ORIGINAL RESEARCH

Addressing Healthcare Utilization and Costs for Older Adults with Limited Mobility through a Multidisciplinary Home-Based Primary Care Program

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Introduction: **Home-based primary care (HBPC) has shown promise in the management of multiple chronic conditions for patients who are homebound or who have limited mobility. The objective of this study was to implement and evaluate an HBPC program that integrates the services of clinical pharmacists and community aging services providers in a community-based setting.**

Methods: **Mountain Area Health Education Center's (MAHEC) HBPC program brought together an interdisciplinary team including medical providers, pharmacists, and community aging services providers to conduct home visits with older adults (age 50+). A single-arm, prepost analysis was conducted to determine differences from the year before program enrollment to the year postenrollment. We examined the frequency of health care visits, high-cost health care utilization (emergency department [ED] utilization and hospitalizations), and health care costs. Descriptive statistics characterized the study population and outcomes. Fisher's Exact Tests were used to determine if there was a significant difference between years.**

Results: **There were 130 home visits with 62 patients enrolled in the program. The Medicare Annual Wellness Visit (AWV) was completed for 32 (51.6%) patients. There were 13 (21.0%) and 12 (19.4%) individuals who had at least 1 ED visit and hospitalization, respectively, pre-enrollment as compared with 8 (12.9%) and 9 (14.5%) individuals postenrollment (p-value = 0.05, p-value = 0.06). During the postenrollment year, patient enrollees had an average per-member-per-month (PMPM) cost of $1567.96 as compared with $3053.21 in the year prior.**

Conclusions: **Pharmacist and community agency services-integrated HBPC was implemented in the community setting. There was a decrease in high-cost health care utilization and total health care expenditures for patients as compared with the previous year. (J Am Board Fam Med 2023;00:000–000.)**

Keywords: **Clinical Pharmacy Service, Disease Management, Geriatrics, Health Expenditures, Home Care Services, Homebound Persons, Multidisciplinary Care Team, Primary Health Care**

Introduction

Demographic change is driving unprecedented transformations in the United States health care system. A rapidly aging population, income inequality, and rising housing prices have all led to a marked rise in the number of older adults who encounter challenges leaving their homes.[1,2] In 2011, it was estimated that nearly 2 million older adults were homebound whereas another 5 million had significant difficulty leaving their home.[1] From 2012 to 2018, an additional 4.5 million Medicare beneficiaries were estimated to be homebound.[3] Homebound older adults have more comorbidities,

This article was externally peer reviewed.

Submitted 23 June 2022; revised 1 September 2022; 18 October 2022; and 18 January 2023; accepted 23 January 2023.

This is the Ahead of Print version of the article.

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Funding: This research was supported by a grant from the WNC Bridge Foundation.

Conflict of interest: The authors have no conflicts of interest to disclose.

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significantly less access to primary care, and an increased risk of mortality as compared with non-homebound older adults.[1,3,4] Home-Based Primary Care (HBPC) is a care delivery model that seeks to address these concerns.

Collectively, HBPC programs have been shown to significantly reduce emergency department (ED) visits by 15%, hospitalizations by 30%, and long-term care (LTC) admissions by 15%.[5] These programs also cut the duration of hospital stays by 45% and LTC stays by 88%.[5] The evidence for HBPC in the US stems primarily from the Department of Veterans Affairs (VA) and the Medicare Independence at Home Project.[5–8] These programs have demonstrated remarkable benefits in improving access to services, the quality of clinical care provided, patient/caregiver satisfaction, and cost savings when delivering primary care at home. Nevertheless, the practice of delivering health services at home is the exception rather than the norm, as only 12% of home-limited patients receive home-based care.[9,10]

Nationally, the composition of HBPC teams is heterogeneous. Although pharmacists have been extensively utilized in the Veterans Health Affairs (VHA) HBPC setting,[11,12] the majority of evidence supporting pharmacist interventions in the community (ie, non-VHA) setting stems from chart reviews rather than primary care provider (PCP)-pharmacist covisits, and there remains a paucity of evidence of the impact that a pharmacist in US community-based HBPC settings may have.[13,14] Further, although HBPC programs described in the current literature frequently involve use of an interdisciplinary team (IDT), few to our knowledge have included community aging services providers on the core team that meets regularly.

The objective of this study was to implement and evaluate an HBPC program that integrates the services of a clinical pharmacist and a local aging services agency in a community-based setting. We examined the frequency of health care visits, ED utilization and hospitalizations, and health care costs during the enrollment year compared with the year prior.

Methods

Setting and Program Description

In January 2020, an HBPC program was launched at Mountain Area Health Education Center (MAHEC) in Asheville, North Carolina (NC). MAHEC was established in 1974 and, as the largest Area Health Education Center in NC, serves a 16-county region in the western part of the state. The family medicine practice supports a large residency program and provides care for more than 25,000 patients (30% with Medicare) across 6 locations, all which are recognized by the National Committee for Quality Assurance as Patient-Centered Medical Homes. MAHEC's mission is to train the next generation of health care professionals for Western NC through quality health care, innovative education, and best practice models that can be replicated nationally.

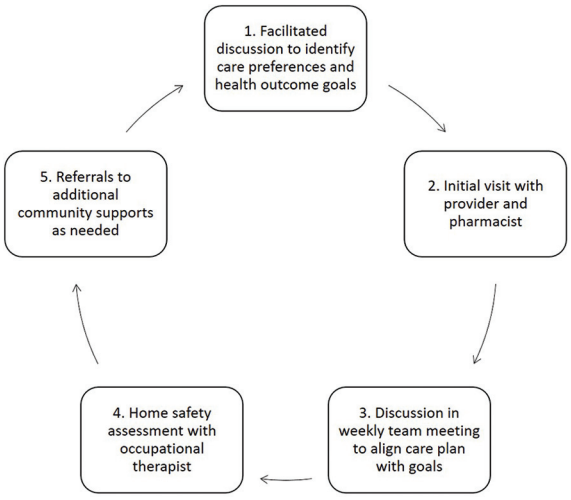
Providers in MAHEC's HBPC program sought to recruit at least fifty complex, multi-morbid patients who would benefit from receiving team-based care in their homes. Participants were enrolled in HBPC by a dedicated scheduler after referral from their PCP. For inclusion in the program, participants were required to be aged 50 or older, residing in Buncombe County (where Asheville is located), and have Medicare as their primary insurer.

The program was designed around a framework that prioritizes social determinants of health and patients' individualized health outcome goals and health care priorities. Social determinants were emphasized through systematic screening for presence of barriers such as food insecurity, home safety, and transportation challenges, and through inclusion of team members trained to address these obstacles. Patients' goals and priorities were ascertained by team members trained to facilitate these discussions, using the structured approach described previously by Tinetti et al.[15] This information was used by the IDT to ensure care was optimally aligned with what matters most to each participant. See Figure 1 for a flow diagram describing our care process.

The IDT comprised the following:

- Two physicians and two pharmacists who worked in pairs to perform intake and quarterly follow-up visits and provide medical management. Specifically, the pharmacists at each medical visit assessed patients' medication lists for potential medication-related problems or needs, evaluated effectiveness, safety, and affordability of therapies, and helped troubleshoot and address challenges with adherence or medication appropriateness.

Figure 1. Care process.



- An occupational therapist who performed home assessments.
- A caregiver resource specialist from the local Council on Aging (COA) who arranged caregiver support, facilitated referral for minor home repairs by qualified professionals, and made referrals to additional community supports, such as food delivery, as needed.
- Nurse care management was furnished through the partnering accountable care organization (ACO) and provided coordination with community referrals and insight into patient needs using risk adjustment and historical claims data.

All members of the IDT met weekly to discuss the panel of participants and generate collaborative, person-centered care plans with input from all team members.

Measures and Analysis

Patient demographics and clinical characteristics were abstracted from the electronic health record. Implementation and high-cost health care utilization were assessed during the first year of the program. To assess implementation, the number of participants enrolled, the number of HBPC visits completed, and the completion of the Medicare Annual Wellness Visit (AWV) were tracked during the calendar year 2020. High-cost health care utilization, including ED visits and hospitalizations, was tracked throughout the observation period with electronic health record data and assessed by comparing for each enrolled patient the proportion with and the number of visits/hospitalizations in the enrollment year (ie, 12 months postenrollment) compared with the year prior (12 months pre-enrollment).

Further, we aimed to assess the trends in health care utilization while examining the natural variation that may occur. To do so, we tracked the number of outpatient visits in the 2 years before enrollment to determine whether there were significant changes in health care utilization between the 2 years before enrollment versus the year postenrollment.

Finally, we tracked total costs, calculated as per-member-per-month (PMPM), outpatient-related costs, ED visits, ED-related costs, hospitalizations, and hospitalization-related costs for a subset of patients with claims data from Mission Health Partners (MHP). MHP is the local ACO that serves much of the western region of NC, including the service area for the HBPC program. We queried costs and utilization outcomes for the HBPC patients during the 12 months before HBPC enrollment and during the 12 months postenrollment.

Descriptive statistics were used to characterize the study population. Frequency and percentages were used to characterize the feasibility outcomes of the program. The proportion of participants with ED visits and hospitalizations pre-enrollment was compared with the proportion postenrollment with Fisher's Exact Test. The number of outpatient visits across the 2 pre-enrollment years and the 1 postenrollment year were compared using a Wilcoxon Signed Rank test (comparing the 2 years before enrollment) and the Friedman test (comparing the 3 years together). At the ACO level, costs and utilization rates during the observation period were compared with the 12 months before enrollment using descriptive statistics. Data were analyzed using Microsoft Excel (Redmond, WA) and SAS v9.4 (SAS Institute, Cary, NC). The study was approved by the University of North Carolina at Chapel Hill's Institutional Review Board. Participants provided informed consent to have their information used in the evaluation.

Results

During the pilot year 62 patients were enrolled, 11 of whom eventually withdrew from the program voluntarily (n = 5), transferred out of the program to a long-term care facility (n = 2), or became deceased (n = 4). Approximately half (53.2%) were

Table 1. Patient Demographic and Clinical Characteristics

Characteristic (n = 62)	Frequency	Percentage
Gender		
Women	33	53.2%
Men	29	46.8%
Age*	76.7	11.9
Race		
White	48	77.4%
Black/African American	7	11.3%
Asian	3	5.8%
Another Race/Unknown	4	6.5%
Tobacco use	18	29.0%
Comorbidities		
Hypertension	46	74.2%
Heart Failure	14	22.6%
Diabetes Mellitus	24	38.7%
Osteoporosis	21	33.9%
Chronic Obstructive Pulmonary Disease	19	30.6%
Coronary Artery Disease	10	16.1%

*Mean and standard deviation.

female, the average age was 76, and the majority identified as white (77.4%). All individuals had Medicare insurance coverage. Common comorbidities included hypertension (74.2%) and diabetes mellitus (38.7%). Participants were from a mix of rural, suburban, and urban settings within Buncombe County. See Table 1 for complete details on the patient population.

A total of 130 home visits by the physician-pharmacist team were conducted in 2020. All enrolled individuals received at least 1 home visit by the HBPC team during 2020. Half (n = 31) of enrollees had their first home visit during the first quarter (Q1) of the year and 15 (24.2%) had their first visit during the second quarter (Q2); the remainder had their first visit in the third (Q3) or fourth quarters (Q4). More than 2-thirds (n = 43, 69.4%) had at least 1 follow-up visit during the year. Of the 53 patients who were enrolled before Q4 of the project and had an intake visit, 45 (84.9%) had at least 1 follow-up visit. AWVs were completed for 32 (51.6%) individuals, 4 of which were performed by providers outside of the HBPC team. See Figure 2 for details on the visits performed during the year.

For the enrolled individuals, 13 (21.0%) individuals had a total of 14 ED visits during 2019 as compared with 9 ED visits by 8 (12.9%) individuals in 2020 (p-value = 0.05). Four (30.8%) individuals who had ED visits in 2019 also had ED visits in 2020 whereas half (n = 4, 50.0%) of the individuals who had ED visits in 2020 did not have visits in 2019. In 2019, 12 (19.4%) individuals had a total of 17 hospitalizations as compared with 19 hospitalizations by 9 individuals (14.5%) in 2020 (p-value = 0.06). Of those who were hospitalized in 2019, 4 (33.3%) were also hospitalized in 2020 whereas 5 (55.6%) of those who were hospitalized in 2020 were not hospitalized in 2019.

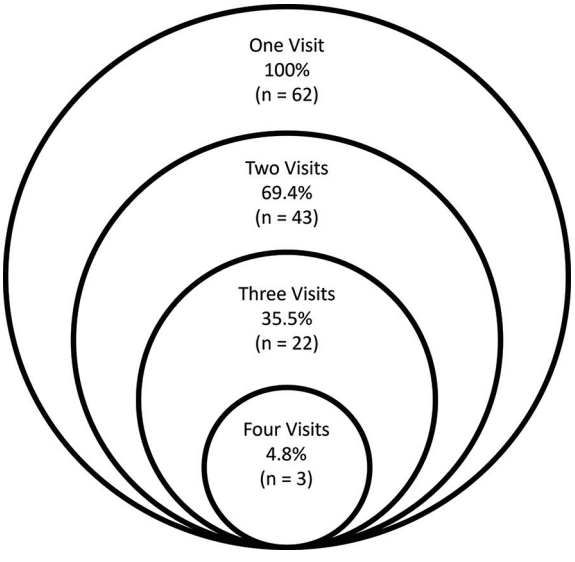
In the year postenrollment, there was an average of 18.6 outpatient visits per patient compared with 8.3 in the year immediately preceding enrollment and 6.9 in the year before that ($P < .0001$). When comparing only the 2 years before enrollment, we did not detect a significant difference ($P = .06$).

Forty-eight (77.4%) individuals had data available from MHP. During the enrollment year, enrollees had an average PMPM cost of $1567.96 as compared with $3053.21 in the year prior. Stratified by type of cost, an increase of $43.17 PMPM was seen for outpatient visits whereas decreases of $31.01 PMPM and $1340.91 PMPM were seen in ED visits and hospitalizations, respectively.

Discussion

There is an increasing need for high-quality, multidisciplinary care among older adults, particularly

Figure 2. Percentage of patients by number of visits over the observation period (calendar year 2020).



those with limited mobility and poor access to health services. HBPC is one solution that has been shown to benefit this population. We described our program which consists of unique elements in that it is offered by a community organization that serves the surrounding rural counties and therefore has the potential to meet the complex medical and social needs of our region's many nonveteran older Americans who do not live within driving distance of a tertiary academic medical center where HBPC programs are most typically offered. We found that we were able to enroll more patients than our original target and perform timely follow-up for the majority of these individuals. Further, we found that patients enrolled in this program had lower high-cost health care utilization in the year after their enrollment as compared with the year prior. These findings may assist provider groups and payers in assessing innovative solutions to reach multimorbid patients with limited mobility in a mixed urban-rural region.

The composition of the HBPC team varies widely across programs. Our inclusion of a pharmacist who accompanied medical providers on most home visits is novel. Although a strong literature exists on the impact of pharmacists working with patients managing multiple chronic medications, and there is evidence on pharmacist-integrated HBPC in the VA setting, there is still insufficient data on the impact that a pharmacist integrated within a community-based HBPC team may have. To our knowledge, only 1 previous study has examined the inclusion of clinical pharmacy services in a community-based HBPC team, although the services were rendered remotely.[16] Evaluating the impact of pharmacist interventions on medication use and appropriateness was beyond the scope of this study but is the subject of ongoing investigation. Future studies should assess the incremental benefit of pharmacist-integrated HBPC by comparing it to programs without a pharmacist.

Further, as part of the MAHEC HBPC program, the IDT had members from multiple organizations. Beyond the physician and pharmacist pairings, there was an occupational therapist who performed home assessments for safety and activity of daily living modifications; a caregiver resource specialist from the COA of Buncombe County who could draw on COA services including minor home repair, food delivery, and grants to pay for respite care, and a nurse care manager from the local ACO. Although other programs may involve some of these services, the totality may render our program, and therefore results, unique. This may be particularly novel among older adults in rural areas. Previous research has found that rural residents were 78% less likely to receive home-based services as compared with their urban counterparts, with only a 4% usage rate in rural counties.[17]

Using data from our ACO, we found that patients had substantially lower health care costs as compared with the previous year, representing more than a fourfold return on investment as compared with the cost of the program. Though there was an expected increase in outpatient costs, as evidenced by the sharp increase in outpatient visits, there was a substantial decrease in high-cost health care (ED visits and hospitalizations). Although no control group was available for comparison, we did attempt to assess trends by examining the 2 years before enrollment and found no difference in the 2 pre-enrollment years. Our data align with previous research showing that increases in primary care visits are associated with decreases in ED visits and hospitalizations.[18] Further, our findings are aligned with previous data on the impact of HBPC. For example, the Centers for Medicare and Medicaid Services (CMS) Innovation Center's Independence at Home demonstration project, a HBPC program with participating practices in multiple states across the country, published findings that HBPC reduces long-term institutionalization from 16% to 8% and extends average community residence by 12.8 months compared with control groups not receiving integrated care.[6] The overall cost savings to payers due to lower high-cost health care utilization was more than $2800 per beneficiary.[6] These early data indicate positive impact on quality, utilization and cost; HBPC may therefore play an important role in improving ACO performance in other regions.

Through HBPC we supported our community's most vulnerable citizens during the COVID-19 pandemic. Our program was in the early stages of enrollment and first quarterly visits when local stay-at-home orders were issued in March 2020. The pandemic challenged the HBPC team and brought forward the best problem-solving, communication and collaboration within our team, with our partners, and with other service providers in our community. With the mobilization of resources from all our partners, phone and telehealth visits were used to address urgent health care needs, and we

resumed home visits as soon as it was safe to do so, after approximately 1 month for medical providers, and 3 months for pharmacists. This further prevented many of these individuals from entering medical offices that may have introduced a COVID-19 exposure. Adoption of telemedicine for HBPC participants has been described previously by VA and New York City based programs, and our generally positive experience with this shift is mirrored in their findings.[19–22] Apart from telemedicine, we also quickly coalesced and worked in the early days of the pandemic to ensure that our patients were safe and had access to food and medications. And, although not tracked as part of this study, this model allowed the IDT to provide COVID-19 vaccinations at home as they became available, which may have further prevented ED visits and hospitalizations related to COVID-19 infections. Because of the unique features of HBPC, it may provide additional clinical and economic value to patients, health systems, and payers during times of pandemic.

Limitations

There are several limitations to this study. First, the data reported represent a small number of individuals eligible for HBPC; these individuals likely represent a population with a greater burden of chronic illness, as they were identified by their primary care providers as being in highest need. The small sample size also increases the likelihood that a few individuals can impact results. Thus, any cost and utilization data only represent this subgroup and may not apply to the broader population in need of HBPC. Future investigations are needed to explore the feasibility and impact of HBPC in a general older adult population. Similarly, we compared health care utilization and costs from the year before enrollment with the year after enrollment. Given the lack of a control group, this provided an estimate of the impact of HBPC on these outcomes. However, it is possible that the year before enrollment was particularly severe for the enrolled individuals, thus precipitating a referral to the program and producing a "regression to the mean" phenomenon. Our results, therefore, may be overestimating the reduction in hospitalization costs, particularly if there were unusually lengthy hospitalizations resulting in high costs in the pre-enrollment year. Considering the number of total hospitalizations slightly increased from 2019 to 2020, this is a possibility and should be taken into account when interpreting the results. Because data on ED visits and hospitalizations as well as costs in the 2 years before enrollment was unavailable, we attempted to investigate this phenomenon by assessing the overall trend of outpatient visits in the 2 years before enrollment. These analyses showed that there was a small but insignificant ($P = .06$) increase in outpatient visits from the second year to the year immediately before enrollment, but a large increase in the year after enrollment ($P < .0001$). This suggests that health care utilization may have been relatively stable before enrollment, although specific data on ED visits and hospitalizations would be needed to confirm this. The significant increase in outpatient visits in the year postenrollment may signal a shift from inpatient to outpatient health care utilization, with an increased number of patient "touches" that could have prevented patients from seeking care in the ED or hospital. The increase in outpatient visits may also be attributable to enhanced uptake of preventative care such as immunizations. Future investigations should examine the long-term health care utilization trends of enrolled individuals pre and postenrollment, ideally with an appropriate control group, to understand the impact of HBPC on costs and utilization.

There were also some individuals who withdrew due to need for long-term care admission or became deceased during the enrollment year; had these individuals remained in the HBPC program, they may have contributed a greater amount of health care expenditures than estimated in our analysis. Thus, the sample available for the prepost cost analysis may be underestimating the enrollment year PMPM costs. It is also important to note that the ongoing COVID-19 pandemic may have influenced health behavior and discouraged health care utilization due to the heightened restrictions. Additional research with an adequate control group is needed to isolate the effects of the program.

Finally, the clinical team needed to adjust to new health and safety protocols due to the ongoing pandemic to prevent the spread of the novel coronavirus. Because of these changes, fewer visits than anticipated were made during the initial phases of the pandemic until protocols were developed and successfully implemented. Thus, estimates of AWV and follow-up visits would likely be higher in non-pandemic conditions.

Conclusions

We found that pharmacist and community agency-integrated HBPC was feasible and was able to provide continuity of care for the majority of enrolled patients. These data suggest that this model may improve access to care for multimorbid patients with limited mobility in mixed rural-urban regions and prevent downstream ED utilization and hospitalizations.

The authors thank Cathy Nielson, MPH, OTR/L, for her assistance with the program implementation and preparation of this manuscript.

To see this article online, please go to: http://jabfm.org/content/00/00/000.full.

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