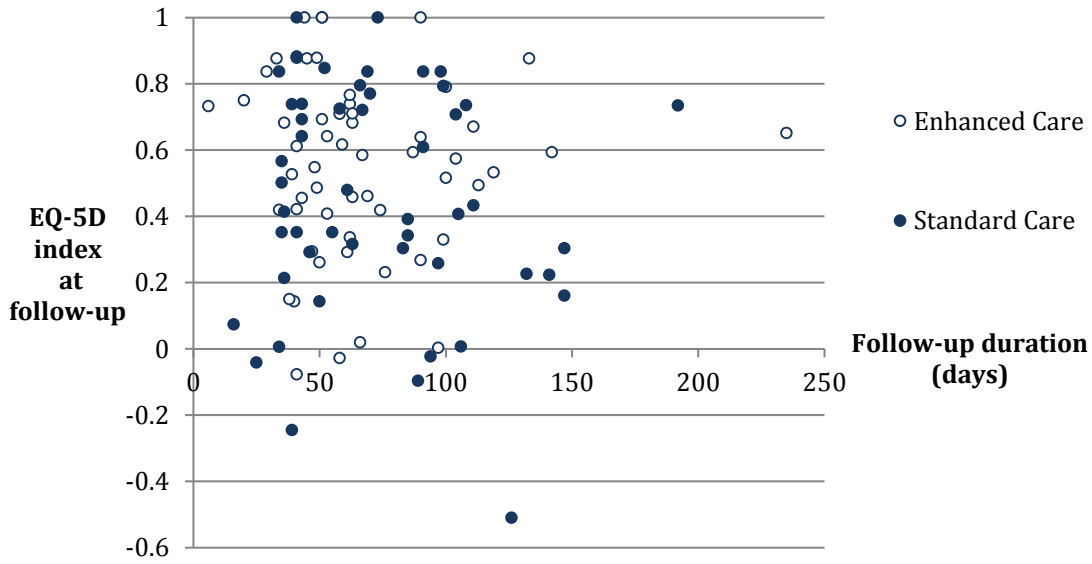
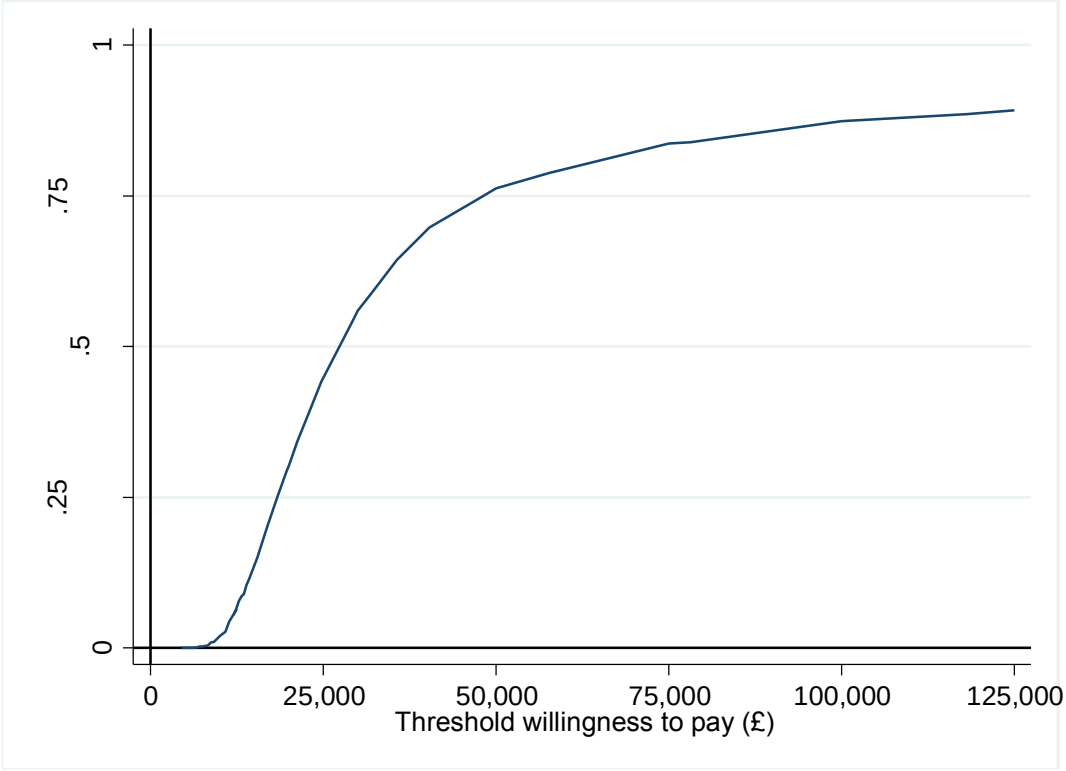
Supplementary Figure 1
EQ-5D-5L scores and time of completion of follow up questionnaire.



Supplementary Figure 2

CEAC for the London Homeless Pathway intervention.

CEAC curve based on reasonable assumptions – specifically all staff costs (including wider economic costs are included) and the changes in EQ-5D scores progress smoothly until follow up and then remain constant for a duration given by the difference between the longest duration of follow up and their follow up duration.
The figure shows that if the NHS is willing to pay £20,000 per QALY, there is a 30% chance that the intervention is cost-effective relative to the usual care that homeless patients could expect to receive. This probability rises to 56% and 76% at a willingness to pay of £30,000 and £50,000 per QALY respectively.



Supplementary Table 1

Medical and Psychiatric conditions at baseline in homeless patients participating in the study

Description	Control N	Control %	Intervention N	Intervention %
Aetiology				
• Infection	75	48·1%	64	39·3%
• Degenerative Includes coronary artery disease and CVA	55	35·3%	61	37·4%
• Alcohol related	36	23·1%	51	31·3%
• Investigation	36	23·1%	38	23·3%
• Metabolic	23	14·7%	22	13.5%
• Trauma	13	8·3%	16	9·8%
• Psychological	4	2·6%	10	6·1%
• Tumour	6	3·8%	6	3·7%
• Pregnancy	1	0·6%	0	0
Organ system				
• Liver	50	32·1%	60	36·8%
• Pulmonary	45	28·8%	50	30·7%
• Musculoskeletal	30	19·2%	30	18·4%
• CNS	29	18·6%	29	17·8%
• CVS	28	17·9%	30	18·4%
• Endocrine	19	12·2%	20	12·3%
• Skin	18	11·5%	17	10·4%
• GI	15	9·6%	20	12·3%
• GU	9	5·8%	10	6·1%
• Haematological	6	3·8%	3	1·8%
• Other	12	7·7%	6	3·7%
Special interest				
• Illicit drugs	7	4·5%	22	13·5%
• DVT	10	6·4%	12	7·4%
• Leg ulcer	12	7·7%	9	5·5%
Psychiatric disorders				
• Depression	84	74·3%	91	74·0%
• Anxiety	13	11·5%	10	8·1%
• Schizophrenia	8	7·1%	12	9·8%
• Psychosis	9	8·0%	7	5·7%
• Personality Disorder	7	6·2%	8	6·5%
• PTSD	6	5·3%	4	3·3%
• Bipolar	4	3·5%	5	4·1%
• Suicide	5	4·4%	2	1·6%
• Drugs	1	0·9%	3	2·4%
• Alcohol	2	1·8%	1	0·8%
• Other	15	13·3%	21	17·1%

Supplementary Table 2
Re-attendance at the initial hospital by intervention arm.

Re-attendances in the Accident and Emergency Department over the three months post discharge (London only) are shown using a logistic regression model adjusting for age and sex as well as re-admissions for both hospitals including all re-admissions or emergency only re-admissions (both analysed using a logistic regression analysis adjusting for age, sex and site).

	Number of patients	Control (%)	Intervention (%)	Adjusted OR (95% CI)
Attendance to A&E within 90 days of index discharge	310	57 (37·0%)	58 (37·2%)	1·01 [0·64 to 1·60]
All re-admissions to hospital within 30 days of index discharge	410	50 (24·5%)	44 (21·4%)	0·83 [0·52 to 1·33]
All re- admissions to hospital within 90 days of index discharge	410	68 (33·3%)	69 (33·5%)	1·02 [0·67 to 1·54]
Emergency only re-admissions to hospital within 30 days of index discharge	410	41 (20·1%)	38 (18·5%)	0·90 [0·55 to 1·47]
Emergency only re- admission to hospital within 90 days of index discharge	410	50 (24·5%)	58 (28·2%)	1·22 [0·78 to 1·90]

Supplementary Table 3

Baseline comparison of patients with and without 6 weeks follow-up questionnaire

	Follow-up questionnaire available					
	No (N = 300)		Yes (N = 110)		Statistical Test	p-value
	No.	%	No.	%		
Allocated treatment						
• Standard care	151	50·3	53	48·2	p(χ^2)	0·699
• GP supported care	149	49·7	57	51·8		
Site						
• London	223	74·3	87	79·1	p(χ^2)	0·320
• Brighton	77	25·7	23	20·9		
Mean Age (SD)	42.1 (11·5)		42·1 (12·2)		t-test	>0·999
Gender						
• Male	243	81	91	82·7	p(χ^2)	0·690
• Female	57	19	19	17·3		
Nationality						
• UK	212	70·7	79	71·8	p(χ^2)	0·627
• EU	61	20·3	21	19·1		
• other	23	7·7	10	9·1		
• Not known	4	1·3	0	0		
Asylum seeker Y/N						
• No	289	96·3	107	97·3	p(χ^2)	0·683
• Yes	9	3	3	2·7		
• Not known	2	0·7	0	0		
Refugee Y/N						
• No	291	97	108	98·2	p(χ^2)	0·656
• Yes	7	2·3	2	1·8		
• Not known	2	0·7	0	0		
Any long-term medical conditions?						
• No	59	19·7	21	19·1	p(χ^2)	0·120
• Yes	230	76·7	89	80·9		
• Not known	11	3·7	0	0		
Any long-term mental health problems?						
• No	114	38	51	46·4	p(χ^2)	0·078
• Yes	177	59	59	53·6		
• Not known	9	3	0	0		
Housing status On admission						
• Street	141	47·0	37	33·6	Kruskal's gamma	0·082
• Unstable address	88	29·3	44	40		
• B&B/Hotel	9	3·0	6	5·5		
• Unsupported hostel	10	3·3	2	1·8		
• Supported hostel	40	13·3	20	18·2		
• Stable address	4	1·3	1	0·9		

• Not known	8	2·7	0	0		
Time since permanent accommodation (cat)						
• less than 1 month	43	14·3	25	22·7	Kruskal's gamma	0·077
• 1 to 12 months	54	18	25	22·7		
• 1-5 years	86	28·7	26	23·6		
• more than 5 years	59	19·7	21	19·1		
• Not known	58	19·3	13	11·8		
Number of hospital admission in 12mo						
• None	47	15·7	13	11·8	Kruskal's gamma	0·087
• 1	74	24·7	33	30		
• 2 to 9	147	49	52	47·3		
• 10 to 30	14	4·7	11	10		
• Not known	18	6	1	0 ·9		
Number of nights sleeping rough in 28d						
• None	126	42	69	62·7	Kruskal's gamma	0·081
• 1 to 6 days	45	15	13	11·8		
• 7 to 13 days	14	4·7	5	4·5		
• 14 to 20 days	19	6·3	9	8·2		
• 21 to 27 days	11	3·7	2	1·8		
• Every day	68	22·7	10	9·1		
• Not known	17	5·7	2	1·8		
Median EQ-5D-5L score						

Supplementary Table 4 – Follow-up health-related quality of life and follow-up duration

	Follow-up EQ-5D-5L™ score
Follow-up duration	-0·00051 (-0·62)
Baseline EQ-5D-5L™ score	0·218788 (2·21)
Constant	0·45136 (5·85)
N	103
F (2, 100)	2·63
R^2	0·0500
Figures in parentheses are t-statistics	

Supplementary Table 5

Staff costs for the additional staff involved in delivering the intervention

Cost description	**Annual cost per Band 7 nurse**	**Cost category**
Nursing staff (Band 7)		
Wages/salary	£38,800	Direct cost
Salary on-costs	£9,667	Direct cost
Qualifications	£9,356	Wider economic cost
Overheads - management, administration and estates staff	£9,257	Wider economic cost
Overheads - non-staff	£20,162	Wider economic cost
Capital overheads	£2,306	Wider economic cost
Nursing direct costs: per nurse	**£48,467**	
Nursing direct costs + wider economic costs: per nurse	**£89,548**	
GP sessions	£32,000	Direct cost
Additional wider economic costs	£21,560	Wider economic cost
GP direct costs	**£32,000**	
GP total: direct costs + wider economic costs	**£53,560**	

Table 1 Patient demographics

	Standard care (N = 204)		Enhanced care (N = 206)	
	No.	**%**	**No.**	**%**
Site				
• London	154	75·5	156	75·7
• Brighton	50	24·5	50	24·3
Age Mean (SD)	42·5 (11·3)		41·6 (12·1)	
• Male	166	81·4	168	81·6
Nationality				
• UK	148	72·5	143	69·4
• EU	36	17·6	46	22·3
• Other/not given	20	9·8	17	8·3
Asylum seeker - Yes	5	2·5	7	3·4
Refugee - Yes	2	1	7	3·4
Time since permanent accommodation				
• less than 1 month	30	14·7	38	18·4
• 1 to 12 months	46	22·5	33	16
• 1 to 5 years	58	28·4	54	26·2
• more than 5 years	32	15·7	48	23·3
• Not given	38	18·6	33	16
Long-term medical conditions - yes	156	76·5	163	79·1
Long-term mental health problems -yes	113	55·4	123	59·7
Housing status On admission				
• Street	96	47·1	82	39·8
• Unstable address	62	30·4	70	34
• B&B/Hotel	3	1·5	12	5·8
• Unsupported hostel	8	3·9	4	1·9
• Supported hostel	26	12·7	34	16·5
• Stable address *	2	1	3	1·5
• Not given	7	3·4	1	0·5
Number of hospital admission in 12 mo				
• None	33	16·2	27	13·1
• 1	52	25·5	55	26·7
• 2 to 9	95	46·6	104	50·5
• 10 to 30	12	5·9	13	6·3
• Not given	12	5·9	7	3·4
Number of nights sleeping rough in 28d				
• None	85	41·7	110	53·4
• 1 to 6 days	26	12·7	32	15·5
• 7 to 13 days	8	3·9	11	5·3
• 14 to 20 days	17	8·3	11	5·3
• 21 to 27 days	9	4·4	4	1·9
• Every day	46	22·5	32	15·5

• Not given	13	6·4	6	2·9
EQ5D5L Mean (SD)	0·48 (0·33)		0·47 (0·32)	

* Includes patients who became homeless during admission

Table 2
Duration of in-patient stay, reattendances and Accident and Emergency attendances.

The total duration of in-hospital stay (the index admission plus re-admissions) is shown for all patients by treatment arm. Type of admission, number of admissions and attendances in Accident and Emergency are also shown.

	Control	**Intervention**
Total number of participants	204	206
Total number of admissions	324	324
Type of admissions		
• Emergency	266	269
• Elective	24	27
• Other	30	25
• Not known	4	3
Number of admissions in 90d from index admission		
• 1	139	138
• 2-5	63	66
• 6-10	1	1
• 11-15	1	1
Mean total length of stay censored at 90days (SD)	14·0 (18·5)	13·3 (14·5)
Number of attendances at A/E within 90 days of discharge – number of attendances (%)	57 (37%)	58 (37%)

Table 3
Impact of the intervention on quality of life, accommodation, and self assessed sliding scale for coping with money, relationships, drugs/alcohol and accommodation.

	Standard Care		Enhanced Care		
	Baseline	Follow up	Baseline	Follow up	Adjusted difference at follow up [95% CI]
EQ 5D-L Questionnaire					
Number of patients	48	48	53	53	
Mean total EQ-5D-5L score	0·48	0·47	0·43	0·56	0·09[-0·03- 0·22] p=0·151
Accommodation Questionnaire					
Number (%) Street Homeless	96/204 (47·1%)	7/48 (14·6%)	82/206 (39·8%)	2/53 (3·8%)	0.14 [0·02 to 0·86] p=0·034

Sliding Scale "Coping" Questionnaire (10 point questionnaire)- adjusted differences in scores				
	Number of patients	Bootstrapped 'mean category'	Bootstrapped 'mean category'	
Money	109	3·85	5·21	1·23 [0·17 to 2·29] p=0·023
Relationships	108	4·79	5·68	1·23 [0·10 to 2·36] p=0·032
Drugs/alcohol	106	7·45	7·33	-0·03 [-1·04 to 0·99] p=0·96
Accommodation	108	4·98	6·20	1·17 [-0·06 to 2·40] p=0·062

Figure 1 Flow of patients through the trial.

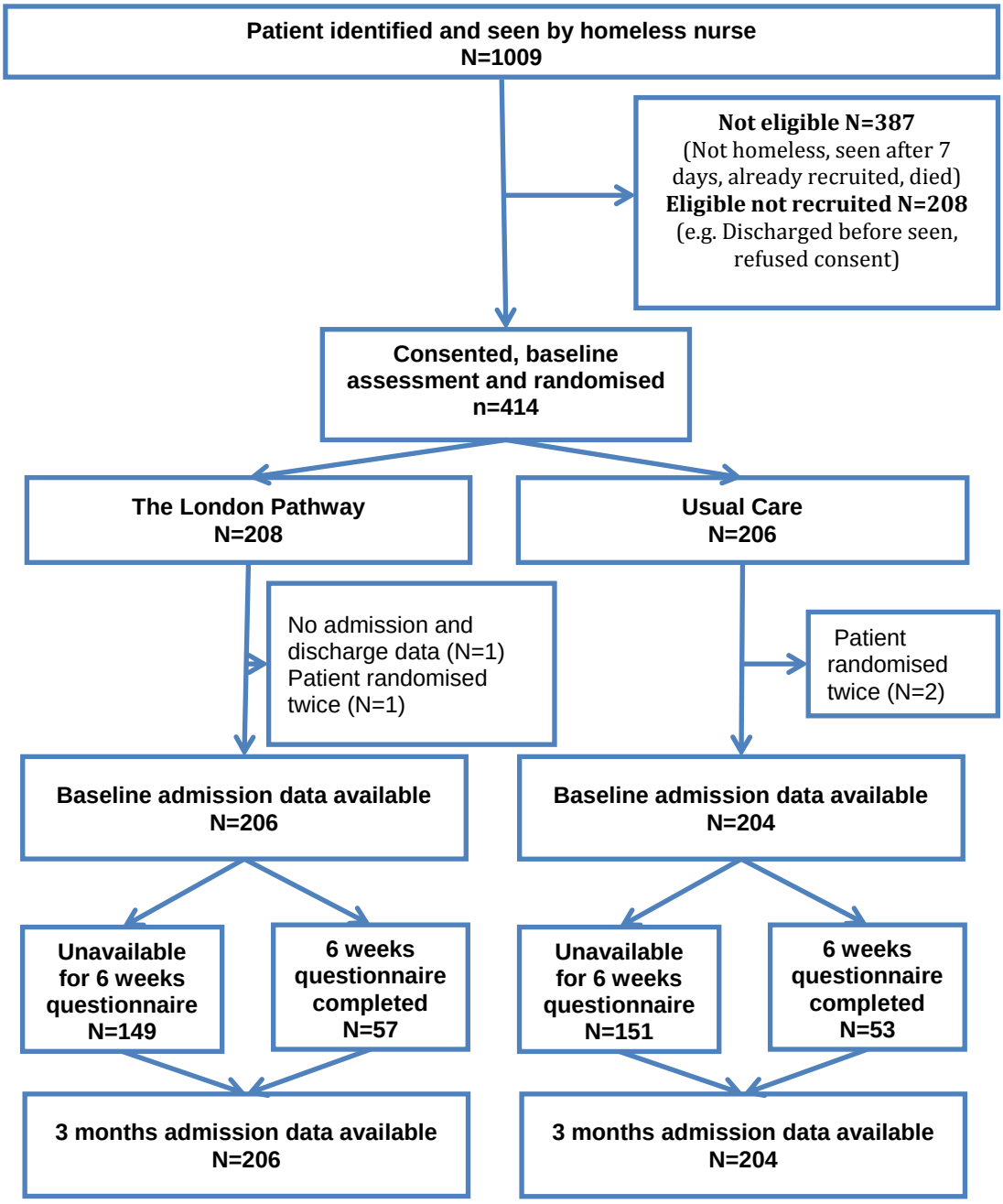


Figure 2. Total length of time in hospital in days by intervention arm.

Kaplan-Meier type curve showing proportion of patients admitted for different durations in each arm.