



Published in final edited form as:

J Public Health Manag Pract. 2024 ; 30: S141–S151. doi:10.1097/PHH.0000000000001962.

The impact of health equity-informed eligibility criteria to increase the delivery of pharmacist-delivered comprehensive medication management services for patients with high blood pressure

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Abstract

Objective.—Evaluate a cardiovascular care intervention intended to increase access to comprehensive medication management (CMM) pharmacy care and improve vascular health goals among socially disadvantaged patients.

Design.—Retrospective electronic health records-based evaluation.

Setting.—Thirteen healthcare clinics serving socially vulnerable neighborhoods within a large health system.

Participants.—Hypertensive and hyperlipidemic adult patients.

Intervention.—CMM pharmacists increased recruitment among patients who met clinical criteria in clinics serving more diverse and socially vulnerable communities. CMM pharmacists partnered with patients to work toward meeting health goals through medication management and lifestyle modification.

Main Outcome Measure(s).—Changes in engagement of socially disadvantaged patients between pre-intervention and intervention time periods; vascular health goals (i.e. controlled blood pressure, appropriate statin and aspirin therapies, tobacco non-use) and use of health system resources by CMM care group.

Results.—The intervention indicated an overall shift in sociodemographics among patients receiving CMM care (fewer non-Hispanic Whites: N=1988, 55.81% vs. N=2264, 59.97%, $p<.001$; greater place-based social vulnerability: N=1354, 38.01% vs. N=1309, 34.68%, $p=.034$; more patients requiring interpreters: N=776, 21.79% vs. N=698, 18.49%, $p<.001$) compared to the pre-intervention period. Among patients meeting intervention criteria, those who partnered with CMM pharmacists (N=439) were more likely to connect with system resources (social work: N=47, 10.71% vs. 163, 3.74%, $p<.001$; medical specialists: N=249, 56.72% vs. N=1989, 45.66%;

p<.001) compared to those without CMM care (N=4356). Intervention patients who partnered with CMM pharmacists were also more likely to meet blood pressure (N=357, 81.32% vs. N=3317, 76.15%, p<.001) and statin goals (N=397, 90.43% vs. N=3509, 80.56%, p<.001) compared to non-CMM patients.

Conclusions.—Demographics of patients receiving CMM became more diverse with the intervention, indicating improved access to CMM pharmacists. Cultivating relationships among patients with greater social disadvantage and cardiovascular disease and CMM pharmacists may improve health outcomes and connect patients to essential resources, thus potentially improving long-term cardiovascular outcomes.

Keywords

Medication therapy management; Social determinants of health; Hypertension; Dyslipidemia; Pharmacy care; Secondary prevention; Patient Care team

Introduction

While there have been major clinical advances in cardiovascular disease (CVD) throughout the past few decades,¹ CVD remains the leading cause of death and long-term disability among adults in the United States.² Wide chasms of disparity in CVD diagnosis, care, and outcomes are reported based on race, ethnicity, sex, and socioeconomic status.^{3,4} These sociodemographic characteristics are embedded within social determinants of health (SDOH) and are implicated as key predictors of the development of CVD risk factors provoking downstream adverse events.⁵ Through the social-ecological model, these SDOH interact at individual, interpersonal, organizational, community, and systems levels across the lifespan, and form the foundation of health inequities that are central to the unequal health status experienced by many populations.⁶ Given the complex ecosystem surrounding health inequities, partnerships between organizations invested in healthcare, community health, and public health are needed to address SDOH and create more equitable health outcomes within CVD treatment and care.⁷

While the primary care physician is often the first to detect chronic diseases like CVD,⁸ there are many partnerships within a healthcare system to aid in the management of disease processes like dietitians, social workers, and cardiologists.⁹ Comprehensive medication management (CMM), a pharmacist-led service, is one such crucial program within CVD care that optimizes clinical outcomes and improves health literacy through personalized patient-pharmacist partnerships aimed at the understanding of disease processes, managing medications, reducing adverse medication events, defining and creating pathways to meet health goals, referring patients to beneficial services, and improving adherence to medications.^{10,11} CMM pharmacist partnerships have been shown to improve patient experience, reduce healthcare costs, increase access to healthcare, and improve health outcomes generally, as well as among chronic disease-specific subpopulations.^{10–12} CMM partnerships also improve physician professional satisfaction through decreasing workload and increasing quality of patient care.^{12,13}

Patients with greater SDOH burden are less likely to access health services, despite being at higher risk for CVD and other chronic diseases.¹⁴ Similarly, patients from vulnerable populations are less likely to be actively engaged in managing their health, necessitating a need for more intentional, direct efforts by health care providers to build productive, trusting relationships.¹⁵ Since CMM pharmacists create effective partnerships with patients to reduce the burden of chronic disease,¹² ensuring that patients with greater SDOH burden and those from socially vulnerable communities have access to CMM pharmacists may be crucial to improving their downstream wellbeing. As such, a large Midwestern health system collaborated with the Minnesota Department of Health to establish an intervention to improve access to CMM services for patients with CVD risk factors who were treated at clinics located in communities of high social vulnerability. This analysis serves to evaluate this pharmacist-led CMM intervention to determine whether the sociodemographics of all CMM patients changed following intervention, indicating increased diversity among participants, and to examine whether CMM partnerships with intervention-eligible patients aided in achieving patient health goals.

Methods

Study setting and design

This was a collaboration between the Minnesota Department of Health, Cardiovascular Health Unit and a large nonprofit, academic health system consisting of 52 primary care clinics and 12 hospitals and medical centers, with clinicians practicing >100 specialties within urban, suburban, and rural Midwestern communities. The health system employs a robust team of Comprehensive Medication Management (CMM) pharmacists who practice within 42 primary care and 16 specialty clinics. CMM pharmacists are available in-person, telephonically, and via video for appointments, and treat an average of 18 000 patients annually across the health system.

This intervention and associated activities reported in this manuscript occurred in response to grant number 5 NU58DP006611, funded by the Centers for Disease Control and Prevention which had the goal of increasing the reach and effectiveness of evidence-based public health strategies in communities with a high burden of diabetes, heart disease, and stroke through a multifaced approach, including innovative ways to expand team-based care for patients with high blood pressure and high blood cholesterol. In order to address these complex community health challenges, this approach targeted multiple focus areas of the HEI Conceptual Framework for CVD, notably health care access, socioeconomic factors, and neighborhood characteristics.⁶ At the institutional level, pharmacy services within this health system took a leadership role, initiating individually-tailored skills building and learning opportunities for CMM pharmacists focused on better serving a diverse patient population. This included the taking part in the Individual Development Inventory (IDI)¹⁶ by 77% of ambulatory pharmacists to enhance cultural competency, the initiation of an active Diversity, Equity, and Inclusion committee responsible for implementing system-wide training and leadership opportunities, conducting focus groups to identify challenges that pharmacists face in providing effective care in response to disparate patient needs and possible resolutions to inform ongoing quality improvement initiatives.

While skills building and learning initiatives broadly targeted the entire system-wide CMM pharmacist team, this intervention more specifically focused on 13 urban and suburban clinics located in neighborhoods with high social vulnerability to bolster the wellbeing of patients with CVD risk factors through recruitment to CMM care. This is a retrospective, observational evaluation of CMM patients who received care between October 2019 and September 2023 within the 13 target clinics to determine the impact of a novel, pharmacist-led intervention. This project was not research. This manuscript describes the rigorous evaluation of a public health program.

Evaluation Population

Clinic Population—Intervention clinics were selected based upon neighborhood social vulnerability and patient sociodemographic data, and having a CMM pharmacist already supporting clinical activities. Clinics initiated intervention activities in 3-phases: in October 2019, 5 primary care clinics and 1 psychiatric specialty clinic began CMM recruitment initiatives, with 4 additional primary care clinics joining recruitment initiatives in October 2020, and 3 primary care clinics joining in October 2021.

To determine if intervention activities were successful in increasing diversity among the CMM patient population, adult patients from target clinics were identified retrospectively from the electronic health record (EHR; Epic; Verona, WI). Of note, the health system had two instances of the EHR until mid-2021 when they were consolidated; all data were available in both EHR instances unless otherwise noted. Included patients were 18-years-old and completed at least one visit with their care provider during the study period at a clinic wherein the primary intervention occurred.

Primary Intervention Population—Adult patients who had high blood pressure, defined as two measurements $>140/90$ mmHg occurring within 6-months, and/or elevated low density lipoprotein cholesterol (LDL-C), defined as >190 mg/dL occurring within the previous 1-year, were identified retrospectively from data available within the electronic health record (EHR; Epic; Verona, WI) within each participating intervention clinic. Lists of these patients were supplied to CMM pharmacists working within intervention clinics who actively reviewed charts to determine appropriate outreach and services needed by patients. For patients who would benefit from a CMM visit, the pharmacist reached out via telephone to discuss the advantages of CMM partnerships, create relationships, and encourage patients to schedule a visit. Eligible patient lists were produced approximately quarterly for CMM pharmacists, and patients from previous lists who had not completed a CMM visit rolled over to the new contact lists.

Variables of Interest

Intervention Period. The pre-intervention occurred during the 1-year before a clinic began recruiting patients into CMM services using intervention criteria; the intervention period consisted of the 1-year following when a clinic began recruiting patients for the intervention.

Intervention Criteria.: To meet intervention criteria, adult patients had elevated blood pressure, measured as 2 measurements of >140/90 mmHg within 6-months, or 1 elevated LDL-C measurement of >190 mg/dL, within the pre-intervention period.

Sociodemographic variables.: Beginning in 2020, the health system initiated efforts to improve and standardize patient sociodemographic data through encouraging patient self-report at the time of a healthcare visit or anytime through the patient's online portal.¹⁷ Insurance type was determined based on the payer named at patient encounters throughout the period of interest.

Social Vulnerability Index (SVI).: The social vulnerability index was determined based on patient zip code and mapped via census tract¹⁸ to the Centers for Disease Control and Prevention's SVI, which ranks the overall vulnerability of an area based on measures of socioeconomic status, household characteristics, racial and ethnic minority makeup, and housing and transportation features.¹⁹ SVI is a continuous metric ranging from 0 to 1; quartiles of SVI were evaluated to indicate vulnerability from lowest (SVI 0.25) to highest (SVI >0.75).

CVD risk factors.: Hypertension, diabetes, and dyslipidemia diagnoses were based off *International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM)* codes denoted within a patient's problem list. Hypertension was denoted by I10-I1A and subcodes, diabetes was E10-E11 and subcodes, and dyslipidemia was defined as E78.0, E78.2, E78.4–E78.6 and subcodes.

Comorbid Mental Health Diagnoses.: Comorbid mental health diagnoses were based on *ICD-10-CM* codes at patient encounters; codes noted within the category of mental, behavioral, and neurodevelopmental disorders within the Agency for Healthcare Research and Quality's Clinical Classifications Software²⁰ and identified as chronic conditions through that agency's Chronic Condition Indicator database²¹ were flagged as comorbid mental health diagnoses.

Cardiovascular health goals.: Blood pressure was initially categorized per national norms to determine changes over time.²² CVD health goals were modeled off the MN Community Measures' V4 for Vascular Health, where patient clinical data documented in the EHR were categorized as meeting or not meeting blood pressure goals of less than 140/90 mm Hg, tobacco-free status, and taking statins and aspirin as recommended by providers.²¹

Medication Therapy Problems.: Medication therapy problems are documented within CMM visits and are standardized by expert consensus into four categories indication, effectiveness, safety and adherence that include such subcategories as dosing issues, need for additional therapies, or adverse reactions.²³ Medication therapy problem documentation was available in only one instance of the EHR, thus is not available for some patients prior to 2021.

Statistical Analysis

In order to understand shifts in overall CMM patient sociodemographics surrounding the initiation of the intervention, patient characteristics were categorized and summarized as frequency and percent; chi-squared tests evaluated differences in sociodemographic characteristics and clinical CVD risk factors before and after the intervention. A more specific analysis among patients who met the intervention criteria compared patients by CMM status (i.e. 1 visit to CMM or not) during the intervention period using chi-squared tests to evaluate differences in sociodemographics and clinical outcomes, including health goals. Analyses were conducted in SAS, Version 9.3 (SAS Institute Inc.; Cary, NC), with $\alpha=0.05$ set *a priori*. Lastly, a subanalysis of the frequency of medication therapy problems documented within CMM visits occurred among patients meeting intervention criteria; this subanalysis included 243 (55.35%) eligible patients since one of the health system's EHRs did not have this data available prior to the 2021 EHR consolidation.

Results

There were 102 976 patients seen in intervention clinics during the pre-intervention period, of which 3775 (3.67%) were seen by CMM; 103 103 patients were seen within the intervention period with 3562 (3.45%) visiting CMM. The average number of clinic visits per patient decreased by 6.96% from 3.04 to 2.83 between time periods. While the number of patients visiting CMM dropped 5.64%, the average number of CMM visits per patient increased by 11.12% from 3.11 to 3.46 between pre-intervention and intervention time periods.

Table 1 shows characteristics for the overall clinic population in the intervention period, and examines how sociodemographic and CVD risk factors changed among CMM patients from before the CMM intervention through one-year following intervention initiation. CMM patients in the intervention period were less likely to be non-Hispanic White (N=1988, 55.81% vs. N=2264, 59.97%; $p<.001$), and more likely to live within neighborhoods indicated to be the most socially vulnerable (N=1354, 38.01% vs. N=1309, 34.68%; $p=.034$), require interpreters at visits (N=776, 21.79% vs. N=698, 18.49%; $p<.001$), and have Medicaid insurance (N=680, 19.09% vs. N=610, 16.16%; $p=.002$) compared to during the pre-intervention period. CMM patients during the intervention period were also more likely to have greater rates of CVD risk factors like a hypertension diagnosis (N=1922, 53.96% vs. N=1856, 49.17%; $p<.001$), diabetes diagnosis (N=2004, 56.26% vs. N=1907, 50.52%; $p<.001$), and high LDL-C (N=1706, 47.89% vs. N=1647, 43.63%; $p<.001$) compared to the pre-intervention period.

There were 4795 patients eligible for the CMM intervention targeting patients with CVD risk factors; among them 439 (9.16%) had a CMM visit in the 1-year following intervention initiation. Most patients met intervention criteria due to having 2 high blood pressure measurements within 6 months (N=3655, 76.23%). Among 243 CMM patients (55.35%) with information on medication therapy problems, the mean number of medication therapy problems reported at the first CMM visit was 1.75 (standard deviation=1.29), with 20.58% of patients reporting 3 medication therapy problems at their first CMM visit, while 10.70% of patients did not report any medication therapy problems (Data not shown).

Table 2 compares characteristics of patients eligible for intervention by whether they met with a CMM pharmacist. Intervention patients who saw a CMM pharmacist were generally older (Age ≥65-years: N=155, 35.30% vs. N=1129, 25.92%; $p<.001$), less likely to be non-Hispanic White (N=171, 38.95% vs. N=2514, 57.71%; $p<.001$), more likely to live in a community with a high SVI (SVI ≥0.75: N=190, 43.28% vs. N=1647, 37.81%; $p<.001$), and more likely to use interpreters (N=131, 29.84% vs. N=601, 13.80%; $p<.001$) compared to patients who did not visit with a CMM pharmacist. Health system use also differed among patients eligible for intervention based on CMM use; CMM patients were more likely to connect to system resources such as the laboratory (N=287, 65.38% vs. N=2196, 50.41%; $p<.001$), social work (N=47, 10.71% vs. N=163, 3.74%; $p<.001$), medical specialty clinicians (N=249, 56.72% vs. N=1989, 45.66%; $p<.001$), or diabetes educators (N=23, 5.24% vs. N=61, 1.40%; $p<.001$), and were also more likely to utilize acute care services such as the hospital (N=108, 24.60% vs. N=448, 10.28%; $p<.001$) compared to patients who did not utilize CMM. Patients receiving CMM were also more likely to meet blood pressure (N=357, 81.32% vs. N=3317, 76.15%, $p<.001$) and statin use (N=397, 90.43% vs. N=3509, 80.56%, $p<.001$) health goals compared to non-CMM patients, though not aspirin and tobacco goals (Aspirin: N=409, 93.17% vs. N=4197, 96.35%, $p=.003$; Tobacco: N=335, 76.31% vs. N=3548, 81.45%, $p=.011$).

Discussion

This novel, pharmacist-led intervention of patients with CVD occurring within 13 health clinics located within socially vulnerable neighborhoods demonstrated success in increasing racial, socioeconomic, and language diversity among patients who receive CMM pharmacy care. In the intervention period, patients who partnered with CMM pharmacists were more likely to be non-White, need interpreters, and live in more socially disadvantaged neighborhoods than prior to the intervention. These characteristics more commonly describe populations who are less likely to receive CMM care,²⁴ either due to nonreferral or lack of awareness concerning the program,^{14,25} and interact within the experiences of SDOH.^{26,27} Additionally, patients with CVD risk factors who partnered with CMM pharmacists during the intervention period exhibited greater connection with the health system through ancillary and specialist visits compared to those who did not receive CMM care. CMM partnerships likely foster improved health literacy through continual touchpoints of care,¹¹ and may generate higher quality care through a team-based model,²⁸ which may lead to improvement in health goals. The health system leading this work was a large non-profit academic health system with a robust and mature ambulatory pharmacy program that has been implementing CMM since 1998, predating recognition of Medication Therapy Management programs by Centers for Medicare & Medicaid Services in 2003 through the Medicare Prescription Drug Improvement and Modernization Act.²⁹ In contrast to many other health systems, the CMM approach in this particular health system evolved out of primary care services in community clinics, rooted in an integrated team-based approach to hypertension and cholesterol management. These factors have permitted the health system to grow its CMM program in strategic ways, allowing pharmacists to create interpersonal relationship with community members, and subsequently bolster patient supports across

the health system, with access to lab services, specialty care, and other team-based care approaches.

Patients who visited with CMM pharmacists were more likely to utilize system resources, including social workers and specialty clinicians. While this study did not distinguish whether these were referrals from CMM pharmacists, it does suggest greater system engagement, overall, among patients receiving CMM care. CMM patients also showed blood pressure and statin goals were met more frequently. However, only a small percentage (9.16%) of patients who were eligible for intervention opted-in to receive CMM care, leaving space to improve patient engagement with CMM in order to more efficiently improve chronic disease outcomes.^{10,12} This is especially important considering the high need for intervention-eligible patients to receive CMM care, since patients reported an average of 1.75 medication therapy problems during their first CMM visit, and 20% of patients reported 3 medication therapy problems.

Understanding how to connect patients with needed health resources may decrease CVD morbidity, and CMM care is one touchpoint toward greater engagement.¹¹ While there are many other programs that recruit patients into CMM care within the health system, including referrals through care coordination, transition of care from hospitals and rehabilitation facilities, primary care physicians, and through the health system's community pharmacies, CMM pharmacists suggest that patients are more likely to opt-in to CMM services when they receive messaging through multiple pathways. While primary care providers, especially, often have lasting relationships with patients, national data suggest that patients perceive their physicians to lack a whole person-oriented approach to care.³⁰ Team-based integrated primary care models with defined provider roles may more strongly establish these initial relationships in the clinic and efficiently connect patients to CMM and other partners to accelerate better health outcomes.³¹ Certainly, integrated care teams containing CMM pharmacists are associated with better patient outcomes;²⁸ therefore, growing integrated care teams may aid in both formal and informal referrals of CVD patients to CMM pharmacists.

This intervention coincided with two prominent events that may have affected results: the start of the COVID-19 pandemic in March 2020 and the murder of George Floyd by police in May 2020, both of which had lasting, detrimental, and deeply personal effects on the communities surrounding intervention clinics. The early stages of the pandemic indicated notable decreases in patients accessing healthcare services especially for routine examinations and health maintenance, medication shortages due to supply chain disruptions, and staff and supply shortages within health clinics.³² Longer term effects of these disruptions include higher out-of-pocket healthcare costs, the expiration of the public health emergency leading to Medicaid disenrollment affecting millions of Americans, and continued healthcare staffing shortages especially prominent among lower-paid workers.^{33,34} These factors contributed to widening health disparities and increased barriers to care that persisted through the duration of this multi-year intervention.³⁴ Additionally, there were many changes to pharmacy workflow that directly impacted patients eligible for this intervention. For example, the health system's pharmacy commanded COVID-19 vaccination initiatives, including steering numerous large-scale employee- and community-

based vaccine clinics which decreased capacity for typical job duties, including recruitment for this intervention.

The murder of George Floyd in May 2020 amplified racial trauma throughout communities in Minneapolis and St. Paul where the intervention occurred. Research showed abrupt increases in anger, sadness, depression, and anxiety, especially among Black Americans, following this incident.³⁵ This may have acutely affected patients within intervention clinics since these locations were within socially vulnerable communities with higher racial and ethnic diversity compared to the overall Twin Cities metropolitan area.³⁶ Damage from civil unrest led to the temporary closure of some intervention clinics.³⁷ It is possible that many patients, especially within the first cohort of intervention clinics, may have opted-out of CMM services due to existing medical mistrust exacerbated by acute racial trauma.^{38,39} According to a large survey (N=800) of Black Americans, 70% reported race-based discrimination within healthcare and 55% reported regular distrust of the healthcare system.³⁸ Despite low rates of intervention-eligible patients receiving CMM services and decreases in patient volumes within clinics throughout the study period, the current study demonstrated increasing CMM visits per patient during the intervention despite the social landscape. This may be indicative of the strong and trusting relationships CMM pharmacists can forge with patients to work toward health goals, resolve medication therapy problems (e.g. dosing issues, need for additional therapies, adverse reactions), increase medication adherence, and strengthen health literacy.^{10–12}

Despite significant changes in healthcare within the beginning of the 2020s,^{33,34} this evaluation indicates success in engaging patients within socially disadvantaged areas with CMM pharmacists noted by demographic shifts and greater rates of CMM visits per patient when comparing pre-intervention and intervention periods. During the intervention, the CMM program engaged higher rates of non-dominant racial and ethnic groups, individuals needing interpreters, and patients in the highest social vulnerability quartile, which may mitigate some upstream effects of CVD on patients who may be the most likely to be experiencing SDOH. CMM pharmacists within intervention clinics may have been especially determined to make positive change for intervention-eligible patients since the intervention directly aligned with pharmacy services health equity initiatives beginning in 2020, including a facilitated Intercultural Development Inventory¹⁶ that allowed pharmacists to measure their cultural competence and understand steps broaden it. Further, a culture of health equity began to take shape throughout the entire health system with the formation of a systemwide health equity commission in 2020,¹⁷ and a diversity, equity, and inclusion committee encompassing all pharmacy service lines that formed in 2022. These system-wide and pharmacy-centric health equity initiatives may have coalesced within the course of this intervention to improve how pharmacists interacted with patients, thus aiding in shifting the demographics of CMM patients and increasing patient trust within pharmacists.

This intervention highlights successes in reaching socially vulnerable patients through bridging public health and an engaged team of CMM pharmacists in a large health system. To further overcome disparities in healthcare access and outcomes, multidimensional progress across individual, interpersonal, organizational, community, and systems levels is necessary.^{6,7} For example, even when clinic systems are well-designed to promote

engagement among patients, payer contracts vary such that not all patients have equal access to CMM care through their medical insurance.^{40,41} Additionally, due to racial trauma, care affordability, un- or under-insurance status, and shortages of medical workers in some areas, specific sociodemographic groups or those who live in under-resourced areas may have reduced access to quality healthcare services,⁶ thus groups who may be at high risk for adverse CVD outcomes may not enter the health system in ways that allows them to receive adequate preventive care services.^{3,6,42} Engaging community organizations as partners to health systems may bridge gaps through building patient trust, aiding in the coordination of social services to overcome barriers to care, providing targeted health education, and ultimately enhancing equitable health access and outcomes.⁷ In order to create more equitable access to care and improve outcomes among CVD patients within health systems, greater efforts should focus on enhancing team-based integrated care models, such as more effectively facilitating CMM care through integrated clinical models.^{4,9,12,31}

Limitations

This was a retrospective analysis of EHR data; while the health system has worked to improve the collection of self-reported sociodemographics,¹⁷ data may suffer from coding errors, inaccuracies, and nonresponse. Further, it is possible that not all intervention-eligible patients within this analysis were contacted when they first became eligible due to fluctuations in identifying patients for CMM intervention over the multiyear study period, systemwide disruptions (COVID-19 pandemic, murder of George Floyd) or due to pharmacist chart reviews indicating that patients would not benefit from CMM care; data fluctuations occurred due to a consolidation of the EHR, shifting work priorities for CMM pharmacists due to the COVID-19 pandemic, and modifications to processes in response to organizational shifts. While this may indicate a bias toward the null of study results wherein patients deemed intervention-eligible may not have been contacted and therefore would be less likely to enter CMM care during the intervention period, it is likely that these patients would have been contacted for CMM services at some point to allow them access to CMM services, which is the ultimate goal of this intervention.

Acknowledgements:

The authors extend their thanks Eric Betzold, MS, and Allyson Schlichte, PharmD for their contributions to this project's success.

Funding:

This publication was supported by Grant number 5 NU58DP006611, funded by the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention or the Department of Health and Human Services.

Abbreviations:

CMM	Comprehensive medication management
CVD	Cardiovascular Disease
EHR	Electronic Health Record

LDL-C	Low density lipoprotein cholesterol
SDOH	Social determinants of health

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Implications for Policy & Practice

- Collaborations between primary care and ambulatory pharmacists ensures the most appropriate patients are referred into CMM services, enhancing the team-based approach for chronic condition management.
- Structured conversations with CMM pharmacists permit focused assessments of patient needs, building trust with patients and providers, and facilitating referrals to appropriate clinical and social needs supports.
- CMM care provides measurable patient outcomes such as verification of appropriate and effective medication therapy and improved clinical measurements, but also includes longer-term impacts such as increased health literacy and improved overall wellbeing.
- Health system investments in Diversity, Equity, Inclusion learnings and approaches improve pharmacist capacity to meet patients where they are and provide more responsive care.
- Consistent benefits across payers are needed to ensure patients have equitable access to CMM services.
- Partnerships between health systems and public health authorities elevate population health concepts beyond patient clinical measurements by expanding knowledge of community characteristics that perpetuate health inequities, improving understanding between pharmacists, providers, patients, and the communities where they live, work, and play.
- Effective evaluation of longer-term patient and community health impacts requires the development of meaningful, robust, and interconnected data infrastructure to support evidence-based policies and programs such as CMM.

Table 1.

Characteristics of the overall clinical population, and comparison of sociodemographics of patients seen by CMM during 1-year before and 1-year after pharmacist-led CMM intervention was initiated.

		Clinic Population	CMM Population		
		N=103 103	Pre-Intervention Period N=3775 (51.45%)	Intervention Period N=3562 (48.55%)	p-value*
Gender	Female	60858 (59.03)	2159 (57.19)	2034 (57.10)	.346
	Male	42173 (40.90)	1616 (42.81)	1526 (42.84)	
	Other	72 (0.07)	0 (0.00)	2 (0.06)	
Age Group	18–34 years	24843 (24.10)	371 (9.83)	297 (8.34)	.006
	35–49 years	24516 (23.78)	559 (14.81)	560 (15.72)	
	50–64 years	26841 (26.03)	1177 (31.18)	1128 (31.67)	
	65–74 years	15307 (14.85)	834 (22.09)	871 (24.45)	
	75+ years	11596 (11.25)	834 (22.09)	706 (19.82)	
Race and Ethnicity	Hispanic	2622 (2.54)	63 (1.67)	66 (1.85)	.024
	Non-Hispanic American Indian or Alaskan Native	814 (0.79)	49 (1.30)	53 (1.49)	
	Non-Hispanic Asian	14054 (13.63)	657 (17.40)	706 (19.82)	
	Non-Hispanic Black	14158 (13.73)	604 (16.00)	617 (17.32)	
	Non-Hispanic Native Hawaiian or Pacific Islander	175 (0.17)	4 (0.11)	2 (0.06)	
	Non-Hispanic White	66283 (64.29)	2264 (59.97)	1988 (55.81)	
	Other	4997 (4.85)	134 (3.55)	130 (3.65)	
Interpreter Use		10153 (9.85)	698 (18.49)	776 (21.79)	.000
Social Vulnerability Index	Lowest vulnerability, 0.25	29024 (28.15)	838 (22.20)	722 (20.27)	.034
	0.26–0.49	23441 (22.74)	850 (22.52)	767 (21.53)	
	0.50–0.75	10857 (10.53)	444 (11.76)	396 (11.12)	
	Highest vulnerability, >0.75	34472 (33.43)	1309 (34.68)	1354 (38.01)	
	Missing	5309 (5.15)	334 (8.85)	323 (9.07)	
Insurance Type	Commercial	40137 (38.93)	527 (13.96)	499 (14.01)	.002
	Medicaid	19855 (19.26)	610 (16.16)	680 (19.09)	
	Medicare	27105 (26.29)	1464 (38.78)	1388 (38.97)	
	Other/Unknown	16006 (15.52)	1174 (31.10)	995 (27.93)	
Tobacco Use		12937 (12.55)	757 (20.05)	696 (19.54)	.581
Alcohol Use		50341 (48.83)	1390 (36.82)	1260 (35.37)	.197
Body mass index, kg/m²	<18.5	1255 (1.22)	42 (1.11)	46 (1.29)	.798
	18.5–24.99	22824 (22.14)	586 (15.52)	522 (14.65)	
	25–29.99	27540 (26.71)	784 (20.77)	736 (20.66)	

		Clinic Population	CMM Population		
		N=103 103	Pre-Intervention Period N=3775 (51.45%)	Intervention Period N=3562 (48.55%)	p-value*
	30–39.99	25718 (24.94)	988 (26.17)	955 (26.81)	
	40	6446 (6.25)	338 (8.95)	303 (8.51)	
	Missing	19320 (18.74)	1037 (27.47)	1000 (28.07)	
Hypertension diagnosis		28447 (27.59)	1856 (49.17)	1922 (53.96)	<.001
Diabetes diagnosis		14999 (14.55)	1907 (50.52)	2004 (56.26)	<.001
Dyslipidemia diagnosis		28412 (27.56)	1647 (43.63)	1706 (47.89)	<.001
Comorbid mental health diagnosis		36968 (35.86)	1958 (51.87)	1894 (53.17)	.263

CMM = Comprehensive medication management

CVD = Cardiovascular disease

LDL-C = Low density lipoprotein cholesterol

*
p-value for chi-square test of difference

Table 2.

Among patients eligible for CMM intervention, comparison of sociodemographic and clinical characteristics by whether or not patients visited with CMM pharmacist in 1-year post-intervention

		CMM Visit			
		Yes	No	Total	p-value
Total CMM Intervention Population		439 (9.16)	4356 (90.84)	4795 (100.00)	
Gender	Female	246 (56.04)	2410 (55.33)	2656 (55.39)	.871
	Male	193 (43.96)	1944 (44.63)	2137 (44.57)	
	Other	0 (0.00)	2 (0.05)	2 (0.04)	
Age group	18–34 years	15 (3.42)	330 (7.58)	345 (7.19)	<.001
	35–49 years	86 (19.59)	1128 (25.90)	1214 (25.32)	
	50–64 years	183 (41.69)	1769 (40.61)	1952 (40.71)	
	65–74 years	102 (23.23)	714 (16.39)	816 (17.02)	
	75+ years	53 (12.07)	415 (9.53)	468 (9.76)	
Race and Ethnicity	Hispanic	10 (2.28)	86 (1.97)	96 (2.00)	<.001
	Non-Hispanic American Indian or Alaskan Native	7 (1.59)	41 (0.94)	48 (1.00)	
	Non-Hispanic Asian	124 (28.25)	735 (16.87)	859 (17.91)	
	Non-Hispanic Black	113 (25.74)	799 (18.34)	912 (19.02)	
	Non-Hispanic Native Hawaiian or Pacific Islander	0 (0.00)	12 (0.28)	12 (0.25)	
	Non-Hispanic White	171 (38.95)	2514 (57.71)	2685 (56.00)	
	Other	14 (3.19)	169 (3.88)	183 (3.82)	
Interpreter Use	131 (29.84)	601 (13.80)	732 (15.27)	<.001	
Social Vulnerability Index	Lowest vulnerability, 0.25	61 (13.90)	1026 (23.55)	1087 (22.67)	<.001
	0.26–0.50	83 (18.91)	911 (20.91)	994 (20.73)	
	0.51–0.75	44 (10.02)	436 (10.01)	480 (10.01)	
	Highest vulnerability, >0.75	190 (43.28)	1647 (37.81)	1837 (38.31)	
	Missing	61 (13.90)	336 (7.71)	397 (8.28)	
Insurance Type	Commercial	35 (7.97)	1259 (28.90)	1294 (26.99)	<.001
	Medicare	158 (35.99)	1344 (30.85)	1502 (31.32)	
	Medicaid	116 (26.42)	944 (21.67)	1060 (22.11)	
	Other/Unknown	130 (29.61)	809 (18.57)	939 (19.58)	
Tobacco use		104 (23.69)	808 (18.55)	912 (19.02)	.009
Alcohol use		128 (29.16)	2058 (47.25)	2186 (45.59)	<.001
Body mass index, kg/m ²	<18.5	65 (14.81)	645 (14.81)	710 (14.81)	.001
	18.5–24.99	86 (19.59)	1145 (26.29)	1231 (25.67)	
	25–29.99	135 (30.75)	1412 (32.42)	1547 (32.26)	
	30–39.99	5 (1.14)	22 (0.51)	27 (0.56)	
	40	50 (11.39)	464 (10.65)	514 (10.72)	
	Missing	98 (22.32)	668 (15.34)	766 (15.97)	

		CMM Visit			
		Yes	No	Total	p-value
Diagnoses	Hypertension	298 (67.88)	2400 (55.10)	2698 (56.27)	<.001
	Diabetes (Type 1, Type 2)	268 (61.05)	929 (21.33)	1197 (24.96)	<.001
	Dyslipidemia	228 (51.94)	1785 (40.98)	2013 (41.98)	<.001
	Mental health comorbidity	253 (57.63)	1994 (45.78)	2247 (46.86)	<.001
Medications	Aspirin	192 (43.74)	756 (17.36)	948 (19.77)	<.001
	Statin	289 (65.83)	1780 (40.86)	2069 (43.15)	<.001
	Antihypertensive	326 (74.26)	2285 (52.46)	2611 (54.45)	<.001
Health system use	Laboratory	287 (65.38)	2196 (50.41)	2483 (51.78)	<.001
	Social Work	47 (10.71)	163 (3.74)	210 (4.38)	<.001
	Specialty Clinicians	249 (56.72)	1989 (45.66)	2238 (46.67)	<.001
	Diabetes Educator	23 (5.24)	61 (1.40)	84 (1.75)	<.001
	Hospitalization	108 (24.60)	448 (10.28)	556 (11.60)	<.001
	Emergency Visit	163 (37.13)	825 (18.94)	988 (20.60)	<.001
Health Goals Met	Blood pressure	357 (81.32)	3317 (76.15)	3674 (76.62)	<.001
	Aspirin	409 (93.17)	4197 (96.35)	4606 (96.06)	.003
	Statin	397 (90.43)	3509 (80.56)	3906 (81.46)	<.001
	Tobacco	335 (76.31)	3548 (81.45)	3883 (80.98)	.011

CMM = Comprehensive medication management