

Program at Home: A Veterans Affairs Healthcare Program to Deliver Hospital Care in the Home

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The Portland Veterans Affairs Medical Center (PVAMC) participated in a research-based National Demonstration and Evaluation Study of Hospital at Home Care for Elderly Patients. PVAMC continued hospital at home care in a modified form based on the results of that research phase and feedback from patients, families, and staff. The modified clinical program (referred to as Program @ Home) provided care for the same diagnoses (exacerbation of congestive heart failure, exacerbation of chronic obstructive pulmonary disease, community-acquired pneumonia, cellulitis) but differed from the research-based demonstration project in that it accepted patients of all ages, accepted early-discharge patients from the hospital, and provided a less-intensive physician and nursing model. In the first 42 months, 290 patients were admitted; 23% came from the emergency room, 54% were early hospital discharge, and the remainder came from an outpatient clinic or home care. Average length of stay was 3.2 days, and 37% were younger than 65. The results describe how a home hospital program has been integrated into the clinical care offerings of a managed care health system and how it supports inpatient, primary, emergency, and home care programs. *J Am Geriatr Soc* 56:2317–2322, 2008.

Key words: home hospital; elderly; acute medical illness; Department of Veterans Affairs

The hospital is the accepted standard for the provision of acute medical care. For a few conditions, health systems have developed outpatient approaches for what

previously required an inpatient stay, the most notable of these being home intravenous (IV) therapy.¹ However, an acute hospital stay may be hazardous, especially for older persons, who commonly experience functional decline, delirium, iatrogenic illness, and other adverse events in the hospital.^{2,3} Moreover, hospital care can be expensive and disruptive for patients and families. One approach to improve outcomes of elderly patients who are hospitalized is the Acute Care for the Elderly (ACE) unit concept, in which a specialized inpatient environment is developed to minimize the potentially adverse affects of hospitalization.^{4,5} These studies have shown less decline in activities of daily living function at discharge and less nursing home placement than with usual care.

For carefully selected patients, providing acute care in a patient's home has been evaluated as an alternative to typical acute hospital care. The rationale is that acute care in the home may reduce complications, increase satisfaction, and reduce costs.⁶ A variety of acute home care models have been described, but many have been nurse-led, early-hospital-discharge models often targeted at surgical patients.^{7,8} With some exceptions, acute care models of home care for medical patients have not provided substantial physician involvement.⁹ These previous models have been studied in the United Kingdom, Israel, Australia, and other countries that have a single-payer, national health insurance system. For example one study reported a randomized controlled trial of 100 patients in a Hospital at Home (HaH) Program in Australia in which a home hospital program was a substitute for hospital admission.¹⁰ This program was targeted at older patients but did not exclude younger patients. It admitted patients with the following six diagnoses: community-acquired pneumonia (CAP), congestive heart failure (CHF), urinary tract infection, infective endocarditis, osteomyelitis, deep vein thrombosis, and minor cerebral vascular accident. The results showed substantial reductions in delirium and bowel complications, and overall, there were no differences between the groups in adverse events or death. There was also greater patient satisfaction, caregiver satisfaction, and function in the HaH care group.

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Recently, research on acute home care in the United States took a major step forward with the publication of a National Demonstration and Evaluation Study of a HaH model that substituted entirely for an acute hospital admission for older persons with acute medical illnesses.¹¹ In that study, patients aged 65 and older who would otherwise have required hospital admission for four specific diagnoses (CHF, chronic obstructive pulmonary disease (COPD), cellulitis, and CAP) were enrolled. Enrollment was restricted to patients aged 65 and older for two reasons: it was a Medicare+Choice care option for two of the study sites, and previous literature supported that patients aged 65 and older have more hospital complications than patients younger than 65. Patients received daily physician home visits and a period of continuous nursing (minimum 8 hours after admission) followed by twice daily nursing visits. The specific aims of that study were to evaluate clinical safety of HaH care; evaluate complications with focus on delirium; evaluate satisfaction of patients, caregivers, and healthcare providers with the HaH model; compare costs of care in HaH with those of acute hospital; and evaluate feasibility of the HaH model in integrated healthcare systems. To summarize the results, 60% of patients offered HaH care chose it over inpatient care. In the HaH group, there was significantly less foley catheter use, fewer technical procedures per patient, and fewer consultations of any type. There were significantly lower rates of incident delirium and subsyndromal delirium, less sedative medication use, and fewer bowel complications. Other outcomes from the HaH group included a shorter length of stay (3.2 vs 4.9 days, $P=.004$) and lower cost of care (\$5,081 vs \$7,480, $P<.001$). The satisfaction of patients and families receiving care at home was significantly better than for hospital care in the domains of physician care, comfort and convenience, admission process, and overall care.¹² Stress levels were also lower in patients and families receiving care at home.¹³ The program was successful in all measures, except that many barriers were identified to making this option more widely available in existing hospital systems.

There are not specific economic incentives in the fee-for-service health insurance systems to provide acute medical care in the home, but integrated healthcare and financing systems, such as managed care organizations, and the Department of Veterans Affairs (VA) healthcare systems, present a setting in which HaH care may be an excellent way to meet patient care needs, reduce complications of acute illness, and make more hospital beds available for patients who cannot receive their care at home. In such integrated systems, capitated payments, or budgets in the case of the VA hospitals, provide incentives to deliver quality care in the least-restrictive and least-expensive setting.¹⁴ In addition, the presence of salaried physicians makes implementation of this type of program easier, because the providers do not have to rely on existing home care physician payments.

The purpose of this report is to describe the process used to transition the HaH model at the Portland VA Medical Center (PVAMC) from the research model described above to a nonresearch, ongoing clinical care model. The experience in the first 42 months of providing care using this modified program is also described.

METHODS

Approvals

Patients were offered the option of receiving or completing their care in the home with the clinicians providing their care. Written informed consent was not obtained. The institutional review board at the PVAMC approved the medical record data collection for this study.

Development of a Modified HaH Model

Informal but specific feedback was obtained during interviews with previous patients, families, and selected staff regarding the national demonstration project. Patients and families liked receiving their nursing care at home but did not like the continuous nursing model. In the original study, a nurse stayed at the patient's home for a minimum of 8 hours after admission and many times overnight. Patients and families stated that they were uncomfortable with a nurse spending the night in their home while they were asleep. They preferred that a nurse come to the home, provide the needed care, and then leave. Emergency department staff felt that there were many patients younger than 65 who could benefit from hospital care at home rather than hospital admission and thus suggested expanding the age range. The inpatient medical service teams wanted to be able to admit "early discharge" patients to the program to allow for completion of complex therapy and monitoring that had started in the inpatient setting. The primary care providers were interested in transitional care for complex patients being discharged from the inpatient ward or the emergency department. Our home care program wanted to integrate the home hospital model into its ongoing home care nursing operations. In the research year at the PVAMC site, a contract home care agency provided the home nursing care. The major concern of the home care nurses was their ability to provide multiple daily visits and still meet the needs of their other home care patients. They supported trying to develop a single daily nursing visit model. The home hospital physicians felt that daily physician visits were excessive and that many patients could be safely and effectively managed using a registered nurse (RN) visit and daily physician oversight and review. They felt that this would be especially feasible if they were working with RN staff with whom they were familiar and could work with on an ongoing basis.

Using this feedback, a new clinical program was developed called "Program @ Home . . . an alternative to hospitalization." This modified program treated the same four diagnoses (CHF, COPD, CAP, cellulitis) but accepted patients of all ages, accepted early hospital discharges, provided a single daily RN visit, and provided a one-time physician visit, with daily physician oversight and additional physician visits if needed. Additional visits occurred at the discretion of the managing physician or at the request of the nurse. All of the physicians were internists or family physicians with Certificates of Added Qualifications in Geriatrics and with experience in home care, nursing home care, and hospital care. For most of the time, there were lead physicians who had 50% of their total effort devoted to the home hospital program. All of the nurses were RNs whose full-time work was home care. There was also usually a lead RN who took most of the admissions. Physician

oversight consisted of a daily conversation with the nurse while the nurse was in the home with the patient, along with review of weight, vital signs, physical findings, daily laboratory results, response to medication changes, and any difficulties with care plan adherence. The medical treatment plan was adjusted daily to meet the changing needs of the patient. The physician and nurse each wrote a daily progress note summarizing their findings, impressions, and plans in the electronic record. Other healthcare team members (physical therapy, occupational therapy, social work, respiratory therapy, pharmacist) were used in the usual outpatient access mechanisms.

The same types of medical support offered in the initial study continued to be provided (intravenous medications, nebulized bronchodilator medications, oxygen). The interventions were adjusted to meet a single daily nursing visit protocol. For laboratory results that were needed that day, a community home draw service collected the blood specimen in the morning and delivered it to the hospital so the results would be available by 11:00 a.m. Intravenous medications that needed to be administered once daily were administered at the time of the nursing visit. Complex patients with CHF often needed to take an oral dose of diuretic in the morning, and then the nurse gave an intravenous dose in the afternoon, after an assessment and physician review of laboratory results. Access to home radiology and electrocardiogram were maintained, but they were rarely used. A private answering service for the program was maintained.

Eligibility

The target population was community-dwelling veteran patients of any age who resided within a 25-mile, 35-minute radius of the PVAMC and required, in the opinion of one or more physicians, an acute hospital admission or extension of their acute hospital stay for one of the four target illnesses. Patients were offered the option of home hospital care versus hospital admission or continued hospital stay during Program @ Home admitting hours (8:00 a.m. to 4:30 p.m. 7d/wk). Administrative eligibility status for Program @ Home was determined (target diagnosis, radius from medical center, not living in nursing home, safe home care environment). Patients were admitted only if the Program @ Home physician and RN concurred that Program @ Home could safely meet the needs of the patient. The nurse, and often but not always the physician, saw the patient before acceptance. The physician usually at least reviewed the electronic medical record and spoke with the referring provider before admission. A prepaid cell phone was loaned to patients without a home phone. Patients who lived alone were eligible to receive care.

Intervention: The Modified HaH Model of Care (Program @ Home)

Before transport home from the emergency department or inpatient ward, the patient was given an initial or daily dose of antibiotic or other medical therapy. All parties involved reviewed and agreed upon mode of transportation. This could be the patient's own car, a cab, a care car, or an ambulance. The Program @ Home physician made at least one patient visit in the hospital, clinic, or home and was

available (or coverage physician) 24 hours a day for urgent or emergent calls or visits.

Patients received daily nursing visits. Durable medical equipment, intravenous fluids, intravenous antimicrobials and other medicines, and oxygen and other respiratory therapies were provided in the home. Patients were followed until stable for discharge, at which time their care reverted to usual care under the supervision of their primary care physician. In addition, at the time of discharge, an assessment was made as to whether postacute home health services were required, and a separate referral for home health care was made if needed.

Data Analysis

Data are reported as means, medians, and ranges as calculated using Excel 2003 (Microsoft Corp., Redmond, WA).

RESULTS

Between October 2002 and March 2006, 225 patients were admitted 290 times for care in this modified program (Table 1). Most of the 65 repeat admissions were a single readmission, although four patients were admitted four times to the program. Only five women received home hospital care, which is reflective of our patient demographics. Admissions per year ranged from 61 to 102 patients and were most often limited by nurse staffing.

Table 1. Characteristics of Patients Receiving Care at Home

| Characteristic | Value |
|---|------------------|
| Admissions, n | 290 |
| Unique patients, n | 225 |
| Age, mean; median (range) | 68.7; 69 (46–93) |
| Aged ≥65, % | 63.8 |
| Male, % | 98.3 |
| Diagnosis, % | |
| Congestive heart failure | 51.0 |
| Chronic obstructive pulmonary disease | 19.7 |
| Pneumonia | 11.0 |
| Cellulitis | 24.8 |
| Other | 5.7 |
| Referral location, % | |
| VA inpatient bed | 54.1 |
| VA emergency department | 22.8 |
| VA outpatient clinic | 8.3 |
| Other | 14.8 |
| VA hospital admission in previous 6 months, % | 70.3 |
| VA hospital admissions in previous 6 months, mean | 1.3 |
| VA emergency department visits in previous 6 months, mean | 2.4 |
| Do-not-resuscitate status during episode of care, % | 20.0 |
| Identified impairment in functional status, % | 24.5 |
| Identified impairment in cognitive status, % | 4.1 |
| Required special transportation home, % | 12.4 |
| Lived alone, % | 30.3 |
| Charlson Comorbidity (age-adjusted), mean | 4.8 |

VA = Department of Veterans Affairs.

Average daily census ranged from zero to three patients. The age demographics are also shown in Table 1. Approximately one-third of the admissions (36%, $n = 104$) were younger than 65. There were six patients in their 90s and seven in their 40s.

There were 314 diagnoses for the 290 admissions (Table 1). The number of diagnoses exceeded the number of admissions because some patients were admitted with more than one diagnosis (e.g., CHF and COPD). The most frequent diagnosis was CHF ($n = 148$), 57 admissions had COPD, 32 pneumonia, 72 had cellulitis, and five had other diagnoses (urinary tract infection, unstable diabetes mellitus, fecal impaction).

The referring sites for admission to home hospital care is shown in Table 1. The most frequent source of admission was the inpatient bed service ($n = 157$). Sixty-six referrals were admitted from the emergency department; 24 from primary care or specialty clinic; and 43 from other venues including home care, outside hospitals, and outside emergency rooms.

The clinical characteristics during the home hospital stay are shown in Table 2. The mean length of stay was 3.2 days, and the median length of stay was 3 days, with a range of 1 to 14 days. The length of stay was similar for patients younger than 65 (3.33 days) and patients aged 65 and older (3.25 days). Admissions were fairly evenly distributed between the days of Monday through Friday. There was a slight but nonsignificant increase on Fridays. There were fewer admissions on Saturday and Sunday. (Approximately 10% of all admissions occurred on Saturday and Sunday combined, and the expected rate would be 28% for the 2 days if admissions were distributed equally all 7 days of the week.) The mean length of stay was similar to the original study length of stay of 3.2 days. Approximately 50% of the patients received intravenous therapy, oxygen therapy, or both, although only 20% of the oxygen therapy was a new

home therapy for the patient. Approximately 20% of the patients required some kind of wound care. Nursing visits exceeded the length of stay in the program, because there was usually a RN visit to an inpatient before discharge (e.g., RN saw patient on a Tuesday, and patient was discharged on a Wednesday). Most patients received only a single doctor's visit. The number of blood draws mirrored the length of stay because of the high percentage of patients with CHF who were undergoing daily electrolyte assessments. Almost 60% of the patients were referred for home care after discharge from Program @ Home care.

Data are reported on patients who had a VA hospital admission within 7 or within 30 days of their home hospital care discharge. These figures underestimate hospital use because outside hospital use is not always present in the electronic medical record, and it was not possible to review progress notes carefully to see whether that occurred. Anecdotally, most of the patients tried to use the VA hospital when possible. These data show that the 7-day hospital admission rate was 16% and that an additional 10% were admitted by 30 days so that a total of 26% of the patients had been readmitted to the VA hospital within 30 days. This 30-day rate is similar to an overall medicine service readmission rate of 20% for the PVAMC.

Of the 290 admissions, six did not complete their care at home as planned. Two had chest pain: one called 911, and Program @ Home staff advised the other to call 911. Both returned home after evaluation. A third patient was advised to call 911 for a COPD exacerbation that required admission for 48 hours at an outside hospital. There were two elective hospital admissions: one for nonresolving cellulitis and another for increasing renal failure. There was one patient who did not stay at home or in contact with staff, probably because of illegal drug use. He was discharged from the program before completing his planned therapy. There were no deaths during the home hospital care, but there were 12 deaths within 30 days of a home hospital admission.

A 0.5 full-time equivalent (FTE) physician, 1.0 FTE home care registered nurse, and 0.5 FTE clerical support were formally added to support an estimated 100 admissions per year (Table 3). The program was staffed by adding additional personnel to the existing home care staff and geriatrics providers. For nursing, existing home care nurses who changed their usual workweek schedule covered weekends and vacations coverage. Existing geriatric faculty supplied physician coverage for nights, weekends, and vacations at no additional cost to the system. Additional costs were incurred for transportation of patients, transportation of medications, contract oxygen, contract intravenous medication delivery, nebulizer machines, and blood drawing services that averaged \$331 per patient for the most recent year of care.

The total estimated additional cost was \$400,000, which equates to \$3,922 per patient admitted in the year in which 102 patients were admitted and \$6,557 per patient admitted in the year in which 61 patients were admitted. The current infrastructure could support approximately 120 admissions per year at a cost of approximately \$3,300 per admission. For planning purposes, 3 inpatient bed days of care saving per HaH admission at a rate of \$1,700 per day of care was used. Using these numbers, 235 inpatient

Table 2. Clinical Measures During Home Hospital Stay

| Clinical Measure | Value |
|---|---------------|
| Length of stay, days | |
| Mean; median (range) | 3.2; 3 (1–14) |
| Patients aged ≥ 65 , mean | 3.3 |
| Patients aged < 65 , mean | 3.3 |
| Receiving intravenous therapy, % | 58.3 |
| Receiving nebulizer therapy, % | 33.8 |
| Receiving oxygen, % | 48.3 |
| Receiving new oxygen, % | 20.3 |
| Receiving wound care, % | 17.9 |
| Registered nurse visits, mean (range) | 4.7 (1–22) |
| Physician visits, mean (range) | 1.1 (1–3) |
| Blood draws, mean (range) | 2.9 (0–33) |
| VA hospital admission within 7 days of Program @ Home discharge, % | 15.5 |
| VA hospital admission within 30 days of Program @ Home discharge, % | 25.5 |
| Deaths within 30 days of discharge, % | 4.1 |
| Home care referral after discharge, % | 55.2 |

VA = Department of Veterans Affairs.

Table 3. Estimated Program Costs per Year

| Cost | \$ |
|--|----------------|
| Staff | |
| Physician (0.5 FTE) | |
| Registered nurse (1.0 FTE) | |
| Registered nurse weekend and vacation coverage (0.2 FTE) | |
| Program assistant (0.5 FTE) | |
| Subtotal | 280,000 |
| Services | |
| Intravenous medications | |
| Oxygen delivery | |
| Nebulizers | |
| Taxi cab transportation | |
| Ambulance transportation | |
| Subtotal | 100,000 |
| Equipment | |
| Laptop computers | |
| Cars | |
| Cell phones | |
| Two-way pagers | |
| Answering service | |
| Subtotal | 20,000 |
| Total costs | 400,000 |

FTE = full-time equivalent.

bed days of care would need to be avoided to cover the costs of the HaH infrastructure.

DISCUSSION

The results demonstrate how a Department of Veterans Affairs Medical Center has added a HaH program to its care options. The utility of this type of program for patients younger than 65 and for patients who are already in an inpatient bed were demonstrated. The admission process from an inpatient bed to a HaH program is easier and less urgent than with a patient coming from the emergency department or clinic. For health systems planning to implement this type of program, an early-discharge model is potentially easier to develop and would likely result in greater throughput than a model based entirely on hospital substitution, although cost savings and reduction of iatrogenic events are not as great as a hospital admission avoidance model.⁸

The Cochrane database for clinical reviews has evaluated HaH care.⁸ Its review defined HaH “as a service that provides active treatment by health care professionals, in the patient’s home, of a condition that otherwise would require acute hospital in-patient care, always for a limited period.” Twenty-two trials were included in the current update of their review. Analyses included early-discharge HaH schemes for elderly medical patients, patients with COPD, patients recovering from a stroke, early discharge of patients recovering from surgery, and patients recovering from a hip replacement. HaH care resulted in slightly shorter hospital length of stay but longer overall length of care. Patients cared for in HaH expressed greater satisfaction with care than those in the hospital, whereas the view

of carers was mixed. They concluded that early-discharge schemes for patients recovering from elective surgery and elderly patients with a medical condition may have a place in reducing the pressure on acute hospital beds, that there was insufficient objective evidence of economic benefit, that future research should focus on rigorous evaluations of admission avoidance schemes, and that standards for research should aim at assisting future meta-analyses.

Compared with those previous studies of HaH, this one was unique in several respects. First, it has strong physician involvement. Many of the previous studies of HaH care have been nurse-led interventions.^{7–9} This difference may be important in the United States, where studies suggest that physician involvement may be crucial in ensuring patient acceptance of HaH-type care.^{15,16} Second, this model used an in-house home care program whose staff was familiar with the care of veteran patients and had historically worked closely with the geriatric physicians who were providing physician oversight for Program @ Home patients. This provided a collaborative model of physician–nursing care. Third, the model employed previously validated and explicit eligibility criteria to select patients for HaH care.^{11,17,18} It is likely that use of these criteria contributed to the low rate of complications in the home and the shorter length of stay. Fourth, it is likely that this experience is the first using a completely integrated electronic medical record in which all inpatient, outpatient, and home care data (notes, consultations, radiology, laboratory) are fully accessible to all providers.

There are significant benefits of this program to the health system, including decreased hospital divert time (the PVAMC is on divert status a significant amount of time each month because of a lack of medical bed capacity), a theoretical increase in acute care bed capacity, the availability of 7-day-a-week home care program coverage for staff and patients. The program supports many facets of our healthcare system including emergency room, inpatient, and primary care programs, as well as the home care program. It provides a model of patient-centered care with the potential for greater patient satisfaction.

The study has several limitations that should be considered when interpreting the findings. First, there was no control group. Because patients were referred from a number of different settings (clinic, inpatient, emergency department), it is not known how many patients refused this type of care when their provider approached them. Second, because the Program @ Home model was limited to four diagnoses and the study was performed entirely at a VAMC, the results may not be generalizable to the treatment of other illnesses, other populations of persons, or other healthcare systems. Despite these limitations, the data suggest that HaH for selected patients with selected acute medical conditions is a safe and efficacious model of care. This study demonstrates that patients will elect treatment at home and that younger patients are equally willing to receive their care at home. This model may also be associated with greater patient and caregiver satisfaction, better function, and less stress.^{12,13,19}

Future studies should explore what infrastructure is needed to meet the needs of specific patient populations (emergency department, late evening, larger radius). There may be additional diagnoses that should be added. The

infrastructure developed for HaH may also be appropriate for other patients whose care needs can be met in a modified outpatient setting (e.g., outpatient stroke rehabilitation, postacute care management). Specifically, the data suggest that length of stay needs to be evaluated to determine whether a longer length of stay or some other intervention (e.g., phone calls after discharge) could reduce 7- and 30-day readmission rates. For the PVAMC, the 30-day readmission rate for the acute medical bedsection in 2007 was 20.3%. For CHF, the 30-day readmission rate was also 20%. Possible interventions to decrease readmissions are being reviewed. It is also necessary to determine how best to incorporate this type of outpatient care program into educational training for physicians, nurses, and other health professionals.

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