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An Evaluation of Home-based Primary Care (HBPC):
Impact on Cost, Outcomes and Patient Satisfaction in the United States and Abroad

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Introduction

Over the past century, the role of medical home visits in patient care has undergone significant changes. Historically, physicians routinely delivered medical care to sick patients in their own homes. In 1930, for example, such calls represented 40% of physician-patient encounters.¹ As healthcare providers developed an increasing reliance on technology and as payment models began to prioritize volumes and efficiency, the provision of health care shifted to hospitals and office-based settings. An analysis of house calls in 1972 found that the number of in-home visits amounted to a mere 5% of physician-patient encounters and these rates continued to decrease to less than 1% by 1980.¹ The seemingly antiquated practice, however, is undergoing a revival as an increasing amount of evidence is demonstrating the benefits associated with delivering home-based primary care (HBPC).

Coinciding with this resurgence of home-based care are the looming demands of an aging population in the United States and worldwide. The U.S Census Bureau projects that by 2030, one in five U.S. residents will be older than 65 (an increase from 13% in 2010).⁴ Additionally, the Census Bureau predicts that persons age 85 and above will double by 2036 and triple by 2049.³

According to the Medicare Payment Advisory Commission (MedPAC), this dramatic shift in demographics will precipitate Medicare enrollment to increase by more than 50% over the next 15 years from 54 million beneficiaries to more than 80 million in 2030.³ An aging population is not unique to the United States, however, as the combination of declining fertility rates and increasing life expectancy has caused the global population of those over 60 to grow at a faster rate than all other age groups.⁵ In 2017, there were an estimated 962 million people over the age of 60 in the world and the United Nations projects this number to reach 1.4 billion in 2030, 2.1 billion in 2050, and 3.1 billion in 2100.⁵ By 2050 all regions of the world except Africa will have

nearly a quarter or more of their populations at ages 60 and above.⁵ As these trends continue, increasing numbers will live with multiple chronic conditions requiring medical management and more patients will face functional impairments that reduce her or his ability to access care. This literature review seeks to evaluate the potential role of HBPC in meeting the evolving needs of an aging population in the United State and abroad; particular attention is paid to the impact that the HBPC model has on cost, outcomes, and patient satisfaction.

Background

According the 2009 Medical Expenditure Panel Survey (MEPS), the sickest 10 percent of patients account for 65 percent of all health expenses for the U.S. population.⁶ A significant driver of healthcare costs among this cohort is the high rate of hospital readmissions – an estimated 75% of which, according to the Medical Payment Advisory Commission, are preventable.⁷ The survey found that the vast majority of those who were readmitted to the hospital had chronic conditions such as heart disease, cancer, mental disorders, chronic obstructive pulmonary disease (COPD) and diabetes.⁶ These trends underscore the importance of improving access to care for Americans with multiple chronic conditions; particularly those with the aforementioned conditions that would benefit from frequent follow-up and, in turn, rapid identification and prevention of deterioration. A patient demographic with one of the highest rates of multiple chronic conditions is those who are homebound as they, on average, encounter twice as many chronic conditions as those who are not homebound (4.9 vs. 2.5 conditions, $p < 0.001$).⁸ As a result of functional limitations and lack of necessary support, an increasing number of older adults are finding themselves homebound.

Homebound individuals, who make up two million of the American population, are more likely to have been hospitalized in the last 12 months (52.1% vs. 16.2%, $p < 0.001$) and are more likely to be older, female, non-Caucasian and have less education and income than those who are

not homebound (all $p < 0.05$).⁸ When accounting for the number of chronic conditions a person has, homebound patients still have higher rates of hospitalization and higher mortality rates than non-homebound patients; thus indicating that other factors such as social support or inability to access routine health care are negatively affecting outcomes more than the conditions themselves.⁹⁻¹¹ The correlation between being homebound and having increased likelihood of illness is illustrated by a comparison of two Massachusetts based studies, the Nutrition, Aging, and Memory in Elders Study (NAME) and the Framingham Heart Study.¹² Participants in the NAME study, which primarily assessed elderly homebound patients in homecare agencies, suffered from more medical and psychiatric illnesses than the elderly participants in the Framingham Heart Study which enrolled mostly non-homebound elders (Table 1).^{9,12-16} More specifically, the studies revealed that homebound individuals had higher rates of diabetes, stroke, hypertension, cardiovascular disease, dementia (including Alzheimer's disease), mild cognitive impairment, and depression.^{9,12-16} These findings, compounded with recent data showing that homebound elders with five or more chronic physical and psychiatric conditions consume two-thirds of Medicare expenditures, has brought attention to the question of how our healthcare system can better support and serve those with limited access to care.¹⁷

As of 2015, only 11.9% of completely homebound individuals reported receiving primary care services at home.⁸ While this finding clearly illustrates the healthcare gap surrounding homebound adults, it also instills optimism that this shortage can be addressed by the implementation of HBPC or other means that help overcome barriers to accessing quality care. The lack of healthcare access not only impacts the homebound individual but also redirects the burden of care onto the informal caregiver who may, in turn, experience stress and potential burnout.¹⁸ Healthcare companies across the United States are beginning to recognize and meet these changing needs as evidenced by analysis of recent Bureau of Labor statistics which

projects that home health care settings will see the greatest job growth (54%) compared to all other healthcare settings, adding nearly 500,000 jobs between 2016 and 2026.¹⁹

While the movement to extend access to healthcare to those on the margins through HBPC holds much promise, it is important to evaluate the effects that this development has on healthcare costs, patient outcomes, and patient satisfaction in both the United States and abroad. Additional consideration should be given to which patients would be good candidates for HBPC, which drawbacks it presents, and which models are most promising.

Methods

In order to synthesize the current knowledge on HBPC and the way in which it influences cost and outcomes, the key words “Home-based Primary Care”, “Home Care”, “Physician home visit”, and “Home Care models in developing countries” in PubMed were used to search for the articles covered in this review. Articles were filtered based on relevance and date of publication. Additionally, only studies from peer-reviewed journals were included in the paper. From initial studies, each reference section was reviewed, and subsequent articles were found. Government websites were utilized to obtain background information on global population statistics, specific HBPC models, and also for finding direct sources. Lastly, some information was gathered by attending lectures and talks related to the healthcare system in Costa Rica.

Discussion

The goals of HBPC are to support patients in overcoming barriers to care by providing quality and timely care for patients at home and, in turn, reduce healthcare expenditures by limiting preventable illness and by delaying the need for care in institutional settings.

Cost & Outcomes

The Independence at Home demonstration (IAH), an initiative set forth by the Centers for Medicare & Medicaid Services (CMS) in 2012, sought to test the efficacy of comprehensive primary care services at home and to answer whether or not doing so improves care for Medicare beneficiaries with multiple chronic conditions.²⁰ The study, which was put in place by the Affordable Care Act, was originally funded through 2015 but, due to its bipartisan backing, was subsequently extended for two more years until 2017 and again through 2020.²⁰ The demonstration garnered support in part because it offered an opportunity to assess the benefits and challenges of rewarding health care providers based on the quality, not the quantity, of care given to patients. The project enrolled 17 clinics who were providing HBPC to approximately 1,000 Medicare beneficiaries and tracked the expenditures and the outcomes of care.²⁰ In order to better quantify the outcomes of each clinic and to ensure that the drive to reduce healthcare expenditures did not result in reduced quality of care, the researchers offered six quality measures by which the health care providers would be evaluated:

1. Follow-up contact within 48 hours of hospital admissions, discharges
2. Medication reconciliation in the home within 48 hours of hospital discharges and ED visits (required for at least 50% of events)
3. Patient preferences documented annually (required for at least 80% of enrolled patients)
4. Hospital admissions within 30 days for ambulatory care sensitive conditions (diabetes, heart failure, chronic obstructive pulmonary disease)
5. All-cause hospital readmissions within 30 days

6. ED visits for ambulatory care sensitive conditions (diabetes, heart failure, chronic obstructive pulmonary disease)²⁰

In the demonstration's first year, IAH participants saved over \$25 million, an average of \$3,070 per participating beneficiary, and in the second year IAH beneficiaries saved more than \$10 million, an average of \$1,010 per beneficiary.²⁰ While the overall savings were reduced in the second year, all 15 practices improved in at least two of the six quality measures as compared to the first year of the demonstration.²⁰ In the program's third year, savings amounted to \$16.3 million (\$1,431 per beneficiary) and year four saw an average reduction of \$2,814 per beneficiary with four of 14 practices meeting the performance thresholds for all six quality measures.²⁰ In conclusion, within the program's first four years, savings ranged between \$1,000 and \$3,000 while the quality measures consistently improved.²⁰ Further analysis of the IAH data reveals that the reduced healthcare costs for high risk homebound patients were largely driven by preventing unnecessary hospitalizations. "Emergency department (ED) visits leading to hospitalization showed statistically significant declines in years 1 (4.8 percent) and 3 (8.4 percent)."²¹ In the third year, the rate of patients with one or more unplanned hospital readmissions decreased by 8.7 percent while the number of avoidable hospital admissions decreased by 7.6 percent.²¹ Even though the findings of the IAH demonstration are promising, a 2018 letter to congress from the authors of the study noted that the results remain inconclusive.²¹ This is, in part, due to the limited sample size and the variability involved in tracking 17 clinics in 14 different states. Despite these limitations, it is safe to conclude that IAH services did not worsen patient outcomes and, secondly, if performance improvements continue to be made as they did throughout the years of the demonstration, we may see more statistically significant results with additional years of data.²¹ Echoing the potential, as well as the uncertainty, around the demonstration's impact on cost, a 10-year projection published in 2018 concluded that the

United States healthcare system could save between \$2.6 billion to \$27.8 billion, depending on how many beneficiaries receive HBPC, how successful the practices are, and how quickly HBPC practices grow in the coming years.²²

A 2009 Cochrane meta-analysis examined five randomized trials (with a total of 844 patients) conducted between 1999 and 2009 that provided care through home-based care models.²³ While there was variability in how the authors measured savings, the review found that the HBPC models were associated with lower healthcare costs and, more specifically, yielded a 38 percent reduction in mortality at six months for those receiving care at home compared with those receiving hospital treatment.²³ Furthermore, a study that focused on persons with dementia concluded that, after discharge, patients who received hospital care at home had fewer problems with sleep (34 %, $p < 0.001$), eating (31.0%, $p < 0.001$) as well as agitation and aggression (32.5%, $p < 0.001$).²⁴ In addition to reducing complications associated with sleeping, feeding and temperament, another trial included in the review found that providing care at home for those recovering from stroke significantly reduced the likelihood of developing depression ($p < 0.001$).²⁵ While these findings should not be misinterpreted as reasoning to replace hospital care with home-based care, it is important to note that certain populations, such as elderly patients recovering from stroke or hospitalization, might be ideal candidates for home-based care as the familiarity and continuity can reduce the risk of negative sequelae.

The results of a study that matched 722 HBPC cases to over 2,000 external controls further differentiated the type of patient that would benefit most from HBPC - specifying that frail patients, as determined by the JEN Frailty Index (JFI), can benefit most financially from HBPC. The JFI, which has been shown to have a direct correlation with future nursing home entry and higher health service usage in high-risk populations, evaluates 13 different parameters in order to score individuals in low (0-3), medium (4-6), or high (≥ 7) risk categories.²⁷ The

study found that after 2 years, HBPC implementation reduced hospital, Medicare, and skilled nursing facility costs, and increased home health and hospice expenditures compared to the control group.²⁶ While the study reported a 17% reduction in Medicare expenses (a reduction of \$8,477 per beneficiary over two years), a subgroup analysis revealed that cost differences were significant only in patients within the highest JFI frailty category (\$56,589 vs \$76,840, $P < .001$) and not in the medium (\$42,223 vs \$43,353, $P = .37$) or low (\$22,611 vs \$19,146 $P = .73$) frailty groups.²⁶ Along with the savings in cost, the study reported no significant changes in mortality and average time to death between those receiving HBPC and those receiving traditional medical care.²⁶ A concurrent match cohort study published in 2018 reported similar findings, stating that mortality rates stayed constant while HBPC participants saved a projected \$14,336 in medical costs over the average 36 months of life after enrollment.²⁷ Interestingly, even though initial costs of enrolling in the program prompt HBPC enrollees to pay an average of \$2,933 more in the first 12 months compared to non-enrollees, the study found that expenditures in the second year result in a 2 year net savings of \$8,620 for the HBPC cohort.²⁷ These findings are significant because they indicate that HBPC can play a role in caring for fragile patients in a more financially efficient manner without compromising quality of care.

In Costa Rica, a country that is ranked one position ahead of the United States at 36th in the World Health Organization's overall healthcare efficiency, efforts are being made to meet the needs of homebound individuals.²⁸ One way in which the country is addressing this healthcare gap is through the use of small, local primary care clinics called Equipos Básicos de Atención Integral en Salud (EBAIS). These micro-clinics serve as the first line of care for patients while focusing on patient education, preventative care, and home visits. A talk given by Dr. Alejandro Madrigal Lobo from the Costa Rican Doctors' Association revealed that, in addition to home visits, the healthcare system in Costa Rica relies heavily on telehealth calls to track and support

patients who are homebound.²⁹ Dr. Madrigal Lobo further explained that efforts have been made to provide used health machines to high-risk homebound individuals to allow providers to access beneficial health information without needing to make a physical visit to the home.³⁰ According to Dr. Madrigal Lobo, both of these practices result in cost savings and improved outcomes for Costa Rican patients.²⁹ Another practice that has likely increased savings and improved outcomes in Costa Rica was described by Susie Aguierre, a registered nurse who works in Geriatric and Emergency medicine in San Jose. In a conversation on July 3, 2019, Aguierre explained the health care system's efforts to discharge geriatric patients from the hospital sooner and, instead, receive home-based care so as to prevent iatrogenic infection and other negative sequelae of long-term hospital stays.³⁰ While cost and outcomes are important measures to consider when implementing a home-based care system like that of Costa Rica, it is just as important that patient's feel satisfied with the care they receive.

Patient Satisfaction

Cost of implementation, patient outcomes, and patient need all serve as essential factors to consider when seeking to implement new healthcare practices. A system that has considered these qualities can still fail to flourish, however, if patient satisfaction and sustainability are not also given priority. While there are many physical and psychological benefits to receiving care at home, those who care for homebound individuals and support their loved ones without appropriate supports face emotional, psychological, and financial challenges.³¹ It is essential for the sustainability and quality of care for the homebound individual that her or his caregiver also be supported so as to prevent burnout, decrease medication errors, and reduce feelings of frustration and guilt.³³ Given these realities, it is important to consider not only the satisfaction of the patients but also her or his caregivers.

Overall satisfaction with HBPC models match or exceed satisfaction rates among those who receive care in a clinic or hospital setting.^{21,33} The aforementioned IAH study surveyed HBPC recipients and their caregivers and found that over nine out of ten reported that they were “satisfied” or “very satisfied” with the care that they have received and, importantly, more than eight out of ten said that they prefer HBPC to receiving care in an office or clinic “a lot” or “somewhat” more.²¹ The positive results seen in the IAH study are supported in long term studies as well. A 9-month follow-up interview of caregivers whose loved ones were receiving HBPC found a statistically significant reduction in overall caregiver burden and an overall decrease in unmet needs.¹⁸ These results suggest that regular, multidisciplinary, home visits can alleviate some of the negative impacts of informal caregiving and enhance sustainability of care. In the aforementioned IAH survey that reported positive patient satisfaction ratings, however, respondents also described that they felt as if the provider appeared to be “in a hurry” more often than when compared to a control group in a clinical setting.²¹ These survey findings shed light on and emphasize the importance of addressing the challenges that HBPC providers face.

Challenges of HBPC

Given the aging demographics in the United States and around the world, health care systems will be spurred to implement value-based payments and be open to models that emphasize high quality, low cost care for elders with chronic illness. While it is clear that HBPC has the potential to reduce costs, improve clinical outcomes, and increase patient and caregiver satisfaction rates, it is evident that there are challenges to implementing successful models.

While communication and coordination of care are essential components in every healthcare setting, the HBPC team’s ability to maintain lines of communication and coordinate care when patients and fellow providers are not in the same locale is even more paramount. Successful HBPC programs prioritize regular interdisciplinary meetings with the patient care

team in order to discuss the plan of care and allow for prompt and efficient delivery of care.³⁴ Facilitation of these meetings, however, can prove to be difficult given the number of providers involved in a patient's care team. In addition to conducting interdisciplinary meetings, a 2016 systematic review identified shared electronic medical records, secure e-messaging, and team-based standardized patient assessments as effective ways to facilitate communication.³⁵ Even though technological advances allow for efficient communication between providers, 57 percent (n = 101) of recently surveyed HBPC clinicians reported that coordination with home-based patients proved to be "difficult."³⁶ In the same survey, four of the top five most frequently reported barriers to HBPC care were related to the challenges of coordinating home and community-based services.³⁶ These findings indicate that even though providers have the tools to maintain effective communication with other members of the healthcare team, hurdles still exist in communicating with the patient and the caregiving team. Given these obstacles, CMS has encouraged providers to implement frequent in-home visits, reliable post-discharge weekend coverage, regular quality improvement efforts, and coordination with community resources in order to better facilitate more seamless care.²¹ CMS also noted that HBPC clinicians who provided care in assisted living settings, wherein multiple patients reside, had fewer difficulties communicating with caregiving staff than with patients who receive care from an untrained caregiver at home.²¹ This is likely due to the fact that correspondence is more streamlined when trained staff are providing care and when responsibilities are clearly laid out.²¹ While familial caregivers provide comfort and consistency to patients, inadequate health literacy, and interfamilial disagreements have the potential to increase stressors on HBPC providers.³⁷

Another challenge that HBPC faces is the complexity of care that homebound individuals require. Unlike communication and coordination, the needs of someone with multiple chronic conditions is not related to HBPC itself but, rather, is attributable to the fact that those who

would benefit from receiving care at home inherently have more comorbidities and face more challenges than those who are not homebound. Homebound individuals with chronic conditions routinely have a higher symptom burden upon enrollment in HBPC than those who are not homebound and, in turn, tend to have more frequent needs.^{34,37} Ideal candidates for HBPC also tend to have multifactorial conditions that include factors related to pain, loss of appetite, lack of energy, anxiety, and depression.^{34,37} While the complex nature of HBPC patients can be a stressor for providers, HBPC providers are in a unique position to provide symptom control for individuals with a high symptom burden who do not yet meet hospice criteria.³⁷ Serving as an intermediary between patients and the local hospice providers can improve transition of care when the need for hospice arises.³⁷

In a recent questionnaire addressing stressors faced by HBPC providers, respondents cited issues surrounding lack of certainty when managing homebound patients, as clinicians often do not have rapid access to specialists or to the necessary laboratory studies needed to complete a full diagnostic workup.³⁷ The geographic isolation and reduced access to laboratory and imaging technology has required that providers become more comfortable with diagnostic uncertainty – a reality that medical training does not often admit or encourage.³⁷ While the development of mobile healthcare has enabled practitioners to order in-home services such as electrocardiograms, echocardiograms, x-rays, ultrasounds, sleep studies, and bone density studies, not all providers have access to these services.³⁷ It is important that HBPC providers are informed about the availability of in-home technologies and that teams develop systems that provide appropriate access to relevant mobile care studies in order to ensure that high-quality care can be provided.

A fourth challenge faced by HBPC teams is that of financial reimbursement. Given that traditional payment models were created with hospital and clinic-based care in mind, many

standard coverage policies pose barriers to new care delivery methods such as HBPC.³⁸ As mentioned previously, HBPC has been shown to reduce costs, in a large part, due to judicious use of labs and studies without sacrificing quality of care or patient outcomes.³⁶ Since the majority of healthcare systems bill based on the number of labs, studies, and procedures performed, those working in a setting that emphasizes preventive care, like HBPC, do not receive the same amount of compensation given the current payment system. While it must be noted that the patient population for those in a hospital and those receiving home care have differing needs, the favorable outcomes experienced by HBPC patients combined with the emphasis on ordering only necessary labs and studies might imply that healthcare providers have a tendency to overuse services more on the basis of convenience and proximity than on well-articulated medical theory or scientific evidence.³⁸ Given the disconnect between the way in which healthcare is reimbursed and the manner in which HBPC care is given, healthcare systems have found it difficult to maintain a fiscally responsible HBPC business model.³⁷ Echoing this challenge is a survey response from a HBPC provider who listed “inadequate funding for the complex work performed” as a difficulty in providing care outside of a hospital or clinic.³⁷ A 2016 study that examined the future of HBPC advocated for reforms that would loosen the criteria to receive homebound care and advocate for consideration of alternative payment models that would enable greater flexibility in the delivery of home health care.³⁹ HBPC teams could be more financially viable if the reimbursement system offered global budgeting to qualified providers, reimbursed based on quality measures rather than resources utilized, or simply granted more remuneration for HBPC of high-cost individuals.³⁹ Given the economic incentive for health systems to fill hospital beds and utilize numerous services, as is the case in fee-for-service Medicare, value-based payments could encourage scalability of this the HBPC model and, in turn, promote the health and dignity of elders while saving healthcare dollars.^{26, 38}

Conclusion

The shifting needs of an aging population present an ever-increasing strain on health care systems around the world. The rise in both chronic conditions and homebound patients applies pressure on providers and insurers to identify successful alternative care models. HBPC embodies much of what health care reform is striving to achieve – a collaborative approach that provides high quality, patient-centered care, while seeking to be both effective and efficient in its utilization of health care funds. A change in healthcare reimbursement models, from one that incentivizes the use of services to another that quantifies and reinforces the use of preventive care, may serve a catalyst for dramatic changes in HBPC documentation and implementation. Incorporation of HBPC in caring for those who are homebound or who have multiple chronic conditions, has been shown to reduce healthcare expenditures and increase patient satisfaction without compromising patient outcomes or mortality. Furthermore, the use of HBPC, due to its ability to support patients in remaining in familiar and comfortable environments, relieves stress on caregivers and is particularly beneficial for frail adults and those with dementia. The implementation of HBPC as an adjuvant to traditional care would benefit healthcare systems by increasing patient follow-up rates and reducing emergency department visits while delivering timely and individualized care to its recipients.

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Appendix

Table 1: Prevalence of physical and mental illnesses in the homebound population (NAME) compared to the non-homebound (Framingham) population.⁹

	NAME STUDY (homebound)	Framingham Study (non-homebound)
Age, mean \pm SD	76.2 \pm 8.4	76.6 \pm 6.0
Diabetes	39.0%	11.4%
Stroke	21.0%	1.7%
Hypertension	92.0%	41.1%
Cardiovascular disease	42.5%	23.6%
Body Mass Index (BMI)	31.0	27.2
Dementia (including Alzheimer's Disease)	31.4%	0.3%
Mild Cognitive Impairment (MCI)	34.3%	24%
Depression	30.0%	9.4%



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