

# Hospitalizations and Skilled Nursing Facility Admissions Before and After the Implementation of a Home-Based Primary Care Program

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**OBJECTIVES:** To evaluate the effect of an urban house calls program (HCP) on healthcare utilization.

**DESIGN:** Retrospective chart review with pre/post analysis.

**SETTING:** Urban home-based primary care program.

**PARTICIPANTS:** All participants (N = 179) in a capitated insurance program enrolled in a HCP between October 2004 and August 2006.

**INTERVENTION:** Enrollment into HCP.

**MEASUREMENTS:** Hospitalizations and skilled nursing facility (SNF) admissions before and after enrollment. Patients with at least one hospitalization or SNF admission before and after enrollment were compared using the McNemar test. Median number of hospitalizations and SNF placements before and after HCP enrollment were compared using the Wilcoxon signed-rank sum test.

**RESULTS:** Sixty-one percent of patients had one or more hospitalizations before enrollment, whereas only 38% had one or more hospitalizations after enrollment ( $P < .001$ ). Thirty-eight percent of patients had at least one SNF placement before enrollment, compared with 18% after enrollment ( $P = .001$ ). The median hospitalization rate decreased from 1 to 0; the median SNF placement rate was 0 (interquartile range 0–1) before enrollment and 0 (interquartile range 0–0) after enrollment ( $P < .001$ ).

**CONCLUSION:** A HCP may be associated with fewer hospitalizations and SNF placements. Models of care that reduce morbidity and preserve quality of life are critical to help homebound older adults remain in their communities. *J Am Geriatr Soc* 58:1144–1147, 2010.

**Key words:** house calls; healthcare utilization; homebound

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DOI: 10.1111/j.1532-5415.2010.02859.x

At least 2 million individuals, half of whom are aged 65 and older, are permanently homebound, and many millions more are temporarily homebound.<sup>1</sup> This vulnerable population has difficulty accessing primary care services, and limited access to primary care has been associated with worse quality of care and higher medical costs.<sup>2,3</sup> Homebound patients often have multiple comorbidities, including dementia, congestive heart failure, arthritis, psychiatric illness, and cancer,<sup>4</sup> and poor functional status and high mortality.<sup>5,6</sup>

Various models of health care have been developed to meet the needs of the homebound population, including longitudinal home-based primary care services, or HCPs.<sup>6</sup> After decades of waning numbers of house calls by physicians, house calls are now on the rise. Between 1998 and 2004, the annual number of house calls increased 43%, from approximately 1.4 million to 2 million visits.<sup>7</sup>

Previous studies have investigated the effect of in-home nursing, physician, and home safety assessments on healthcare utilization in older community-dwelling adults. Other studies have evaluated the effect of specific home-based programs, such as transitions between home and hospital discharge, acute care at home, or disease-specific interventions, on healthcare utilization in this population. One study found that multidisciplinary home-based physician care after an admission for congestive heart failure resulted in a 40% relative reduction in hospital readmissions.<sup>8</sup> Studies of Hospital at Home, a program that treats acute conditions in patients' homes with minimally invasive measures, have shown fewer complications and lower cost than for patients hospitalized for similar conditions.<sup>9,10</sup> The Veterans Affairs Team-Managed Home-Based Primary Care (TM/HBPC) study randomized patients aged 65 and older with more than two activity of daily living (ADL) impairments, congestive heart failure, chronic obstructive pulmonary disease, or terminal illness to TM/HBPC or usual care. There were lower hospital readmission rates for TM/HBPC at 6 months than for the usual care group, but 58% were discharged from the program within 6 months, because they were no longer homebound.<sup>9</sup> Few studies have examined the effect of a longitudinal primary care house calls program (HCP) on

healthcare utilization by homebound elderly patients, a different population than the TM/HBPC population.

The Montefiore Medical Center HCP, begun in 2004, was developed and implemented to provide longitudinal home-based primary care services to older homebound adults. This study determined the hospital and SNF utilization patterns before and after enrollment in a physician-led urban HCP. The objectives were to describe the sociodemographic, clinical, and functional characteristics of patients enrolled in HCP and to determine whether enrollment in HCP is associated with fewer hospital and SNF admissions.

## METHODS

### The HCP Model of Care

Montefiore Medical Center Care Management Company (CMO), a capitated insurance program, identified homebound patients in its managed care program and enrolled them in HCP. At the time of analysis, HCP consisted of two primary care physician (PCP)–nurse practitioner (NP) teams and one social worker. Upon enrollment, each patient was assigned to a healthcare team. Each team currently follows a maximum of 200 patients, but at the time of analysis, neither team was at capacity. The program goal is to see new patients within 2 weeks of referral date; on average, patients are seen 7 days after referral. The assigned PCP performs a comprehensive initial visit for all newly enrolled patients. This initial visit consists of a complete medical history; physical examination; and assessment of function, disability, and cognition. After the initial visit, the NP makes monthly visits, and the PCP sees patients approximately every 3 months. If a patient has an urgent problem, there is a HCP PCP on-call by telephone on weeknights and weekends. Immunizations and intramuscular or subcutaneous injections (e.g., vitamin B<sub>12</sub>, leuprolide) are given at home. Wound care is done at home through home nursing services. The PCP or NP draws blood for laboratory tests when needed. If imaging is needed, patients travel to an imaging center, although some X-rays can be done in the home. Podiatry visits are done at home. If other specialty consultations are needed, patients travel to the specialist's office. Transportation for services is arranged depending on insurance eligibility. Approximately 15% of patients are discharged from the program every year; the most frequent cause is death, followed by long-term nursing home placement. HCP accepts referrals from hospital- and community-based healthcare providers, as well as social programs, religious organizations, family members, and word-of-mouth recommendations. Currently, the most common referral sources are CMO case managers, hospital discharge planners, home care agencies, and community healthcare providers. To be eligible for HCP, patients have to meet the Medicare definition of homebound: able to leave home only with great difficulty and for absences that are infrequent or of short duration.<sup>11</sup> There are no other exclusion criteria for enrollment.

### Study Design

A retrospective review of eligible participants' medical and billing records was conducted. Billing records provided by the CMO capture all billing data for each patient, regardless of site of care.

The sample included all CMO participants enrolled in HCP between its inception in October 2004 and August 2006 who had at least 30 days of follow-up in the program and who had complete chart data in the medical record.

### Medical Record Review

Sociodemographic and clinical data were abstracted from the patient's paper medical record using a structured chart review instrument. Clinical diagnoses were abstracted from the problem list and intake history and physical. Presence of co-inhabitants, home health services, end-of-life discussions, healthcare proxy, a do-not-resuscitate (DNR) order, and history of falls were captured from the intake history and physical. The clinician assessed functional status at the initial intake history and physical using seven-item ADL and seven-item instrumental ADL (IADL) scales.<sup>12,13</sup> The assessing clinician scored the patient's function for each scale item as 0 (complete dependence), 1 (partial dependence), or 2 (independence) and calculated a summary score of 0 to 14 for each scale. The ADL scale included bowel continence and ability to independently dress, eat, walk, toilet, bathe, and transfer from bed to chair. The IADL scale included ability to use the telephone, prepare meals, take medications, complete activities beyond walking, shop, do housework, and handle money.

### Outcome Measures

The main outcome was the change in number of admissions to the hospital or a SNF before and after enrollment. Using the CMO database maintained for billing, the number of hospitalizations and SNF admissions for patients during their enrollment in HCP and for a time before HCP enrollment equivalent to their period of observed HCP enrollment was determined.

The post-HCP enrollment time period was calculated from each patient's date of enrollment to the date of data analysis (or death, if the patient died before August 2006). The pre-HCP period was calculated using an equivalent number of days dating back from HCP enrollment date. For example, if a patient was enrolled 8 months before the time of analysis, that patient's HCP data was compared with the 8 months before HCP enrollment.

### Data Analysis

The proportions of patients with at least one hospitalization and at least one SNF admission before and after enrollment were compared using the McNemar test. Median number of hospitalizations and SNF placements before and after HCP enrollment were compared using the Wilcoxon signed-rank sum test.

## RESULTS

Two hundred ten patients met inclusion criteria; 179 of these were included in the sample. Thirty-one patients were excluded because of lost or unavailable charts or because of no recorded HCP visits. The median number of days enrolled in HCP was 198 (range 32–368). The majority of enrollees were female (70%), and the mean age at enrollment was 79.0 ± 10.6. Forty-nine percent of patients were black, 26% white, 12% Hispanic, and 14% other.

**Table 1. Characteristics of House Call Program (HCP) Enrollees (N = 179)**

Characteristic	Value
Age, mean $\pm$ standard deviation	79.0 $\pm$ 10.6
Sex, n (%)	
Female	125 (70)
Male	54 (30)
Race or ethnicity, n (%)	
Hispanic	21 (12)
Black	87 (49)
White	46 (26)
Other	25 (14)
Diagnoses, n (%)	
Congestive heart failure	46 (26)
Diabetes mellitus	78 (44)
Dementia	60 (34)
Depression	40 (22)
Arthritis	99 (55)
Coronary artery disease	36 (20)
On anticoagulation (warfarin)	24 (13)
Chronic obstructive pulmonary disease or asthma	44 (25)
History of stroke	40 (22)
History of falls	25 (14)
Functionality*	
ADL score, median (interquartile range)	9 (4–12)
IADL score, median (interquartile range)	4 (0–6)
Support services at enrollment, n (%)	
Lives alone	54 (30)
Live-in caregiver	103 (58)
Non-live-in caregiver	44 (25)
Home health aide	92 (51)
End-of-life decisions, n (%)	
Do-not-resuscitate order	35 (20)
Healthcare proxy	47 (26)
Enrolled in HCP, days, median (range)	198 (32–368)

\*Functionality was determined using seven-item activity of daily living (ADL) and seven-item instrumental activity of daily living (IADL) scales. Each scale item ranged from 0 (complete dependence) to 2 (complete independence). Total scores ranged from 0 to 14.

The most common diagnoses were arthritis (55%), diabetes mellitus (44%), dementia (34%), and congestive heart failure (26%). The median ADL and IADL scores were 9 and 4, respectively; 28% of patients' ADL scores were between 0 and 4 (least functional), and 56% had IADL scores between 0 and 4. Fifty-eight percent of patients had a live-in caregiver at time of enrollment, and 30% lived alone; 51% had a home aide or attendant. Only 20% had a completed DNR form in the chart during the time of chart review (Table 1).

During the study period, 12 patients were placed in nursing homes (7%), nine died (5%), and two (1%) withdrew to return to their prior PCP. Twenty patients (11%) were no longer at home at the time of analysis, but no information was available as to their whereabouts at the time of disenrollment from the program.

It was found that 61% of patients had one or more hospitalizations before enrollment, whereas only 38% had

**Table 2. Hospital and Skilled Nursing Facility (SNF) Admissions Before and After Enrollment in the House Call Program (N = 179)**

Healthcare Utilization	Before Enrollment	After Enrollment	P-Value
Patients with $\geq 1$ hospitalizations	110 (61)	178 (38)	<.001
Patients $\geq 1$ SNF admissions	63 (35)	33 (18)	.001
Hospitalizations, median (interquartile range)	1 (0–2)	0 (0–1)	.001
SNF admissions, median (interquartile range)	0 (0–1)	0 (0–0)	.001

one or more hospitalizations after enrollment ( $P < .001$ ). Similarly, 38% of patients had at least one SNF placement before enrollment, compared with 18% after enrollment ( $P = .001$ ). The median hospitalization rate decreased from 1 to 0; the median SNF placement rate was 0 (interquartile range 0–1) before enrollment and 0 (interquartile range 0–0) after enrollment ( $P < .001$ ) (Table 2).

## DISCUSSION

Studies in the homebound population have found high rates of chronic medication use,<sup>14</sup> higher rates of emergency department use,<sup>15</sup> and nearly twice the rate of annual hospitalizations as with other Medicare beneficiaries.<sup>15,16</sup> This retrospective analysis found that patients in HCP were less likely to be admitted to the hospital or SNF in the period after enrollment than in the period before.

Important features of HCP that might have contributed to the lower hospital and SNF admissions in this vulnerable population include better access to healthcare services and 24-hour availability of healthcare professionals. Other possible factors that may contribute to less inpatient utilization include home safety interventions, better medication management, lower caregiver stress, and ability to support death in the home.<sup>17</sup> The association between greater access to primary care and lower hospital use has been demonstrated in previous studies.<sup>18</sup> Patients with limited access to primary care have poorer quality of care and higher healthcare costs.<sup>3</sup> The integrated services at HCP, including physician, nursing, nutrition, and social services, may provide better coordination of services and prevent unnecessary admissions. Another possible factor leading to the lower utilization may have been the HCP's ability to connect these patients with needed community resources. Despite their overall poor functionality and cognitive function, only half of the patients in HCP had a home aide or attendant before enrollment. Evaluations of home-based primary care services have demonstrated that physicians who care for patients in their homes make more referrals to skilled home health agencies and provide more individualized and -comprehensive instructions.<sup>19, 20</sup> Another possible contributor to the decrease in hospital and SNF admissions may have been the result of disease-specific interventions that HCP provided during longitudinal house call visits, consistent with results of disease-specific home care programs.<sup>8, 21–23</sup>

Few studies have specifically examined physician-based primary care home visits to elderly homebound patients in the community. The findings of the current study suggest

that longitudinal primary care physician home visits may be associated with lower hospital and nursing home use, a result seen in prior studies of various home care services, including nursing, social work, and one-time geriatric home safety assessments.<sup>6,24,25</sup> The few studies that have evaluated physician house calls have found fewer admissions to long-term care and better quality of life, but many of these were not solely home-based primary care but rather home visits that supplemented traditional office-based care.<sup>6,24–26</sup> The Veterans Affairs TM/HBPC has examined its multidisciplinary physician-led home-based primary care model, finding that house calls were associated with fewer hospitalizations than usual care.<sup>9</sup> The HCP patients consisted of more older women and minorities and those with poorer baseline function than in the TM/HBPC study. The VA program was designed to be intermittent care rather than outpatient-based longitudinal care for all community dwellers. These data suggest that home-based primary care is effective in a variety of populations with various illness severities.

The observational design of the study makes it subject to referral bias, with the sickest patients entering the program. Given the mean follow-up time of approximately 6 months, it was not possible to determine whether the decrease in hospitalization and SNF admissions would persist as patients stabilized and had continued access to care. Without a randomized design and comparable control group, it is possible that the decrease in admissions may not be directly attributable to enrollment in HCP. Referral sources were not recorded routinely; therefore, it was not possible to assess what proportion of patients was referred after hospital discharge. For patients enrolled after hospital discharge, the hospitalization itself may have conferred a benefit and resulted in an overestimation of the observed reduction in hospitalizations. Assuming a base hospitalization rate of 50% and no effect of the intervention, the results would be explained if more than 46% of the sample was referred from the hospital. Finally, although a reduction in hospitalizations and SNF admissions is likely to result in cost savings, it was not possible to evaluate the total costs before and after enrollment; further study is necessary to elucidate exact cost reduction.

## CONCLUSION

Despite these limitations, the data suggest that a HCP can reduce costly hospitalizations and SNF placements. Models of care that reduce morbidity and costs and preserve quality of life are critical to helping older homebound adults remain in their communities, achieve better health outcomes, and avert costs. As the number of older homebound adults with multiple chronic illnesses increases in the United States, prospective, randomized evaluations of home-based primary care models are needed to ensure high-quality, cost-effective healthcare for this population.

## ACKNOWLEDGMENTS

**Conflict of Interest:** The editor in chief has reviewed the conflict of interest checklist provided by the authors and has determined that the authors have no financial or any other kind of personal conflicts with this paper.

Dr. Aniff is the Medical Director of the Montefiore HCP.

**Author Contributions:** Ania Wajnberg: concept and design, acquisition and analysis of data, drafting of manuscript, and approval of final version. Karen Wang: concept, acquisition and analysis of data, drafting and revising of manuscript, and approval of final version. Mohammed Aniff: acquisition and interpretation of data. Hillary Kunins: design, analysis of data, revision of manuscript, and approval of final version.

**Sponsor's Role:** No sponsor.

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