

Main document

Impact of Patient-Centred Care and Population Health Management on Diabetes and Hypertension Outcomes

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Abstract

Background: Type 2 diabetes mellitus (T2DM) and hypertension are prevalent global health concerns associated with increased morbidity, mortality, and healthcare expenditure. This study evaluated the effectiveness of Patient-Centred Care (PCC) and Population Health Management (PHM) strategies in improving clinical outcomes and medication adherence among patients with co-existing T2DM and hypertension in Hounslow, UK.

Study Design: Quantitative intervention study.

Methods: A total of 221 patients were selected from 6,000 attendees at West Middlesex University Hospital's pre-assessment clinic. Participants were allocated into three groups. Study 1 was a randomised controlled pilot trial with 40 patients assigned to either a PCC intervention group (n = 20) or a usual care group (n = 20) over six months. Study 2 involved 41 patients receiving a pharmacist-nurse-led collaborative PCC intervention for six months. Study 3 included 140 patients enrolled in a six-month community-based PHM lifestyle programme integrated with PCC. Data collection involved patient questionnaires and hospital records, focusing on clinical and behavioural outcomes.

Results: In Study 1, the PCC group showed a significant HbA1c reduction (mean decrease 23.2 mmol/mol; 95% CI: 4.3–42.1) and improved medication adherence compared to controls. The number needed to treat (NNT) was 1.8 (95% CI: 1.3–7.6). Study 2 participants experienced significant reductions in systolic (27.5 mmHg) and diastolic blood pressure (9.1 mmHg), and HbA1c (23.1 mmol/mol) (all p<0.001). In Study 3, 90% of patients with elevated

BMI achieved 5%-10% weight loss, and 82% reported increase in moderate or higher physical activity levels.

Conclusion: PCC and PHM integration led to substantial improvements in glycaemic control, blood pressure, weight management, and physical activity. These findings support the adoption of community-based, patient-centred care models to effectively manage chronic conditions and improve public health outcomes.

Key messages

What is already known on this topic?

Patient-Centred Care (PCC) and Population Health Management (PHM) are known to improve chronic disease outcomes. However, their combined impact on patients with both type 2 diabetes and hypertension in community settings has not been well studied. There is a need for evidence supporting integrated care models that address multiple conditions simultaneously.

What this study adds

This study shows that PCC and PHM together significantly improve glycaemic control, blood pressure, weight loss, physical activity, and medication adherence. The interventions were effective across hospital and community settings, with strong clinical outcomes and low numbers needed to treat.

How this study might affect research, practice or policy

The findings support implementing pharmacist-nurse-led PCC and PHM programmes in routine care. These models could inform future service design and policy to better manage chronic conditions and reduce healthcare burden. Further research may explore scalability and long-term impact.

1. Introduction

Type 2 diabetes mellitus (T2DM) is a major global health challenge, strongly linked to obesity, sedentary lifestyles, and hypertension, and remains a leading contributor to cardiovascular morbidity and mortality^{1, 2, 11, 17}. In the United Kingdom, over 4.5 million individuals live with diabetes, with approximately 700 new diagnoses daily. Ethnic disparities are well documented, with South Asian and African-Caribbean populations exhibiting significantly higher susceptibility compared to White counterparts¹⁵. Hounslow, a culturally diverse borough in West London, reflects these trends, with an estimated 6.8% of adults affected by T2DM—exceeding the national average of 6.4%. Its demographic profile, comprising 34.4% Asian and 11.6% Black residents, alongside socioeconomic challenges such as high deprivation indices, underscores the need for tailored, equitable healthcare strategies^{21, 23, 26}. Medication adherence is critical for glycaemic control and long-term outcomes; however, global adherence rates for oral hypoglycaemic agents remain suboptimal at 70–80%, contributing to complications, increased costs, and reduced quality of life^{3, 8, 9, 17}. Patient-Centred Care (PCC), grounded in humanistic principles, combined with Population Health Management (PHM), offers a synergistic framework to address disparities and improve outcomes in high-risk populations^{4, 12, 27}.

1.1 Aims

This study aimed to evaluate the effectiveness of combining PCC and PHM strategies to improve adherence to oral hypoglycaemic agents, optimise clinical outcomes, and promote lifestyle modification among diabetic and hypertensive patients accessing hospital and community services in Hounslow.

2. Methods

2.1 Study Design and Participants

A quantitative intervention design was employed to assess the impact of PCC and PHM on clinical and behavioural outcomes among adults (≥ 18 years) with T2DM and associated comorbidities. Participants were recruited from West Middlesex University Hospital's pre-assessment clinic during 2024 following referral for elective surgery. Of approximately 6,000 screened patients, 221 met inclusion criteria: confirmed T2DM diagnosis, coexisting

hypertension, BMI ≥ 32 kg/m², non-pregnant status, and smoking history exceeding 10 cigarettes/day. Eligible participants were stratified into three intervention studies based on clinical profiles and care delivery models (Appendix 4).

2.2 Study 1: Randomised Controlled Pilot Trial

This pilot randomised controlled trial was conducted at West Middlesex University Hospital in 2024 to evaluate a patient-centred care (PCC) intervention for adults aged 18 years or older scheduled for elective surgery. Eligible participants had type 2 diabetes mellitus (T2DM), HbA1c >75 mmol/mol, coexisting hypertension and poor medication adherence. Of 60 screened patients, 40 met inclusion criteria and were randomly allocated (1:1) to intervention or control using a computer-generated sequence with allocation concealment. The intervention group (n=20) received biweekly PCC counselling sessions (10–15 minutes) for six months, delivered by PCC trained nurses and pharmacists, focusing on medication adherence, lifestyle modification, and self-care. The control group (n=20) received standard care and monthly questionnaires. The primary outcome was change in HbA1c; secondary outcomes included medication adherence, lifestyle adherence, and self-management behaviours. Sample size followed pilot trial guidelines²⁵; no participants were lost to follow-up. Blinding was not feasible due to intervention design (Figure 1) (Appendix 1).

2.3 Study 2: Non-Randomised PCC Intervention

Study 2 targeted 41 patients with uncontrolled hypertension (BP $>160/90$ mmHg) despite pharmacotherapy, and mean baseline HbA1c of 84.3 mmol/mol. Participants received a six-month PCC intervention comprising home monitoring of blood pressure and glucose, alongside personalised lifestyle and dietary counselling delivered by PCC-trained pharmacist and clinical nurse(Appendix 2 and 3).

2.4 Study 3: Non-Randomised Community-Based PCC and PHM Integrated Programme

Study 3 recruited 140 individuals at high risk of T2DM and cardiovascular disease (pre-diabetic HbA1c 39–47 mmol/mol; BP $\geq 140/90$ mmHg) through Healthy Hounslow community services. The six-month structured interventions combined PCC principles with PHM strategies in group-based sessions, addressing weight management, smoking cessation, alcohol reduction, and physical activity. Behavioural change techniques, goal setting, and

peer support were integral components. Primary outcomes included changes in weight, HbA1c, and blood pressure; secondary outcomes assessed lifestyle behaviours (Appendix 4).

3. Data Collection and Analysis

Data sources comprised patient questionnaires (sociodemographic data, medication adherence, PCC experience) and hospital records (HbA1c, BP, BMI). Medication adherence was measured using a NICE-endorsed self-report tool ¹⁴, while PCC experience was assessed via validated questionnaires^{16, 19, 29, 30}. Statistical analyses employed IBM SPSS and Minitab®22. Between-group differences were evaluated using Fisher's Exact Test, Mann-Whitney U Test, and paired/unpaired t-tests. For Study 1, clinically positive outcomes were defined as HbA1c <69 mmol/mol post-intervention. Absolute risk differences (ARDs) and 95% confidence intervals (CIs) were calculated using the Newcombe–Wilson method; Number Needed to Treat (NNT) was derived as the reciprocal of ARD. Analyses were conducted in R (v4.4.0) using the PropCIs package, with significance set at $p \leq 0.05$.

4. Results

4.1 Demographic Characteristics and Comorbidities

The study included 221 participants: 52% White, 28% Asian, 11% Black, 9% other ethnicities, and 0.5% Chinese. Gender distribution was 52% female, 43% male, and 5% unidentified. Most participants (75%) were aged 60–64 years; none were under 18, over 89, or pregnant. Over half (54%) had BMI ≥ 32 kg/m², while 36% had uncontrolled diabetes and 36% poorly controlled hypertension. Additional comorbidities included COPD, asthma, and smoking history (20%) (Table 1).

Table 1. Demographic and Clinical Characteristics of Patients at West Middlesex University Hospital Pre-assessment Unit (January–December 2024)

Age (years)	Number (%)	Gender	Number (%)	Ethnicity	Number (%)	Comorbidities	Number (%)
18–59	43 (19%)	Female	114 (52%)	White	115 (52%)	High BMI ≥ 35	119 (54%)
60–64	166 (75%)	Male	97 (43%)	Asian	62 (28%)	Uncontrolled DM	79 (36%)
65–88	12 (6%)	Not ID	10 (5%)	Black	23 (10.5%)	Poorly controlled HTN	79 (36%)
				Other	20 (9%)	COPD/Asthma/Smoking	44 (20%)
				Chinese	1 (0.5%)		

Note: Some patients had multiple comorbidities.

4.2 Baseline Characteristics of Study 1 Participants

In the randomised controlled pilot trial (Study 1), 40 patients were allocated equally to intervention and control groups. Baseline characteristics were comparable between groups (Table 2).

Table 2. Baseline Characteristics of Participants in Study 1

Characteristic	Intervention (n=20)	Control (n=20)
Age (years), mean $\pm$ SD	58.2 $\pm$ 9.4	57.8 $\pm$ 8.9
Gender, male (%)	55	50
HbA1c (mmol/mol), mean $\pm$ SD	82.5 $\pm$ 6.8	81.9 $\pm$ 7.2
BMI (kg/m ²), mean $\pm$ SD	34.6 $\pm$ 3.2	34.1 $\pm$ 3.5
Systolic BP (mmHg), mean $\pm$ SD	162 $\pm$ 12	160 $\pm$ 11
Smoking history (>10 cigarettes/day), %	40	45

4.2.1 Study-1- Glycaemic Change and Behavioural Outcomes

All 40 participants completed the trial. Baseline HbA1c levels were similar across groups. Post-intervention, the PCC group exhibited a significant reduction in HbA1c from 77.7 mmol/mol to 55.3 mmol/mol ($t = 4.89$, $p < 0.001$), whereas the control group showed negligible change (82.9 to 83.7 mmol/mol, $p = 0.930$). The mean reduction in HbA1c for the intervention group was 23.2 mmol/mol (95% CI: 4.3–42.1), representing a clinically meaningful improvement (Figure 2).

Behavioural outcomes also favoured the intervention group. Healthy eating adherence was reported by 11/20 patients versus 4/20 in controls ($p = 0.048$). Regular physical activity was achieved by 16/20 intervention participants compared to 9/20 controls ($p = 0.048$). Blood glucose monitoring was consistent in 18/20 intervention patients versus 11/20 controls ($p = 0.03$). Knowledge of diabetes management improved significantly (14/20 vs. 6/20, $p = 0.026$). No significant difference was observed in foot checks ($p = 0.20$) or agreement with management plans ($p = 0.6948$). Medication adherence was markedly better in the intervention group, with zero missed weeks compared to three missed weeks in controls ($p < 0.0001$). No medication-related issues were reported in the intervention group, whereas three were noted in controls ($p < 0.0001$).

4.2.2 Number Needed to Treat (NNT)

In Study 1, 18/20 participants (90%) in the PCC group achieved successful outcomes compared to 7/20 (35%) in controls. The absolute risk difference was 55% (95% CI: 13%–79%; $p < 0.001$). The NNT was 1.8 (95% CI: 1.3–7.6), indicating that treating two patients with PCC yields one additional positive outcome compared to usual care.

4.3 Study 2

Among 41 patients with diabetes and uncontrolled hypertension, PCC intervention produced significant improvements. Systolic BP decreased by 27.51 mmHg ($t = 10.28$, $p < 0.001$), diastolic BP by 9.07 mmHg ($t = 6.41$, $p < 0.001$), and HbA1c by 23.05 mmol/mol ($t = 9.97$, $p < 0.001$). Effect sizes (Cohen's d) were large for all outcomes (Figures 3 and 4).

4.4 Study 3- Integration of PCC and PHM

In Study 3, 140 high-risk patients received integrated PCC and PHM interventions via community health services. Among 35 pre-diabetic patients, 70% achieved normal glycaemic range. Eighty percent of hypertensive patients attained normal BP ranges. Of 25 patients referred for alcohol recovery, 20% reduced consumption. Weight management outcomes were notable: 90% of 119 patients with BMI >35 achieved a 5–10% reduction. Smoking cessation was successful in 18% of 44 referred patients.

5. Discussion

5. 1 Evaluation of glycated haemoglobin (HbA1c) Levels and Behavioural Outcomes

Study 1 demonstrated that patient-centred care (PCC) significantly improves glycaemic control and behavioural outcomes in individuals with type 2 diabetes mellitus (T2DM). The reduction in HbA1c observed in the intervention group was clinically meaningful, with a calculated number needed to treat (NNT) of 1.8 (95% CI: 1.3–7.6). These findings align with previous evidence indicating that PCC enhances self-care and clinical outcomes, supporting the integration of PCC into routine care for chronic disease management⁴.

An independent t-test was conducted on 40 participants (20 control, 20 intervention) following a six-month PCC intervention. The control group exhibited minimal changes in HbA1c (pre-intervention: 82.9 mmol/mol; post-intervention: 83.7 mmol/mol; $p = 0.930$),

whereas the intervention group showed a substantial reduction (pre-intervention: 77.7 mmol/mol; post-intervention: 55.3 mmol/mol; $p < 0.001$). These results indicate that PCC has a clinically significant impact on glycaemic control.

The effectiveness of PCC interventions in reducing HbA1c has been widely studied, with mixed findings. For instance, a systematic review by Asmat et al. (2022)⁵ reported that PCC interventions improved glycaemic control and self-care behaviours compared to usual care. Conversely, Cheng et al. (2018)¹² found that while PCC enhanced dietary management and blood glucose self-monitoring, it did not significantly reduce HbA1c. Despite variability in outcomes, the evidence generally supports PCC as a strategy for improving glycaemic control, particularly when patients are actively engaged in care processes^{12, 24}. Our findings are consistent with previous research, suggesting that PCC effectively reduces HbA1c levels through collaborative partnerships between healthcare providers and patients, addressing clinical, educational, and psychological aspects of diabetes management^{7, 20}. The calculated NNT of 1.8 (95% CI: 1.3–7.6) indicates that approximately two patients need to receive PCC to achieve one additional positive outcome compared to usual care.

Behavioural outcomes were evaluated in study 1 to assess the impact of the patient-centred care (PCC) intervention on diabetes self-management practices. Adherence rates between the intervention and control groups were compared using Fisher's Exact Test. Participants in the intervention group demonstrated significantly higher adherence to healthy eating (11/20 vs. 4/20, $p = 0.048$), regular exercise (16/20 vs. 9/20, $p = 0.048$), and blood glucose monitoring (18/20 vs. 11/20, $p = 0.03$) compared with the control group. These findings suggest that PCC not only improves clinical outcomes but also strengthens self-management behaviours essential for long-term diabetes control. Previous studies support these results; for instance, Asmat et al. (2022)⁵ reported that PCC-based interventions enhance self-care behaviours, while Gonzalez et al. (2020)²² found that PCC promotes engagement in physical activity, dietary changes, and glucose monitoring. Our findings corroborate this evidence by demonstrating that PCC effectively improves adherence to key lifestyle practices.

Medication adherence also improved significantly in the intervention group. Mann-Whitney U-Test analysis showed that participants missed fewer weeks of medication (median = 0 vs. 3 weeks, $p < 0.0001$) and reported fewer medication-related problems (median = 0 vs. 3 weeks,

$p < 0.0001$). These results highlight PCC's ability to address both clinical and psychosocial aspects of care, which are critical for adherence. Consistent with our findings, previous research by Dilles et al. (2023)¹⁶, Cheng et al. (2018)¹², and Johnson et al. (2017)²⁴ demonstrated that PCC interventions are associated with improved medication adherence. This positive impact can be attributed to PCC's approach, which prioritises individual preferences, addresses concerns, and provides tailored education. The findings of study 2 demonstrate that PCC intervention was highly effective in improving clinical outcomes among patients with diabetes and uncontrolled hypertension. Significant reductions were observed in systolic blood pressure (-27.51 mmHg), diastolic blood pressure (-9.07 mmHg), and HbA1c (-23.05 mmol/mol), all with large effect sizes and strong statistical significance ($p < 0.001$). These results suggest that PCC-based strategies can substantially enhance blood pressure and glycaemic control in this high-risk population, supporting their integration into routine clinical practice.

5.2 Integration of Patient-Centred Care (PCC) and Population Health Management (PHM)

The integration of PHM has been shown to enhance clinical outcomes and improve medication adherence, offering a more comprehensive approach to managing chronic conditions^{4, 10, 30}. In the present study, the combined implementation of PCC and PHM not only facilitated personalised care but also addressed the broader health needs of at-risk populations. This dual approach was associated with significant improvements across multiple health indicators, including reductions in blood pressure, blood glucose levels, and BMI, as well as improved medication adherence, successful smoking cessation, and reduced alcohol consumption. These findings align with previous research demonstrating the effectiveness of integrated care models. For example, Schmitt diel et al. (2017)²⁷ reported that integrating PCC with PHM led to improved care quality, better medication adherence, and a reduction in hospitalisations. Similarly, our results reinforce the value of such integration in supporting chronic disease management within community healthcare settings.

Furthermore, a systematic review and meta-analysis conducted by Zarora et al. (2022)³⁰ evaluated integrated diabetes care interventions involving specialists in primary and community care environments. The review concluded that integrated approaches significantly improved clinical outcomes—particularly glycaemic control—when compared

with standard care. Collectively, these findings suggest that a population-level strategy, when integrated with patient-centred care principles, can amplify individual health benefits and contribute to improved overall health outcomes. The evidence supports the adoption of integrated PCC and PHM models as a cornerstone of effective chronic disease management⁴.

6. Strengths and Limitations

The integration of Patient-Centred Care (PCC) and Population Health Management (PHM) offers several notable strengths. It has demonstrated clear benefits in improving care coordination and enhancing patient outcomes. The approach promotes multidisciplinary collaboration and encourages the adoption of Patient-Centred Care, contributing to more responsive and efficient healthcare delivery. By addressing both individual and population-level needs, this model ensures that interventions are tailored yet scalable, supporting equity in healthcare provision.

However, several limitations remain. Fragmented care systems and the absence of integrated health records pose significant barriers to effective implementation. Limited funding and resource constraints further hinder progress, while reluctance among healthcare providers to embrace PCC principles slows adoption. Additionally, there is a critical need for ongoing education and training for both patients and healthcare professionals to support sustainable integration of these care models. Without these structural and cultural changes, the full potential of PCC and PHM integration may not be realised.

7. Conclusion

In conclusion, this study highlights the effectiveness of integrating Patient-Centred Care (PCC) with Population Health Management (PHM) in managing diabetes and hypertension. The intervention led to significant improvements in HbA1c levels, medication adherence, self-management behaviours, and blood pressure control. This dual approach not only enhanced individual outcomes but also supported a broader, population-focused healthcare strategy—essential for tackling public health challenges. The synergy between PCC and PHM demonstrates a promising model for chronic disease management. Future research should explore its cost-effectiveness, scalability, and long-term impact across diverse healthcare settings to maximise benefits for patients and health systems alike.

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Consent to participate: All participants gave verbal consent during the pre-assessment clinic, confirming their willingness to participate in the study.

Author's contribution: Thewodros Leka is the guarantor of this work and accepts full responsibility for the integrity of the content, including the data analysis, study design, and data collection. All other authors participated and supported in data analysis and writing the manuscript. All authors read and approved the final manuscript.

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Figure 1. Number of patients included in the study and those lost to follow-up.

Figure 2. HbA1c concentrations pre- and post-intervention in Study 1 (N=40).

Figure 3. Individual systolic and diastolic BP readings pre- and post-intervention.

Figure 4. HbA1c concentrations pre- and post-intervention

Data Availability Statement

The data that support the findings of this study are in Appendix 1, 2, 3 and 4.

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