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Impact of an Ambulatory Clinical Pharmacy Population Health Initiative on HbA1c Reduction and Value-Based Measures: A Retrospective, Single-Center Cohort Study

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Abstract: Background: Studies of pharmacists' clinical programs have demonstrated improvements in controlling chronic diseases. However, significantly less data are available regarding pharmacist impact in a value-based Patient-Centered Medical Home (PCMH). The present study assessed a population health initiative to incorporate pharmacists for the management of type 2 diabetes (T2D), hypertension, and hyperlipidemia in a PCMH. **Methods**: This was a single-center retrospective cohort study of patients with T2D and baseline glycated hemoglobin (HbA1c) greater than 9%. Patients were excluded if they received care from an endocrinology provider or were lost to follow-up during the observation window of 1 January 2023 through 31 July 2023. Patients were analyzed in two cohorts: (1) patients who received any outpatient care from a clinical pharmacist (pharmacist cohort) and (2) patients who did not receive any outpatient care from a clinical pharmacist (usual care cohort). The primary outcome was the proportion of patients achieving an HbA1c of less than 8%. Secondary outcomes included blood pressure control and receipt of guideline-directed statin therapy. **Results**: Ninety-one patients were identified, twenty-nine in the pharmacist cohort and sixty-two in the usual care cohort. The overall population was older (mean age ~66 years), 59% female, and racially diverse (<50% Caucasian). HbA1c less than 8% was achieved in 34% of patients in the pharmacist cohort and 29% of patients in the usual care cohort ($p = 0.001$). A blood pressure goal of less than 140/90 mmHg was achieved more frequently in the pharmacist cohort (90% vs. 61%, $p = 0.006$), but guideline-directed statin therapy was similar between groups (90% vs. 79%, $p = 0.215$). **Conclusions**: Pharmacists can play an integral role within a PCMH to improve value-based measures for HbA1c and blood pressure control. Further research is needed to assess the impact of pharmacist care on statin use and economic outcomes.

Keywords: diabetes mellitus; type 2; glycated hemoglobin; patient-centered care; pharmacists; population health; quality indicators

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1. Introduction

Historically, Medicare reimbursed providers via a fee-for-service structure that provided payment per individual service provided. Since the passage of the Affordable Care Act in 2010, there has been a shift in reimbursement to focus on the quality of care rather than the quantity of care, with the aim to lower cost and improve health outcomes for individual patients and populations [1]. To measure this quality of care, Medicare plans use value-based measures, such as those set by the Healthcare Effectiveness Data and Information Set (HEDIS) and Centers for Medicare & Medicaid Services (CMS). The achievement of these intermediate measures can help increase overall value-based reimbursement rates to the clinic but also presents an opportunity to minimize the long-term complications of various chronic diseases.

The Patient-Centered Medical Home (PCMH) is one care model used to achieve the goals of value-based care. The PCMH model puts the patient at the center of care to deliver cost-effective, high-quality, team-based management of chronic conditions [2]. Pharmacists provide expertise in pharmacotherapy as part of team-based care to help meet the value-based goals of the PCMH. The ability of pharmacists to provide coordinated medication expertise to improve access to high-quality care has been shown in many settings [3]. One review of 39 randomized controlled trials including a total of 5474 patients found that pharmacist involvement in type 2 diabetes (T2D) care resulted in a mean glycated hemoglobin (HbA1c) decrease of 0.05% to 2.1%, with 16 studies finding a statistically significant difference [4]. Additionally, a retrospective matched cohort study of 1960 patients found that patients seen by a pharmacist were more likely to achieve the HEDIS HbA1c goal of less than 8% within 3 months (OR = 2.44, $p < 0.0001$) [5]. Moreover, a retrospective pre-post intervention study of 105 patients with T2D found that pharmacists improved the key quality measures of statin use and completion of diabetic eye exams [6].

One study found that pharmacists in primary care can fill gaps in care to increase the likelihood of quality measure achievement [7]. While this study included seven quality measures, only one addressed chronic disease treatment (HbA1c control). Therefore, while pharmacist impact has been shown to lower HbA1c and improve chronic disease control generally, data are scant in demonstrating pharmacist impact on improving value-based measures in a PCMH when addressing T2D, hypertension, and hyperlipidemia concurrently, as many pharmacist-driven programs may desire to do.

Therefore, this study aimed to assess a population health initiative to incorporate pharmacists for the management of T2D, hypertension, and hyperlipidemia in a PCMH, specifically by assessing the value-based measures of HbA1c less than 8%, blood pressure less than 140/90 mmHg, and statin use.

2. Materials and Methods

2.1. Setting

Tampa General Medical Group (TGMG, Tampa, FL, USA) consists of multiple primary care clinics associated with a large academic medical center. TGMG has an affiliation with the University of South Florida (USF) Health, providing a unified management and coordination of care that aims to deliver cost-effective care and successful value-based care, with recognition by the National Committee for Quality Assurance (NCQA) as a PCMH. A pharmacist-led population health initiative was implemented at these clinics to reduce HbA1c in patients with uncontrolled T2D (HbA1c greater than 9%). Pharmacists worked in a collaborative practice model to evaluate the safety and efficacy of drug therapy, order and interpret laboratory tests, and adjust medication regimens.

2.2. Pharmacist Care Model

Patients evaluated in this study were seen by one of nine ambulatory care pharmacists at one of 17 TGMG primary care clinics. Patients were either referred by their primary care provider for diabetes education and management, regardless of baseline HbA1c, or auto-enrolled in pharmacy services based on HbA1c being greater than 9% within the year 2022. Upon initial consultation for pharmacotherapy services, pharmacists set up an in-person or telehealth appointment to complete a comprehensive medication review, including previous antihyperglycemic regimens trialed. Each subsequent visit consisted of a subjective review of self-reported blood glucose readings or continuous glucose monitor (CGM) data, screening for hypoglycemic events, discussion of lifestyle and exercise habits, and medication regimen adjustments as allowed in the collaborative practice agreement. Pharmacists also assessed for additional therapies, including a statin therapy for atherosclerotic cardiovascular disease (ASCVD) prevention, antihypertensives for blood pressure control, and other health maintenance recommendations, such as immunizations and referrals to ophthalmology, podiatry, and dental providers.

2.3. Study Design

This was a retrospective, single-center cohort study of adult patients seen at TGMG Family Care Centers. Patients were reviewed for inclusion from quality improvement and Medicare Advantage plan reports of patients identified as having uncontrolled T2D during the year 2022. Uncontrolled diabetes was defined by the CMS star rating measure C11: Diabetes Care—Blood Sugar Controlled as HbA1c greater than 9%. Patients whose primary payor was either UnitedHealthcare (UHC, Minneapolis, MN, USA) or Florida Blue Medicare Advantage Plan were included if they were 18 years of age or older with uncontrolled T2D, had a baseline visit and HbA1c measure in 2022, and had at least one follow-up visit and HbA1c measure during the study period. Patients were excluded if they received outpatient care from an endocrinology provider within the study period, as such patients likely represent a more complex subgroup of patients with T2D. This study was determined to be exempt by the institutional review board at the University of South Florida. The STROBE guidelines were used to ensure the reporting of this observational cohort study [8].

Laboratory values and encounter data were extracted via chart review of the electronic medical record using a standardized data collection sheet. Diabetes management encounters assessed as part of the chart review were completed by pharmacists or primary care providers (i.e., physicians, advanced practice registered nurses, physician assistants) and were either in-person or via telehealth. Baseline demographics, HbA1c, medications, comorbidities, and blood pressure were collected from the last encounter in 2022 and each encounter during the study period of 1 January 2023 through 31 July 2023 (Figure 1). Patients were included in the pharmacist cohort if they had at least one visit with an outpatient clinical pharmacist for diabetes management during the study period in which they received care according to the pharmacist care model described above. These patients were also co-managed by their primary care provider. Patients were included in the usual care cohort if they received care from their primary care provider with no care provided by an outpatient clinical pharmacist during the study period.

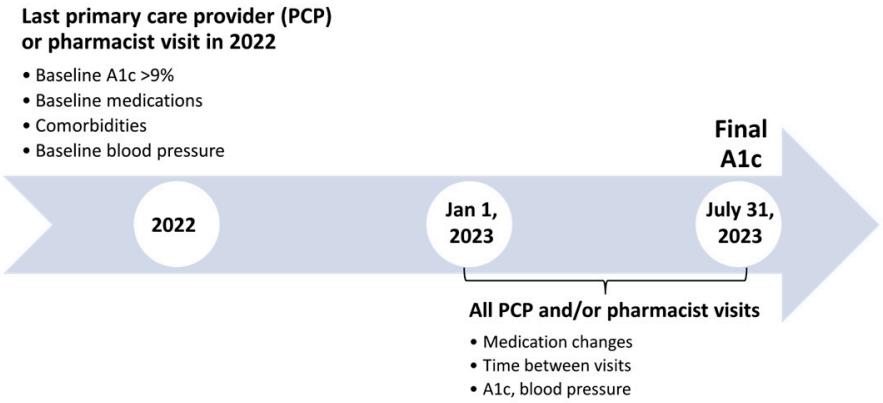


Figure 1. Study design.

2.4. Outcomes

The primary outcome of this study was the proportion of patients achieving HbA1c of less than 8% in the pharmacist cohort versus the usual care cohort. Baseline HbA1c was defined as the last HbA1c measure greater than 9% obtained within the year 2022. Follow-up HbA1c was defined as the last HbA1c measure obtained during the study period. Secondary outcomes included the proportion of patients achieving blood pressure control at the last clinic visit within the study period (defined per HEDIS measure, less than 140/90 mmHg) [9] and the proportion of patients receiving any statin therapy (defined per the HEDIS measure) [10,11]. Additional secondary outcomes included the proportion of patients with at least a 1% reduction in HbA1c from baseline, frequency and interval of visits for diabetes management within the study period, and the number of

medication adjustments (defined as any dose modification, initiation, or discontinuation of antihyperglycemics, antihypertensives, or statins).

2.5. Statistical Analysis

Continuous baseline characteristics and outcomes were reported as mean with standard deviation, and categorical baseline characteristics and outcomes were reported as the number (%). The student's *t*-test was used to compare means between cohorts for continuous variables, the Wilcoxon rank sum test was used to compare between cohorts for ordinal variables, and the chi-square test was used to compare between cohorts for categorical variables. Microsoft Excel Version 2310 (Microsoft, Redmond, WA, USA) was used for data collection and analysis, with *p*-values less than 0.05 considered significant.

3. Results

Electronic reports of patients seen at TGMG Family Care Centers in 2022, whose primary payor was UHC, Florida Blue, or Medicare Advantage, identified 630 patients with T2D. Of these, 91 patients met inclusion and exclusion criteria, with the most common reason for exclusion being that they did not have uncontrolled diabetes (Figure 2). Of the 91 included patients, 29 were in the pharmacist cohort and 62 in the usual care cohort.

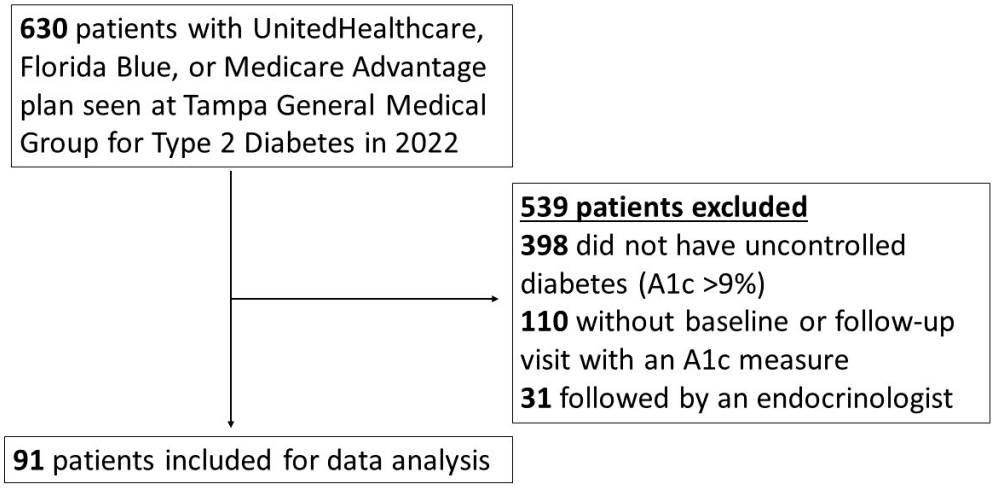


Figure 2. Inclusion and exclusion criteria.

Baseline characteristics were similar between cohorts (Table 1), with a mean age of 66 years and baseline HbA1c of 10.5%. Most patients were Caucasian or African American. Baseline medications were similar among cohorts, except metformin was used more often in the usual care cohort (66% versus 41%, $p = 0.026$), and sodium-glucose cotransporter-2 inhibitors were used more often in the pharmacist cohort (55% versus 32%, $p = 0.037$). More patients in the pharmacy cohort were followed by a pharmacist in the year prior to the study period (76% versus 27%, $p < 0.001$). Both cohorts had similar comorbid conditions, with the most common comorbidities being hypertension and hyperlipidemia. Blood pressure control was similar between groups at baseline (pharmacist cohort, 62%; usual care cohort, 63%; $p = 0.939$), as was statin use (pharmacist cohort, 86%; usual care cohort, 76%; $p = 0.255$).

By the end of the study period, 34% of patients in the pharmacist cohort met the primary outcome of having an HbA1c of less than 8%, compared to 29% of those in the usual care cohort ($p = 0.001$) (Table 2). The mean time between baseline and final HbA1c measurement was shorter in the pharmacist cohort, with a mean of 221 days (SD 86) versus 286 days (SD 128) in the usual care cohort ($p = 0.015$). For the secondary outcome of percent reductions in HbA1c, 52% of patients in the pharmacist cohort had an HbA1c reduction of at least 1% versus 63% in the usual care cohort ($p = 0.512$).

Table 1. Baseline characteristics.

Characteristic [a]	Pharmacist Cohort (n = 29)	Usual Care	p-Value
Age, mean (SD)	65 (12.9)	67 (8.7)	0.333
HbA1c, mean (SD)	10.4 (1.2)	10.5 (1.5)	0.766
Race			
Caucasian	13 (45)	29 (47)	0.862
African American	14 (48)	19 (31)	0.103
Other	2 (7)	7 (11)	0.513
Ethnicity			
Hispanic	5 (17)	7 (11)	0.434
Payer			
UnitedHealthcare	11 (38)	23 (37)	0.939
Florida Blue	3 (10)	10 (16)	0.462
Medicare Advantage	15 (52)	29 (47)	0.660
Followed by pharmacy in year prior to study period	22 (76)	17 (27)	<0.001
Medications			
Metformin	12 (41)	41 (66)	0.026
Sulfonylurea	4 (14)	14 (23)	0.327
Thiazolidinedione	2 (7)	5 (8)	0.846
DPP-4 inhibitor	0 (0)	7 (11)	0.060
SGLT2 inhibitor	16 (55)	20 (32)	0.037
GLP-1 and/or GIP agonist	17 (59)	23 (37)	0.054
Insulin	20 (69)	34 (55)	0.201
ACEi or ARB	23 (79)	47 (76)	0.712
Comorbidities			
Hypertension	23 (79)	52 (84)	0.712
Hyperlipidemia	19 (66)	37 (60)	0.594
Clinical ASCVD	14 (48)	21 (34)	0.594
Heart failure	4 (14)	6 (10)	0.188
Chronic kidney disease	5 (17)	15 (24)	0.559
Obesity	9 (31)	21 (34)	0.789
Statin use	25 (86)	47 (76)	0.255
BP < 140/90	18 (62)	39 (63)	0.939

Abbreviations: ACEi = angiotensin-converting enzyme inhibitor; ARB = angiotensin II receptor blocker; ASCVD = atherosclerotic cardiovascular disease; BP = blood pressure; DPP-4 = dipeptidyl peptidase 4; GLP-1 = glucagon-like peptide 1; GIP = glucose-dependent insulinotropic peptide; SGLT2 = sodium-glucose cotransporter-2. [a] All data are Nos. (%) unless otherwise indicated.

Table 2. Primary and secondary outcomes.

	Pharmacist Cohort (n = 29)	Usual Care	p-Value
Primary Outcome			
HbA1c < 8%, No. (%)	10 (34)	18 (29)	0.001
Secondary Outcomes			
HbA1c reduction of at least 1%, No. (%)	15 (52%)	39 (63%)	0.512
Days between baseline and follow-up HbA1c, mean (SD)	221 (85.6)	286 (128.0)	0.015
Number of visits, mean (SD)	5.8 (3.4)	1.8 (0.8)	<0.001
Days between visits, mean (SD)	34 (18.0)	72 (31.4)	<0.001
Medication changes, mean (SD)	3.5 (3.2)	1.2 (1.2)	<0.001
Statin use, No. (%)	26 (90)	49 (79)	0.214
Final BP < 140/90, No. (%)	26 (90)	38 (61)	0.006

Abbreviations: BP = blood pressure.

Patients in the pharmacist cohort were seen more often for diabetes management, with a mean number of visits of 5.8 (SD 3.4) versus 1.8 (SD 0.83) with usual care ($p < 0.001$). The mean time between visits was 34 days (SD 17.98) for pharmacist care versus 72 days (SD 31.42) for usual care ($p < 0.001$). Patients managed by pharmacists had more changes to their medication regimen during the study period, with a mean number of medication

changes of 3.5 (SD 3.15) versus 1.2 (SD 1.19) with usual care ($p < 0.001$). At the end of the study period, 90% of patients had blood pressure control of less than 140/90 mmHg in the pharmacist cohort versus 61% of patients in the usual care cohort ($p = 0.006$). Finally, 90% of patients in the pharmacist cohort versus 79% of patients in the usual care cohort received statin therapy ($p = 0.215$).

4. Discussion

This study found that a pharmacist-led population health initiative improved the attainment of value-based quality measures in a PCMH among patients with uncontrolled T2D at baseline. Patients receiving care from a pharmacist were significantly more likely to have HbA1c less than 8% within 6 months versus patients not receiving pharmacist care. The mean time to the CMS-defined HbA1c control goal was significantly shorter in the pharmacist cohort versus usual care by approximately 2 months. Additionally, this study highlighted the impact of pharmacist care on other value-based measures, such as blood pressure control and guideline-directed statin therapy. While the difference in blood pressure control was statistically significant, the study may have been underpowered to detect a difference in treatment with a statin versus usual care. Based on a post hoc power calculation with the available sample size and an alpha equal to 0.05, the present study had 19.5% power to show a statistically significant difference between groups (pharmacist cohort with ~90% statin use versus usual care, with ~80% statin use).

The most likely factor contributing to the difference in outcomes was the greater frequency of visits and medication changes in the pharmacist cohort versus the usual care cohort. As the patients in the pharmacist cohort were also seen by their primary care provider, achievement of clinical measures cannot be attributed to pharmacist involvement alone but rather the team-based approach fostered by the population health initiative. It is also possible that patients seen by a pharmacist were more motivated to participate in their own care or had fewer access barriers to regular visits. For example, 17 (27%) patients in the usual care cohort saw a pharmacist in the previous year but were unreachable by pharmacists during the study period. The higher percentage of patients followed by a pharmacist in the year prior to the study period in the pharmacist cohort (76% versus 27%) may also explain why a greater proportion of these patients were already on newer, effective antihyperglycemic medications, such as sodium-glucose cotransporter-2 inhibitors and glucagon-like peptide-1 receptor agonists, at baseline. Despite this difference, a greater percentage of patients in the pharmacist cohort achieved HbA1c control.

While several studies report similar findings regarding the beneficial impact pharmacists have on HbA1c control [12,13], the present study provides key insight into the potential mechanism of this benefit, that being more frequent visits and medication changes. Increased frequency of monitoring presents more opportunity for medication counseling, reinforcement of adherence, medication adjustments, and avoidance of therapeutic inertia. Notably, the pharmacy workflow included referral back to usual care once the HbA1c goal was achieved. A study by Bou-Ghazale et al. supports this approach, as it found no difference in mean HbA1c levels after the cessation of pharmacist involvement in care after a mean of 10.5 months [14]. However, this may have also resulted in a greater mean HbA1c in the usual care group, given the potential for longer follow-up.

Limitations of this study include a retrospective study design, limited sample size, and short follow-up time. The period between baseline and the final HbA1c measurement was shorter in the pharmacist cohort, leaving potential further reductions in HbA1c uncaptured. However, the short follow-up time indicates that extended time periods are not needed for pharmacists to impact quality measures. This study also did not assess specific medication adjustments made by pharmacists, apart from the numerical amount made during the study period. Future studies are needed to assess the long-term impact of pharmacist involvement on value-based measures, including the long-term control of chronic disease, patient loss of control following referral back to usual care, and the downstream effect on clinical and economic outcomes. This study did not assess specific interventions made by pharmacists,

such as the interpretation of CGM devices, lifestyle counseling, comprehensive medication review, and financial assistance, due to a lack of a specific tracking mechanism. Future investigations should assess the frequency of these interventions and their respective effects on specific outcome measures.

5. Conclusions

Overall, improvements in measures related to diabetes, hypertension, and (numerically) hyperlipidemia through a collaborative practice model within the primary care treatment team demonstrate a successful implementation of the pharmacist population health initiative in the PCMH. The implication of these outcomes extends beyond the achievement of payor-driven value-based measures to why they are important, with the potential to reduce the cardiovascular risk and microvascular complications expected among patients with T2D [15].

The pharmacist-led population health initiative studied was associated with improved HbA1c control among patients with uncontrolled T2D at baseline. Additionally, patients seen by pharmacists were more likely to meet value-based quality measures for blood pressure control. These findings support pharmacists as an integral member in team-based care provided in the PCMH model at primary care clinics with a large academic medical center. Further research is needed to assess the impact of pharmacist care on statin use and economic outcomes.

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Data Availability Statement: The data presented in this study are available upon request from the corresponding author due to privacy restrictions.

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