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Association between systolic blood pressure and cardiovascular inpatient cost moderated by peer-support intervention among type 2 diabetes: two cohorts study

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**TITLE PAGE**

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**Keywords**: systolic blood pressure; hospitalization; health payment; two-part model

**KEY MESSAGE**

- It's unclear whether there is SBP threshold impacting on CVD inpatient costs and could be altered by peer-support in people with diabetes
- Association between SBP and CVD inpatient payment was a `hockey-stick' shape with a threshold at 133-141 mmHg
- A novel two-part model revealed the combined peer-support intervention altered the above association

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**Author Disclosures**
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# TITLE: Association between systolic blood pressure and cardiovascular inpatient cost moderated by peer-support intervention among type 2 diabetes: two cohorts study


## ABSTRACT

### Objective

People with type 2 diabetes and increased systolic blood pressure (SBP) are at high risk of cardiovascular diseases (CVD). We aimed to investigate the association between CVD related hospital payments and SBP and test whether it is influenced by diabetes peer-support.

### Methods

Two cohorts comprising people with type 2 diabetes were included. The first cohort includes 4,704 patients with type 2 diabetes assessed between 2008-2009 from 18 general practices in Cambridgeshire and followed up to 2009-2011. The second cohort comprises 1,121 patients with type 2 diabetes from post-trial follow-up data, recruited between 2011-2012 and followed up to 2015. The SBP was measured at baseline. Inpatient payments for CVD hospitalization within 2 years since baseline was the main outcome. The impact of 1:1, group or combined diabetes peer support and usual care were investigated in the second cohort. Adjusted mean CVD inpatient payments per person were estimated using a two-part model after adjusting for baseline characteristics.

### Results

A `hockey-stick' relationship between baseline SBP and estimated CVD inpatient payment was identified in both two cohorts, with a threshold at 133-141 mmHg, suggesting increased payments for patients with SBP below and above the threshold. The combined peer-support intervention altered the above association, with no increased payment with SBP above the threshold, and payment slightly decreased with SBP beyond the threshold.

### Conclusion

SBP maintained between 133-141 mmHg is associated with the lowest CVD disease management costs for patients with Type 2 diabetes. Combined peer-support intervention could significantly decrease CVD related hospital payments.


## INTRODUCTION

The rapid increase in prevalence and health costs associated with type 2 diabetes has been observed worldwide [1]. It has been estimated that the risk of hospitalisation is two-fold higher in people with diabetes compared to those without diabetes, and the proportion with diabetes is >10% in those admitted to hospital at any one time [2]. Among some specific age-strata, the proportion is over 20% [3]. The associated costs of excess admissions, as well as increased costs per admission, are significant contributors to the financial burden borne by healthcare systems from diabetes and often reflect preventable morbidity suffered by patients [4].

Systolic blood pressure (SBP), as the most common modifiable risk factor, has been found to be associated both with cardiovascular diseases (CVD) mortality and CVD hospitalisation among people with type 2 diabetes [5, 6]. However, no established association between SBP and inpatient cost due to CVD hospitalisation has been shown among people with type 2 diabetes. Although a target SBP has been agreed to lower the risk of eg CVD mortality and CVD hospitalisation, it is unclear whether this threshold will potential impact on inpatient costs due to CVD mortality.

Diabetes peer support involves people with diabetes assisting each other to improve their social, mental and physical wellbeing. Peer support can be provided through individual or group approaches and either face-to-face, telephone or online contact. It is generally seen as a low-cost intervention has been suggested to reduce health-care costs [7]. Some studies have reported that peer support can reduce health-care costs among people with type 2 diabetes [8, 9]. The RAndomised controlled trial of Peer Support In type 2 Diabetes (RAPSID) was the largest randomised controlled trial (RCT) of type 2 diabetes peer support to date [10]. The intervention was recently shown to be cost-effective during the trial based on self-reported costs [11] and also from prospective hospital costs [12]. In RAPSID, group peer support was associated with 2-3 mm Hg lower SBP, however, it was unclear whether this was a mediator in the reduction in inpatient costs, and whether this was through an effect on CVD hospitalisation specifically.

In this study, we aimed to investigate the association between SBP measured in primary care settings and inpatient cost for CVD hospitalisation over the next 2 years accounting for the risk of hospitalisation among people with type 2 diabetes, using data from two cohorts. We have then examined the impact of peer support on this association.

## MATERIAL AND METHODS

### Data source and study population

We followed the methods of Dahai Yu et al. 2018 for the data and data collection [12]. Briefly we utilised two cohorts from Cambridgeshire, England: one (main cohort) based on the electronic health record data from primary care settings to develop our CVD hospitalisation and re-hospitalisation risk scores and another (replication cohort) based on post-trial cohort data for external validation.

### Main cohort

Patient lists from 18 general practices across Cambridgeshire, England, in 2008/2009 were collated and linked with hospital admissions (Secondary Uses Service) data as part of an evaluation of diabetes care across the county by the local health board, National Health Service (NHS) Cambridgeshire. This cohort was limited to volunteer practices using the Egton Medical Information Systems general practitioner software system, from which a predefined set of data could be extracted. There was no systematic selection process for these surgeries, and data extracted were for their entire diabetes population. All patients with diabetes had follow-up hospitalisation data to 2010–2011. Hospital admissions to NHS and private hospitals within and outside Cambridgeshire were followed-up. No personal identifiers were released to researchers, and all subsequent analyses were conducted on anonymised datasets. Baseline blood pressure and clinical measurements were recorded as part of clinical practice in primary care settings[6].

**Replication cohort**

The design and methods of the RAPSID trial have been published previously [10], as have its Consolidated Standards of Reporting Trials diagram and the results of its primary outcomes [10]. Briefly, RAPSID was a 2x2 factorial cluster RCT comparing 4 groups: Controls, 1:1 (individual) peer support, group peer support, and combined 1:1 and group peer support among patients with type 2 diabetes. Participants had their diabetes for at least 12 months and those with dementia or psychotic illness were excluded. Participants were recruited from communities across Cambridgeshire and neighbouring areas of Essex and Hertfordshire. Follow up data were only available for participants in Cambridgeshire and neighbouring areas of Hertfordshire that are served by the Cambridgeshire and Peterborough Clinical Commissioning Group (CCG). Clusters were defined by local government ('parish council') boundaries. The intervention was developed following a pilot, using a framework defined by Peers for Progress [11]. Peers facilitating peer support were termed peer support facilitators and their selection, training, support and the overall programme are described elsewhere [10]. The intervention lasted 8-12 months and was commenced and concluded, cluster by cluster, between 02/06/11 to 12/04/12. Ethics approval was received from the Cambridgeshire REC2 Committee (10/H0308/72), and signed consent included agreement for access to hospital data.

Demographic data, blood pressure, and HbA1c and lipid profiles information were collected at baseline. Blood pressure were measured using the Omron 705IT Electronic BP Monitor [13]. Each participant was followed up until June 2015 (0.91-4.07 years' follow-up from beginning/entry into the trial). Hospitalisation (NHS hospitals & private hospitals), Accident & Emergency and outpatient visits within/outside Cambridgeshire and the included areas of Hertfordshire were collected through Cambridgeshire and Peterborough Clinical CCG [14] as well as elective/non-elective status, and International Classification of Diseases (ICD-10) codes[15].

**Ethical approval**

Ethics approval was received from the Cambridgeshire REC2 Committee (10/H0308/72), and signed consent included agreement for access to hospital data.

**Defining CVD hospitalisation**

The primary outcome of the study was having at least one hospitalisation with CVD as the primary diagnosis (ICD-10: I20–I25, I60–I69 and I73 in the first ICD field) over the 2-year follow-up.

**Statistical Analysis**

A large proportion of the population do not attend hospital as an inpatient or outpatient in any given year and therefore health care payment data demonstrate a skewed utilisation/payment pattern [16]. To take into account the problem of 'zero mass' and skewed outcomes, the demand functions were modelled using a two-part model [17]. In this two-part model, a probit model was estimated for the probability of observing "zero" versus positive medical expenditure. Positive medical expenditure is defined as any healthcare expenditure greater than zero. A generalized linear model (GLM) was estimated, conditional on having healthcare expenditure. GLM was used, instead of log ordinary least squares regression, since it relaxes the normality and homoscedasticity assumption, and avoids bias associated with re-transforming to the raw scale [18]. The results of the modified Park test verified that the use of a gamma distribution, with a log link, was the best fitted GLM for consistent estimation of coefficients [19]. The variance inflation factor (VIF) for all predictors used in the two-part model indicated no-existence of multi-collinearity [20]. The F-test for the two-part regression models was found to be significant, which indicated the overall significance of the regression model. Predicted inpatient cost was estimated in the two-part model by the level of baseline SBP with adjustment of other co-variables. Confidence intervals (95% CI) for estimated payments were estimated by a bootstrap process with 1000 samples. Analysis restricted analyses in each financial year were carried out as sensitivity analyses. All analyses were performed with STATA (STATA/SE 14.0 StataCorp Texas).

## RESULTS

In our main cohort, we analysed information on 4,704 type 2 diabetes patients with 588 CVD hospitalisations within 2 years. Our replication cohort had information on 1,121 type 2 diabetes patients with 183 CVD hospitalisations. **Table-1** summarises the basic characteristics and clinical measurements of the study population. Patients with type 2 diabetes in both cohorts had similar age, gender, blood pressure and total cholesterol. Patients in the main cohort had a higher level of high density lipoprotein, low density lipoprotein, and HbA1c. Compared with the main cohort, those in the replication cohort were more likely to be prescribed lowering lipid medicine. Baseline data for the 4 groups of the replication cohort were well matched (**Table-1**). The sample size of the cohort and intervention groups, characteristics of participants and median cost by baseline systolic blood pressure categories: <120, 120-129, 130-139, 140-149, 150-159, and >160 mmHg are presented in **Table-2**.

As shown in Supplemental **Table-1**, inpatient cost data from CVD hospitalisation were typically skewed due to the mass of 'zero' payments and a relatively small proportion of patients incurring extremely high expenditure. 87.5% and 83.7% of participants in the main and replication cohort were not hospitalised due to CVD diseases over the two year of follow-up. Within the replication cohort, 79.7% of controls and 82.8%, 85.4% and 86.8% of patients in the 1:1 group, and combined intervention groups respectively were not hospitalised due to CVD disease. Among patients hospitalised due to CVD diseases, median inpatient costs were £4348.35 (IQR: 1623.50 to 8766.75) and £2430.72 (IQR: 793.06 to 4026.20) for the main and replication cohort, respectively. With the replication cohort, median inpatient costs were £2419.60 (1006.91 to 4387.66), £2489.40 (770.69 to 4387.66), £1963.56 (714.93 to 4032.55) and £2436.00 (885.19 to 3473.12) for control, 1:1, group and combined intervention groups, respectively. Compared with patients with no inpatient costs due to cardiovascular diseases hospitalization, patients with such costs were more likely to

be older, male, have higher systolic blood pressure, body mass index, and HbA1c, with a lower proportion were prescribed lipid lowering treatment (**Supplemental Table-2**).

**Results from two-part model**

Dose-response relationship curves between SBP and predicted inpatient cost for CVD hospitalisation derived from the two-part models after accounting for the risk of CVD hospitalisation with adjustment of co-variables in **Table-1** are presented in **Figure-1** for the main cohort and the replication cohort. SBP was non-linearly associated with adjusted predicted inpatient cost for CVD hospitalisation (linearity test: all $P < 0.00001$) both in the main and replication cohort. The threshold was estimated at 137 (133-141) mmHg for SBP both in the main sample and replication sample, with consistent stable adjusted predicted inpatient cost for CVD hospitalisation below the threshold and increased predicted inpatient cost above the threshold.

Within the replication cohort, dose-response relationship curves between SBP and adjusted predicted inpatient cost for CVD hospitalisation in each group is presented in **Figure-2**. A non-linear association between SBP and adjusted predicted inpatient cost was found in control, 1:1 and group intervention groups (linearity test: all $P < 0.00001$). The threshold at 137 (133-141) mmHg for SBP was consistently found in each group, with consistent stable adjusted predicted inpatient cost for CVD hospitalisation below the threshold and increased predicted inpatient cost above the threshold. In the combined intervention group, the adjusted predicted inpatient cost was linearly stable as SBP increased (linearity test: $P=0.05263$). Associations between baseline systolic blood pressure and predicted inpatient cost due to cardiovascular diseases hospitalisation in those receiving 1:1 peer support and among the rest within the replication cohort are presented in **Supplemental Figure 1**. In each baseline systolic blood pressure level, patients who received the 1:1 peer support

intervention (as 1:1 alone or as the combined intervention) were more likely to have lower inpatient costs due to cardiovascular diseases hospitalisation.

## DISCUSSION

In this study, using two prospective cohorts, we found a non-linear association between SBP measured in UK populations with type 2 diabetes and the adjusted predicted inpatient cost for CVD hospitalization over 2 years of follow-up, after accounting for the risk of CVD hospitalisation both in the main and replication cohort. Further investigation revealed: SBP below 137 mmHg was associated with stable lowest inpatient cost; inpatient cost increased with an increase in SBP above 137 mmHg. The peer support intervention, especially group intervention combined with 1:1 support had a significant impact on the association between inpatient cost for CVD hospitalisation and SBP.

### Comparison with previous studies

It is well established that SBP is the major determinant of CVD risk in the population who are aged over 50 [21]. In patients with type 2 diabetes, previous studies have revealed a J-shape relationship between SBP and CVD event risk, for example, the United Kingdom Prospective Diabetes Study [22] showed a lowered CVD event rate with an attained lower BP goal of 144/82 mm Hg. The International Verapamil SR—Trandolapril [23] and the Avoiding CVD Events in Combination Therapy in Patients Living with Systolic Hypertension [24] trials also failed to demonstrate a CVD outcome benefit at a blood pressure below 130/80 mm Hg. We have previously shown that an SBP between 133-141 mmHg was associated with the lowest risk of CVD hospitalisation among patients with type 2 diabetes [6]. However, it was not clear whether this J-shape relationship exists between SBP and inpatient costs for CVD hospitalisation as most studies analysed health cost/payments which had a skewed distribution Ours is the first study among patients with T2DM, following adjustment for the individual probability of being hospitalised, and we now show that there is a `hockey-stick' shape relationship between SBP and CVD inpatient payment. This finding suggests that

CVD inpatient payments are stable for SBP below 133-141 mmHg and linearly increase above this range. This in turn supports a SBP target between 133-141 mmHg to minimise future risks of CVD hospitalisation and associated inpatient payments.

Although we have shown that CVD hospital payments increase with a baseline SBP above 133-144 mm Hg, this was not found to occur in the 2-year post-trial period of RAPSID intervention participants. In RAPSID, group peer support was associated with a significant reduction in SBP after 8-12 month follow-up from baseline and we speculate that it was this lower SBP that was responsible for this finding. Hospitalisation was shown to be reduced in Hong Kong with peer support among those who had high diabetes distress [25]. We have not been able to elucidate the mechanism behind the lower SBP in RAPSID and have excluded a greater effect among those with high diabetes distress and medication adherence. There was also no evidence of changes in lifestyle as measured by questionnaires, or crudely by body weight (a small reduction in waist circumference was found in the per protocol analyses). The current finding of reduced CVD hospitalisation costs does provide some validity that the lower SBP described was not simply due to chance.

This suggests that the peer support intervention was associated with a reduced inpatient payment, however in the 2-year post-trial follow-up, among patients in the combined intervention group, CVD inpatient payment did not increased along with the increase of SBP, especially beyond 133-141 mmHg, the slightly reduction in the CVD inpatient payment, suggesting that patients whose SBP beyond 133-141 mmHg were less likely to trigger the CVD hospitalisation that primarily due to the combined peer-support intervention. The potential mechanism could be that patients in the combined intervention might stick to the healthy lifestyle in the post-trial follow-up, which might have an impact on patients' obesity status and then SBP as observed in the trial follow-up. However, there was no post-trial measurements on obesity measurements to prove this hypothesis. Although in the trial follow-up the SBP reduction could not be explained by increased medication adherence as

this as previously found to be unchanged [27,28], it was unclear whether anti-hypertensive treatments adherence pattern was modified in the post-trial follow-up restricted by the post-trial information on the medication adherence.

**Strength and limitation**

Strengths of the analysis include that the association between SBP and CVD inpatient payment was examined in two independent cohorts. A further strength is the minimal information bias, with the outcome used, recorded inpatient payments, having been fully recorded by the CCG [26]. In particular, as these are payment details, both NHS hospitals and private hospital admissions were able to be included. There would have been some loss for patients where no component of care was paid for by the CCG.

Some limitations have to be considered in the interpretation of our findings. Unlike pharmaceutical interventions, where adherence can be assessed using pill counters, it is difficult to evaluate the magnitude of peer-support intervention on an individual level, and although we did record attendance and telephone calls, we did not assess engagement. The payment/savings from similar peer-support interventions should be further investigated in other post-trial observation studies. Another limitation in this study is the inconsistent blood pressure measuring methods between primary care recorded blood pressure measurements (main cohort) and the blood pressure measurement in the trial (replication cohort), in terms of attended or unattended, standardized protocol vs usual measurement, automated vs mercury sphygmomanometer. A further limitation of our study is that we have not been able to describe the activities of participants after the trial was completed. All participants were sent the results, and we are aware that some intervention (e.g. peer support groups) continued including with support from the Diabetes UK “Type 2 Together” programme [11].

**CONCLUSION**

As far as we are aware, our study is the first study to examine the prospective association between SBP and 2-year estimated CVD inpatient payment. A `hockey-stick' relationship between SBP and 2-year estimated CVD inpatient payment was identified in two independent cohorts, with a consistent threshold at 133-141 mmHg and a linearly increased payment beyond the threshold. Alteration in this relationship following a combined peer-support intervention (group and 1:1 interventions) is suggested by their lack of an increase in estimated CVD payment. Our findings suggest that among people with type 2 diabetes, blood pressure management should target a SBP of 133-141 mmHg. Integration of this threshold into clinical practice guidance, could lower both individual risk of, and associated payments for, CVD hospitalisation.

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recruitment was provided by the NIHR West Anglia Comprehensive Local Research Network. NHS Cambridgeshire funded research nurses to link with the Peer Support Facilitators. ATP was supported by the NIHR Biomedical Research Centre at Guy's and St Thomas' NHS Foundation Trust and King's College London. The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health.

**Author Disclosures**

Conflicts of interest: None.

**Author Contributions**

D.Y., Y.C., Z.Z., and D.S. contributed to the conception and design of this work and to the interpretation of the data. D.Y. performed the data cleaning and analysis and drafted the initial manuscript. D.Y., Y.C., Z.Z., D.H., J.G., and D.S. reviewed and revised the paper and approved the final manuscript.

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401 **TABLES AND FIGURE LEGENDS**
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403 **Table-1**. Baseline Characteristics of study cohorts

| | Main cohort | Replication cohort | | | | |
|---|---|---|---|---|---|---|
| | | All | Control | 1:1 | Group | Combined |
| N | 4,702 | 1,121 | 291 | 261 | 288 | 281 |
| Cardiovascular diseases hospitalisation, n (%) | 588 (12.5) | 183 (16.3) | 59 (20.3) | 45 (17.2) | 42 (14.6) | 37 (13.2) |
| Age, years | 65.0±16.3 | 65.5±11.4 | 65.9±12.8 | 65.3±9.8 | 65.8±11.9 | 65 .0±10.4 |
| Female, n (%) | 1,919 (40.8) | 444 (39.6) | 122 (41.9) | 109 (41.8) | 101 (35.1) | 112 (39.9) |
| Systolic blood pressure, mmHg | 134.5±16.0 | 139.7±20.2 | 140.0±20.6 | 140.4±20.6 | 140.8±19.5 | 137.9±20.3 |
| Diastolic blood pressure, mmHg | 76.3±10.0 | 75.5±11.5 | 75.0±11.6 | 75.8±10.9 | 75.1±11.3 | 7 5.6±11.9 |
| Total cholesterol, mmol/L | 4.3±1.2 | 4.2±1.7 | 4.3±1.5 | 4.3±1.3 | 4.1±2.0 | 4.3±1.7 |

| | | | | | | |
|---|---|---|---|---|---|---|
| High density lipoprotein, mmol/L | 1.3±0.6 | 1.1±1.2 | 1.2±0.9 | 1.2±1.0 | 1.0±1.5 | 1.1±1.1 |
| Low density lipoprotein, mmol/L | 2.5±1.4 | 1.4±3.0 | 1.3±3.2 | 1.5±2.8 | 1.5±2.8 | 1.5±3.0 |
| Body mass index, kg/m$^2$ | 30.8±6.9 | 32.2±6.0 | 32.3±6.0 | 32.6±6.5 | 32.0±5.9 | 32.2±5 .9 |
| HbA1c, mmol/mol | 61.5±17.2 | 56.2±15.1 | 55.6±16.2 | 56.5±15.0 | 57.3±14.7 | 5 5.3±13.8 |
| Lipid Lowering treatment, n (%) | 3,342 (71.4) | 731 (65.2) | 180 (61.9) | 173 (66.3) | 191 (66.3) | 187 (66.6) |

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420 **Table-2. Distribution of baseline characteristics and inpatient cost due to**
421 **cardiovascular diseases hospitalization in study cohorts**

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| | Category of systolic blood pressure, mmHg | | | | | |
|---|---|---|---|---|---|---|
| | **<120 mmHg** | **120-129 mmHg** | **130-139 mmHg** | **140-149 mmHg** | **150-159 mmHg** | ≥160 mmHg |
| Main Cohort | 564 | 795 | 1204 | 1059 | 324 | 756 |
| Replication cohort, overall | 134 (12.0) | 174 (15.5) | 244 (21.8) | 255 (22.8) | 167 (14.9) | 147 (13.1) |
| Replication cohort, control | 35 (11.9) | 46 (15.8) | 64 (22.1) | 68 (23.5) | 46 (15.8) | 32 (10.9) |
| Replication cohort, group | 33 (12.5) | 35 (13.6) | 50 (19.1) | 66 (25.4) | 35 (13.6) | 41 (15.8) |
| Replication cohort, 1:1 | 30 (10.5) | 43 (15.0) | 67 (23.3) | 62 (21.6) | 43 (15.0) | 42 (14.6) |
| Replication cohort, combined | 37 (13.0) | 50 (17.7) | 63 (22.4) | 58 (20.6) | 43 (15.2) | 31 (11.2) |
| Age, years | 59.9±18.0 | 62.7±15.8 | 65.1±14.0 | 67.7±12.9 | 68.6±13.2 | 65.7±19.2 |
| Female, n (%) | 244 (35.0) | 382 (39.4) | 611 (42.2) | 572 (43.5) | 208 (42.3) | 347 (38.4) |
| Systolic blood pressure, mmHg | 110.3±8.3 | 123.8±3.1 | 133.7±3.1 | 143.0±3.0 | 153.4±3.1 | 169.4±10.9 |
| Diastolic blood pressure, mmHg | 68.0±9.2 | 73.4±8.4 | 76.0±8.3 | 78.5±8.7 | 81.2±9.5 | 85.0±11.3 |
| Total cholesterol, mmol/L | 4.2±1.2 | 4.2±1.1 | 4.3±1.1 | 4.3±1.2 | 4.5±1.2 | 4.6±1.3 |
| High density lipoprotein, mmol/L | 1.3±0.5 | 1.2±0.4 | 1.3±0.5 | 1.3±0.5 | 1.3±0.5 | 1.3±0.5 |
| Low density lipoprotein, mmol/L | 2.4±1.0 | 2.4±1.0 | 2.5±1.0 | 2.5±1.0 | 2.5±1.0 | 2.6±1.0 |
| Body mass index, kg/m$^2$ | 29.8±6.3 | 30.5±6.7 | 31.5±6.9 | 31.5±6.6 | 31.7±6.4 | 30.4±7.3 |
| HbA1c, mmol/mol | 61.5±19.5 | 60.2±16.9 | 60.9±15.6 | 60.5±16.0 | 61.0±15.8 | 62.4±16.7 |
| Lipid Lowering treatment, n (%) | 459 (65.8) | 688 (71.0) | 1066 (73.6) | 1010 (76.9) | 364 (74.2) | 484 (53.6) |

| | | | | | | |
|---|---|---|---|---|---|---|
| People with zero payment, n(%) | 602 (11.9) | 865 (29.0) | 1263 (25.0) | 1109 (22.0) | 382 (7.6) | 832 (16.5) |
| Median cost (interquartile of cost), £ among people with non-zero payment | 2436.37 (629.40 to 5277.45) | 2017.75 (763.53 to 3561.62) | 1781.41 (644.42 to 4931.43) | 2507.73 (1318.58 to 4786.15) | 2801.81 (893.70 to 4008.91) | 3485.46 (1362.57 to 4956.08) |

**Figure-1**. Adjusted association between baseline systolic blood pressure and predicted inpatient cost due to cardiovascular diseases hospitalisation in main cohort and replication cohort

**Figure-2**. Adjusted association between baseline systolic blood pressure and predicted inpatient cost due to cardiovascular diseases hospitalisation in groups of replication cohort