

Effect of a Consumer-Directed Voucher and a Disease-Management–Health-Promotion Nurse Intervention on Home Care Use

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Purpose: We describe the impact of two interventions, a consumer-directed voucher for in-home supportive services and a chronic disease self-management–health-promotion nurse intervention, on the probability of use of two types of home care—skilled home health care and personal assistance services—received by functionally impaired Medicare beneficiaries. **Design and Methods:** The Medicare Primary and Consumer-Directed Care Demonstration was a randomized controlled trial in 19 counties in New York, West Virginia, and Ohio with four groups: disease-management–health-promotion nurse, consumer-directed voucher, combination (nurse plus voucher), and control. We estimated a bivariate probit model for the 1,394 individuals aged 65 or older who had no private long-term-care insurance. **Results:** Whereas the nurse intervention alone had no effect on the probability of using either type of home care, the voucher alone increased the probability of personal assistance services use by 13% ($p = .002$) but not that of skilled home health care use. The combination of the two interventions increased the probability of personal assistance services use by 18% ($p < .001$).

Implications: The implementation of disease-management–health-promotion nurse interventions should not lead to a greater probability of skilled home health care or personal assistance services use, whereas the provision of consumer-directed vouchers should result in an increased probability of personal assistance services use, as intended.

Key Words: Consumer direction, Disease management, Health promotion, Skilled home care, Personal assistance services

Various models have been proposed by researchers and policymakers to improve the effectiveness and contain the costs of providing better care for people with chronic conditions, including elderly Medicare beneficiaries. These models range from refinement of delivery mechanisms to service coordination and funding integration (Fox, Etheridge, & Jones, 1998). Self-management models are increasingly being implemented to help individuals better manage their illnesses in order to improve the quality and efficiency of their care (Weingarten et al., 2002). Among these, consumer-directed vouchers, chronic disease self-management interventions, and health promotion are promising approaches for improving health status and cost outcomes of older adults. As this trend continues, it will be important for researchers to examine the effects of these approaches on the use of home care, a service that is vital to many older people. In this article we describe the impact of a consumer-directed voucher for in-home supportive services and a chronic disease self-management–health-promotion intervention on the probability of use of two types of home care—skilled home health care and personal assistance services—by functionally impaired Medicare beneficiaries who were enrolled in a Medicare demonstration.

Personal assistance services consist of services for

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people who require partial or complete assistance with activities of daily living (ADLs), such as bathing, dressing, and eating, or with instrumental activities of daily living (IADLs), such as shopping for groceries, performing routine household chores, and doing laundry. Home health aides and personal care aides are paid to provide personal assistance services. Skilled home health care consists of skilled nursing or therapy services that are included in a care plan prescribed by a physician, provided on an intermittent basis, and delivered to homebound individuals. Skilled home health care is provided by nurses and physical, occupational, and speech therapists.

Consumer-Directed Vouchers

Vouchers have been used in social policy interventions ranging from food stamps to housing (Steuerle, 2000). There has been an increasing interest in their use in health care, especially in models that allow people with serious disabilities, the majority of whom are older adults (Schiller & Bernadel, 2004), to self-direct their use of home- and community-based services (Benjamin, 2001). Providing consumers with voucher benefits for personal assistance enhances their choices among various providers, including the option to engage nonprofessionals for home care services (e.g., paying a neighbor to perform home and personal care duties) if that option is allowed by the funding agency. The freedom to tailor the services the consumers obtain to their needs and preferences is expected to result in care that better suits each individual, leading to increased satisfaction and possibly improvements in other outcomes.

Consumer-directed home care is now available in several European countries (Wiener, Tilly, & Cuellar, 2003). In the United States, nearly a half million people were enrolled in consumer-directed home and personal care programs financed by individual states in 2001 (Coleman, 2003). However, there have been few rigorous evaluations of those programs. Two exceptions are recent analyses of California's (predominantly Medicaid) In-Home Supportive Services (IHSS) program and the Medicaid Cash and Counseling Demonstration. In the IHSS program, individuals receiving the consumer-directed model reported a better sense of security, fewer unmet functional status needs, and greater satisfaction with a range of outcomes including technical quality and interpersonal manner (Benjamin, Mathias, & Franke, 2000). The Cash and Counseling evaluation compared those who received agency-directed services with people assigned to consumer-directed care. Care recipients in the intervention group indicated fewer unmet needs and better satisfaction with paid caregivers' reliability, schedules, and attitudes, their relationships with paid caregivers, and their overall care arrangements. No effects were detected for adverse events (Foster, Brown, Phillips, Schore, & Carlson, 2003).

It does not appear that any studies have examined the impact of a European consumer-directed voucher on probability of home care use. Similarly, we are aware of only one such study in the United States, an evaluation of the Cash and Counseling program in Arkansas. This study found that the proportion of elderly people in the intervention group had a significantly higher probability of receiving paid assistance in the past 2 weeks than did those in the control group (94% vs 79%; see Dale, Brown, Phillips, Schore, & Carlson, 2003).

Health Promotion

We define health promotion broadly to include both traditional disease-prevention activities such as risk-factor screening for particular illnesses (e.g., blood pressure measurement) and healthy behaviors such as proper diet and sufficient physical activity as part of one's lifestyle. A variety of approaches have been developed to achieve and maintain changes in health behaviors (Bandura, 1997; Becker, 1974; Prochaska & DiClemente, 1983). Increasing emphasis is being placed on health promotion for elderly people by Medicare (Centers for Medicare and Medicaid Services [CMS], 2002) and others, because it has been found to result in improved health status and reduced disability in later life (Partnership for Prevention, 2003), and because it has the potential to help lower health care costs (Ackermann et al., 2003).

Although there has been little investigation of the effect of health promotion on the probability of home care use, one of the Medicare COBRA Prevention Demonstrations, Senior Health Watch, did examine this. The proportion of beneficiaries who had Medicare claims for home health care was slightly but not significantly lower for the intervention group than for the control group (Burton et al., 1995).

Chronic Disease Self-Management

Chronic disease self-management refers to the following of disease-specific protocols by patients who have been activated or empowered to do this. Many of these protocols utilize a case manager, most often a nurse, who usually engages in an initial assessment, education, activation, or empowerment, and periodic monitoring of the patient. There has been increasing evidence of positive outcomes of disease management for many chronic diseases (Bodenheimer, Wagner, & Grumbach, 2002). Furthermore, disease management is of considerable interest to Medicare, which is currently conducting several disease-management demonstrations (CMS, 2003).

Few disease management studies have looked at how their interventions affect the probability of home care use. An exception is the three Medicare Case Management Demonstrations, which experienced no significant differences between the case management

Empowerment Framework

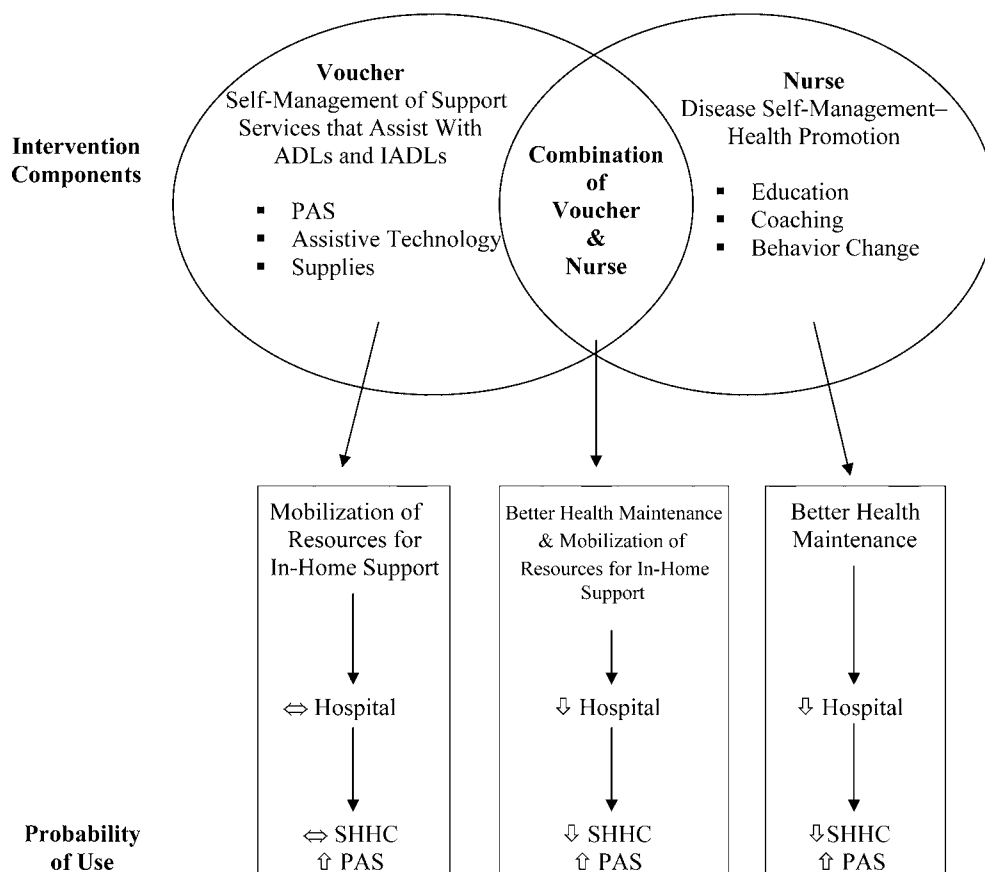


Figure 1. Self-management of chronic conditions among Medicare beneficiaries. SHHC = skilled home health care; PAS = personal assistance services; ADLs = activities of daily living; IADLs = instrumental ADLs.

and control groups in the proportion of beneficiaries with any Medicare home-health-care use (Schoore, Brown, Cheh, & Schneider, 1999).

Rationale for the Interventions

The Medicare Primary and Consumer-Directed Care Demonstration, sponsored by the CMS, was designed to test the effect of two interventions on health care service use and costs, health and functional status, and satisfaction: (a) a consumer-directed voucher, and (b) a nurse intervention affiliated with primary care that focused on both chronic disease self-management and health promotion. These interventions are connected by their common emphasis on self-management, which takes place within an empowerment framework.

Self-management has been defined by Lorig (1993, p. 11) as “learning and practicing the skills necessary to carry on an active and emotionally satisfying life in the face of a chronic condition.” DeFries and Konrad (1993) elaborated on this by suggesting that self-management goes beyond the notion of a single

individual acting alone and includes the mobilization of resources, support, and help provided by others. Figure 1 illustrates the connection between the two components of our self-management model: (a) disease self-management–health promotion, and (b) self-management of support services that assist with ADLs and IADLs. These components are operationalized through the use of a disease-management–health-promotion nurse and a consumer-directed voucher for supportive in-home services, supplies, and equipment.

The overall goal of the Medicare demonstration was to promote empowerment and improve health status, functioning, and quality of life while reducing Medicare and total health care costs through the encouragement of greater consumer choice and control over personal health care decisions and management. The demonstration was based on the logic of empowering (through self-management of more resources, i.e., the voucher) and teaching or coaching (by the nurse) chronically ill Medicare beneficiaries with functional impairment to better manage their own health and interact more effectively with health practitioners. It was believed that these

improvements would result in improved care and better health maintenance.

Although the demonstration examined a wide range of utilization and cost outcomes, including hospital and nursing home use, physician services, and emergency room visits, in the study presented here, we focus on the impact of these two interventions on the probability of home health care use by seriously functionally impaired Medicare beneficiaries. To our knowledge, this is the first study to test a consumer-directed voucher funded by Medicare that could be spent on a wide range of in-home supportive-care services, supplies, and equipment not reimbursed by the traditional Medicare fee-for-service program, and one of the first studies to examine the impact of a disease-management–health-promotion nurse intervention for Medicare beneficiaries. It should be noted that participants were prohibited from spending the voucher on services, supplies, and equipment reimbursed by traditional Medicare.

We estimated the effect of these two interventions separately and combined on the probability of skilled home health care use and personal assistance services use during the first year each Medicare beneficiary was enrolled in the demonstration. We examined the following hypotheses.

First, for skilled home health care, we expected that the probability of use would be *lower* for the nurse group than for the control group because we anticipated that the intervention would result in lower hospitalization rates. The majority of skilled home health care episodes of care occur either directly or indirectly after a hospitalization (Office of the Inspector General, 2001), so a reduction in hospitalizations would be expected to lead to a reduction in the probability of skilled home health care use. In contrast, we hypothesized that there would be *no difference* between the voucher group and the control group because the voucher could not be spent on skilled home health care.

Second, for personal assistance services, our expectation was that the probability of use would be *higher* for the nurse group than for the control group. We hypothesized that this would occur because a goal of the nurse intervention was to encourage the substitution of home care for nursing home care when possible. Another hypothesis was that the probability of personal assistance services use would be *higher* in the voucher group than in the control group because the voucher could be spent on personal assistance services not reimbursed by traditional Medicare (in Medicare this is always part of skilled care and never stand-alone personal care), thus allowing some people who could not otherwise afford to purchase personal assistance services to do so.

Third, we anticipated that individuals who received *both* a voucher and were enrolled in the nurse group would have *higher* probability of personal assistance services use than would those who received

either the voucher only or the nurse only. The rationale for this is that the nurse would suggest that the voucher be spent on personal assistance services as well as on supplies and equipment. Finally, our expectation was that the probability of skilled home health care use would be *lower* in the group that had both the nurse and the voucher because we believed that the nurse intervention would help to lower hospitalization rates.

Methods

Demonstration Description

The demonstration enrolled Medicare beneficiaries during a 2-year period beginning in August 1998 and was conducted in eight counties in western New York, six in West Virginia, and five in Ohio.

Participants

The great majority of primary care physicians in the study's 19 counties were recruited for the demonstration. From the practices of the 307 physicians who agreed to participate in the demonstration, we then recruited by mail patients who met the following criteria: (a) were enrolled in Medicare Parts A and B; (b) were functionally impaired with at least two limitations in ADLs (toileting, bathing, dressing, eating, and transferring) or at least three limitations in IADLs (prepare meals, shop for groceries, do routine household chores, manage money, do laundry, take medications, get to places out of walking distance, and use the telephone); (c) had been hospitalized, been a nursing home patient or resident, or received Medicare home health care within the past 12 months, or had two or more emergency room visits in the past 6 months.

Interventions

We randomly assigned participants to one of four groups: (a) a control group, which was eligible for the traditional Medicare Part A and B fee-for-service benefits; (b) a voucher group, which received a monthly consumer-directed voucher benefit of up to \$200; (c) a disease-management–health-promotion nurse group; and (d) a combination group, which received both the nurse and the voucher interventions.

The consumer-directed voucher intervention included a monthly voucher benefit that could be used to purchase services from in-home workers, respite care, transportation, home modifications, supplies, durable medical equipment, and consumable care goods not normally financed by Medicare. The in-home workers provided personal assistance and could be either agency personnel or individuals who were privately hired. The latter could be friends, neighbors, and others but not family members. Demonstration

participants or their caregivers could choose supplies, durable medical equipment, or consumable care goods listed in a large catalog. An important feature of the voucher intervention was a voucher specialist who advised patients and caregivers on how to spend the voucher (including information and assistance on hiring and firing in-home workers) and provided instructions and assistance relating to billing and income tax issues. At the end of each month, receipts for purchased supplies, equipment, and services were submitted to the voucher specialist, who had the responsibility for authorizing payment. The participant was then paid for 80% of the amount of supplies, equipment, and services that qualified, up to \$200 per month. This payment process covered services provided by individuals that were not employees of home care agencies as well as services from home care agencies.

The disease-management–health-promotion nurse intervention included the following components. First, nurses made monthly home visits to teach participants or their informal caregivers relevant knowledge and skills on how to conduct disease self-management by using the *Consumer Self-Care Strategies* and *Healthwise for Life* handbooks (Mettler, Kemper, & Stilwell, 1996). Second, during home visits and telephone communications, the nurses used the PRECEDE health-education planning model (Green & Kreuter, 1991) as the organizing framework for the application of health-behavior change strategies (the model provides a systematic framework to implement a planning process to empower individuals to engage in behavior change, develop and sustain motivation, develop behavioral skills, and participate in community activities). Third, Medicare provided payment (\$60 per office visit) to the primary care physicians for conferences with the patient, informal caregiver, and nurse; the purpose was to facilitate communication. Because most patients had multiple chronic illnesses, the nurse utilized at least several disease-management protocols. Thus, the intervention differs from that of most disease-management studies because in those studies there is generally only a protocol for a single chronic illness. It is also important to note that the nurses did not provide most typical hands-on nursing care such as dressing changes and intravenous therapy care, although they did complete patient assessments of vital signs and body systems.

Data

The demonstration included 1,605 Medicare beneficiaries. The study reported here includes 1,394 individuals. We excluded 164 beneficiaries under the age of 65, as well as 47 individuals who had private long-term-care insurance. (We excluded the latter group because they would have a source of funding for personal assistance services that might be confounded with the services, supplies, and equipment that could

be purchased with the demonstration's voucher.) We used two data sources for this study. First, we obtained data on beneficiary characteristics (demographics, health and functional status, insurance status, caregiver status, and prior health care utilization) from a baseline interview completed before each participant entered the study. Baseline interviews were administered at participants' homes by trained interviewers. Second, we obtained data on the use of skilled home health care and personal assistance services from a utilization diary completed by the participant or his or her caregiver on a daily basis.

Dependent and Independent Variables

Table 1 presents the mean and standard deviation of each variable. There are two dependent variables: any use of skilled home health care (coded 1 if the participant reported any use of home care services provided by a nurse practitioner, physician assistant, visiting nurse, social worker, or physical, occupational, speech, or respiratory therapist; 0 otherwise) and any use of personal assistance services (coded 1 if any use of a home health aide, personal care aide, companion, or respite care; 0 otherwise).

We chose covariates on the basis of factors that have been shown in prior studies to affect home health care use (Hadley, Rabin, Epstein, Stein, & Rimes, 2000; Kempen & Suurmeijer, 1991; McAuley & Arling, 1984; Rabiner, Mutran, & Stearns, 1995; Slivinske, Fitch, & Wingerson, 1998; Stoller & Cutler, 1993). We included three groups of individual characteristics as covariates: sociodemographic variables, health and functional status variables, and prior health service use. Sociodemographic variables included age, gender, ethnicity, living arrangement, marital status, education, income, assets, informal caregiver status, and health insurance status. Health and functional status variables included number of chronic conditions, score on the Cognitive Performance Scale (CPS; Morris et al., 1994), a scale combining ADL dependence and difficulty (Gill, Robison, & Tinetti, 1998), and a scale combining IADL dependence and difficulty (Gill et al.). Prior health services use included the use of the hospital, nursing home, skilled home health care, adult day care, and emergency room. We did not ask about whether there had been personal assistance services use during the year prior to study entry. It is important to account for the amount of informal care received by patients when one is measuring their formal home health care use. Because we do not have data on the amount of informal care, we used whether or not the patients had an identified informal caregiver as a proxy for the provision of informal care. We also included county fixed effects to control for local supply factors (e.g., availability of home health care).

Table 1. Variable Definition and Mean Values, by Treatment Group

Variables	Control	Nurse	Voucher	Combination	<i>p</i>
Independent variables					
Sociodemographics					
Age	80.6 (7.7)	80.0 (7.4)	80.6 (7.8)	79.6 (7.6)	.225
Female gender	0.706	0.693	0.701	0.705	.985
Minority ethnicity	0.024	0.028	0.030	0.040	.656
Married	0.403	0.396	0.389	0.431	.674
Lives alone	0.358	0.390	0.397	0.391	.712
Has informal caregiver	0.752	0.731	0.773	0.726	.458
Education	2.9 (1.4)	2.7 (1.4)	2.7 (1.3)	2.8 (1.4)	.229
Income	3.2 (1.4)	3.1 (1.2)	3.1 (1.2)	3.1 (1.3)	.694
Home ownership	0.524	0.594	0.589	0.617	.082
Medicaid	0.079	0.090	0.066	0.106	.242
Medigap	0.742	0.755	0.740	0.676	.071
HMO	0.121	0.105	0.145	0.109	.351
Veteran	0.170	0.176	0.167	0.160	.947
Health and functional status					
ADL score ^a	5.8 (3.6)	5.7 (3.5)	5.7 (3.5)	5.8 (3.3)	.910
IADL score ^b	7.7 (3.4)	7.3 (3.3)	7.6 (3.4)	7.5 (3.4)	.304
CPS score	1.4 (1.5)	1.2 (1.3)	1.3 (1.4)	1.4 (1.5)	.192
No. of chronic conditions	4.4 (2.1)	4.5 (2.3)	4.6 (2.2)	4.6 (2.3)	.492
Prior health services use					
Emergency room	0.258	0.235	0.186	0.125	.137
Hospital	0.652	0.669	0.652	0.604	.297
Nursing home	0.130	0.087	0.079	0.109	.113
Medicare SHHC	0.542	0.539	0.504	0.513	.687
Adult day care	0.048	0.053	0.041	0.037	.755
Dependent variables					
SHHC	0.509	0.502	0.479	0.574	.060
PAS	0.615	0.560	0.677	0.707	.000

Notes: Standard deviations are given in parentheses. HMO = health maintenance organization; ADL = activity of daily living; IADL = instrumental ADL; CPS = Cognitive Performance Scale; SHHC = skilled home health care; PAS = personal assistance services. The *p* values are based on a chi-squared test for dichotomous variables and an *F* test for continuous variables.

^aEach participant received a score ranging 0–12, based on whether he or she was independent with no difficulty (0 points), independent with difficulty (1 point), or dependent (2 points) for each of six ADLs: walking or getting around, transferring, dressing, eating or feeding, toileting, and bathing (see Gill, Robison, & Tinetti, 1998).

^bEach participant received a score ranging 0–12, based on whether he or she was independent with no difficulty (0 points), independent with difficulty (1 point), or dependent (2 points) for each of six IADLs: meal preparation, ordinary housework, finance and medication management, telephone use, and shopping (see Gill, Robison, & Tinetti, 1998).

Statistical Analyses

To evaluate the extent to which the randomization succeeded, we compared the baseline characteristics of the treatment groups with those of the control group by using the chi-square test for categorical variables and analysis of variance for continuous variables.

To evaluate the effect of the interventions on home health care use, we first calculated chi-square tests. These did not adjust for baseline covariates. Second, we estimated a bivariate probit model that included the aforementioned covariates and the two dependent variables: any use of skilled home health care and any use of personal assistance services. The simultaneous modeling of the two outcomes allows us to account for a possible correlation between the error terms in the two models. Such a correlation is likely because the use of skilled home health care and personal assistance services is closely related and they

depend on similar factors. Third, we calculated standardized predictions of the probability of each of the two types of home health care use for each of the four groups by using all 1,394 patients. The advantage of this approach is that it utilizes the entire sample to calculate probability of use rather than the smaller number of participants in each group. We can thus be more confident that any inferences drawn apply to the entire sample. We then used an analysis of variance to compare the predicted probability of use for each of the three treatment groups with that of the control group. Fourth, we calculated confidence intervals of the predicted probabilities by using bootstrapping (Mooney, 1996), a nonparametric method of statistical inference in which the empirical sampling distribution (in this case, of probability of use) is estimated by repeated resampling from the actual distribution (in this case, probability of use predicted from the bivariate probit model). This

approach is advantageous because it allows us to calculate the standard errors and confidence intervals without making distributional assumptions about the data, as is done in traditional inference approaches. We examined goodness of fit of the bivariate probit model by using standard approaches (Hosmer & Lemeshow, 2000; Pregibon, 1980). SAS (version 8) and Stata (version 7) were the statistical software packages we used.

Results

Sample Description

The demonstration participants in this study ($N = 1,394$) had a mean age of 80 years and were predominantly female, with little education and low income. Only 3.1% of the participants were non-White. This reflects the very low proportion of elderly non-Whites in the study area. Three out of four participants (74.5%) had an informal caregiver, 28% were cognitively impaired, and 82% had three or more chronic conditions. Participants had a mean of 5.8 ADL and 7.5 IADL impairment scores on scales ranging from 0 to 12. During the past year, 64% had at least one hospital admission.

There were no significant differences in baseline sociodemographic characteristics, health and functional status, and prior health care use across the control ($n = 330$), voucher ($n = 365$), nurse ($n = 323$), and combination ($n = 376$) groups (see Table 1).

During the year after study entry, 193 participants (13.9%) died and 116 (8.3%) dropped out. The mortality rate was not different across the groups ($p = .86$), but the dropout rate was ($p = .01$), with the nurse group experiencing the highest dropout rate (14.9% vs 7.9%, 6.0%, and 5.3% for the control, voucher, and combination groups, respectively). A possible explanation for the higher dropout rate in the nurse group is that some participants might view having a nurse intervention as a burden compared with receiving financial assistance. We received anecdotal information that some participants who dropped out thought that the nurse information placed too many demands on them, such as increased physical activity or the goals to which they were expected to adhere.

Unadjusted Results

The probability of unadjusted (for any covariates) skilled home health care use during the first year of the demonstration was about 50% for the control, voucher, and nurse groups, and it was slightly higher (57%) for the combination group. The probability of unadjusted personal assistance services use was lowest for the nurse group (56%), intermediate for the control group (62%), and highest for the voucher

Table 2. Summary of Basic Results

Group	Probability of SHHC Use		
	Unadjusted	Bivariate Probit	Standardized Predictions
Control	0.51	0.51	0.51
Voucher	0.48	0.48	0.49
Nurse	0.50	0.50	0.51
Combination	0.57	0.57	0.57
<i>p</i> Value for Difference in Probability of SHHC Use Between Intervention and Control Groups			
Voucher	0.44	0.56	0.73
Nurse	0.85	0.96	0.48
Combination	0.08	0.08	0.03
Group	Probability of PAS Use		
	Unadjusted	Bivariate Probit	Standardized Predictions
Control	0.62	0.61	0.60
Voucher	0.68	0.68	0.68
Nurse	0.56	0.56	0.57
Combination	0.71	0.70	0.71
<i>p</i> Value for Difference in Probability of PAS Use Between Intervention and Control Groups ^a			
Voucher	0.09	0.01	<0.01
Nurse	0.16	0.40	0.85
Combination	0.01	<0.01	<0.01

Notes: SHHC = skilled home health care; PAS = personal assistance services. Bolded values represent statistically significant differences as compared with the control group.

^aUnadjusted values are compared by use of the chi-squared test; standardized predictions are compared by use of analysis of variance.

and combination groups (68% and 71%, respectively; see Table 2).

Adjusted (Multivariate) Results

Bivariate Probit Model.—Table 3 presents the results of the bivariate probit model. As we expected, skilled home health care use and personal assistance services use were significantly correlated ($p = 0.56$, $p < .001$). The nurse intervention alone had no effect on the probability of using either skilled home health care or personal assistance services ($p = .96$ and $.40$, respectively). The voucher intervention alone increased the probability of using personal assistance services ($p = .01$) but not skilled home health care ($p = .57$). Having both nurse and voucher benefits (the combination group) increased the probability of using personal assistance services ($p < .01$) and may have had an effect on skilled home health care ($p = .08$). Goodness-of-fit statistics indicate that the models fit the data well.

Standardized Predictions From the Bivariate Probit Model.—Table 2 includes the standardized

Table 3. Bivariate Probit Models for Any Use of Home Health Care

Variable	SHHC		PAS	
	Coefficient	<i>p</i>	Coefficient	<i>p</i>
Voucher intervention	-0.06	.57	0.29	.01
Nurse intervention	0.01	.96	-0.09	.40
Combination intervention	0.17	.08	0.37	<.01
Age	0.001	.92	0.01	.02
Female	-0.05	.64	0.37	.00
Minority	-0.08	.73	-0.21	.36
Lives alone	0.16	.10	0.59	.00
Married	0.15	.15	0.01	.92
Education	0.02	.51	0.08	.01
Income	-0.01	.66	0.03	.39
Home ownership	-0.12	.12	0.06	.51
Veteran status	-0.10	.44	-0.19	.15
Medicaid	0.36	.01	0.23	.14
Medigap	-0.09	.34	0.24	.01
HMO	0.05	.72	0.14	.29
Has informal caregiver	-0.09	.34	-0.33	<.01
ADL score	0.09	<.01	0.08	<.01
IADL score	0.03	.06	0.08	<.01
CPS score	-0.05	.12	0.05	.20
No. of chronic conditions	0.01	.41	0.00	.86
2+ ER visits during the past 6 months	0.29	<.01	0.41	<.01
Prior year hospital use	-0.03	.70	-0.14	.10
Prior year NH use	-0.15	.23	0.21	.14
Prior year SHHC use	0.32	<.01	0.50	<.01
Prior year adult day care visit	-0.40	.03	0.10	.62
County 2	0.11	.52	-0.03	.88
County 3	0.21	.12	-0.06	.66
County 4	0.11	.46	-0.29	.07
County 5	0.17	.50	0.17	.54
County 6	0.06	.74	-0.41	.04
County 7	0.23	.39	0.72	.04
County 8	0.54	.16	0.41	.35
County 9	-0.42	.13	0.53	.08
County 10	-0.35	.24	0.52	.15
County 11	-0.35	.01	0.13	.36
County 12	0.09	.76	0.25	.45
County 13	-0.42	.03	-0.49	.01
Constant	-0.74		-2.87	

Notes: An alternative model including interactions between the treatment groups and covariates was estimated (results not shown here). These interaction terms contributed little to the goodness-of-fit statistics. Predictions based on the interacted model were almost identical to the model presented. Therefore, this model does not include any interaction terms. For the table, N = 1,394. HMO = health maintenance organization; ADL = activity of daily living; IADL = instrumental ADL; CPS = Cognitive Performance Scale; SHHC = skilled home health care; PAS = personal assistance services. $p = 0.56$ ($p < .001$) for the models, indicating a significant positive correlation between the error terms of the two models.

predictions of probability of skilled home health care and probability of personal assistance services use for the four groups. Compared with the control group, both the voucher and the combination intervention increased the probability of using personal assistance services, by 13.3% (from 60% to 68%; $p = .002$) and 18.3% (from 60% to 71%; $p < .001$), respectively.

Table 4. Bootstrapped Probability of Home Care Use With 95% Confidence Intervals

Service	Control	Voucher	Nurse	Combination
SHHC				
Probability of Use	0.51	0.49	0.51	0.57
95% CI	0.45-0.56	0.45-0.55	0.48-0.57	0.53-0.61
PAS				
Probability of Use	0.60	0.68	0.57	0.71
95% CI	0.56-0.63	0.65-0.72	0.53-0.62	0.66-0.74

Notes: SHHC = skilled home health care; PAS = personal assistance services; CI = confidence intervals.

The combination intervention also increased the probability of skilled home health care use by 11.8% (from 51% to 57%; $p = .03$).

Bootstrapping.—We used bootstrapping (50 replications) to construct 95% confidence intervals for probability of skilled home health care and probability of personal assistance services use for each of the four groups (see Table 4). For personal assistance services, we found that the confidence intervals did not overlap between the control group and the voucher and combination groups, thus verifying the aforementioned results. However, for skilled home health care, the confidence intervals for the control and combination groups overlapped, indicating that the combination intervention had no impact.

Discussion

There are several limitations to this study. First, we do not have data on informal care except for whether a patient has a caregiver. Thus, we cannot examine whether formal home care purchased through the voucher substituted for informal care. The Cash and Counseling Demonstration evaluation recently reported such a substitution in Arkansas (Dale et al., 2003). Second, the home care data were self-reported and were not verified against provider or Medicare data. However, whether or not there was any use is less likely to be problematic than the amount of use. In addition, the home care data were reported prospectively (usually on a monthly basis) and were monitored, so reporting generally occurred shortly after service use. Third, we note that our results do not generalize to the Medicare population at large. However, they are relevant to those who are disabled and are at high risk of health care services use, a population that is of great importance to Medicare. Fourth, this is a regional study and as such may not generalize to the entire United States. Fifth, by examining probability of use and not amount of use, we do not take advantage of all of the information we collected. However, our question of in-

terest focuses not on the extent of utilization but on the likelihood of using home care.

Voucher Benefit

The higher probability of personal assistance services use in the voucher group might be explained by several reasons. First and most likely, people who otherwise would have been unable to financially afford personal assistance services used the voucher to pay for those services. Although only about 10% of demonstration participants were enrolled in Medicaid, 32% had an annual household income under \$10,000 and 68% had an income under \$20,000. The voucher, which could have been as much as \$2,400 per year (after the copayment), most likely would have made a major difference in the ability of these low-income people to afford personal assistance services. Second, discussion between the voucher specialists and the patients or caregivers about personal assistance services should have made it more likely that the patients or caregivers purchased these services, either with the voucher or their own money or both. Third, the voucher could have been spent on supplies and equipment, freeing up the patients' own money to be spent on personal assistance services. It is important to remember that although the voucher was of benefit to many people because of their low income, it was nevertheless modest, limited to a maximum of \$2,400 per year. A larger voucher could conceivably result in a higher probability of personal assistance services use than that which occurred in the demonstration.

Although the level of personal assistance services use in the control group might appear to be high, our findings are consistent, although slightly higher, with those reported by Liu, Manton, and Aragon (2000). Those researchers indicated that, according to the 1994 National Long Term Care Survey, the proportion of disabled elders with paid personal assistance services helpers (some in combination with informal helpers) increased as disability level rose, from 21.7% of those with dependence in IADLs only to 58.6% with dependence in five ADLs. We expect that the 60% probability of personal assistance services use in our control group reflects several factors: the demonstration enrollment criterion of needing or receiving help with at least two ADLs, a continuing increase during the past few decades in the proportion of individuals who have paid ADL help (Liu, Manton, & Aragon), and the ability of the control group to gain access to a variety of community-based personal assistance services programs on their own.

Not surprisingly, the voucher did not result in a higher probability of using skilled home health care. The implication of this is important, because Congress might be less willing to fund consumer-directed vouchers if they were to lead to an increase

in the probability that voucher recipients would use Medicare skilled home health care.

Nurse Services

For the nurse group, we expected a lower probability of skilled home health care use because we believed that the intervention would result in a lower hospitalization rate in comparison with the control group. Most Medicare skilled home health care occurs after patients are discharged from the hospital. Preliminary analyses for our final report indicate that this anticipated difference in hospital admissions did not materialize. The proportion of patients in the nurse group who had at least one hospital admission was not significantly different from that of the control group (44.3% vs 40.6%, respectively). A similar primary care physician office-based nurse and case-assistant intervention reported by Schraeder, Shelton, and Sager (2001) also was unable to reduce hospitalization rates.

We hypothesized that our nurse group would have a higher probability of personal assistance services use than the control group because the nurses had as a goal the encouragement of personal home care services to prevent or postpone permanent nursing home admissions if possible. Preliminary analyses for our final report show that the nurse group experienced about the same number of permanent nursing home admissions as did the control group (about 6% of each group). Thus, it does not appear that the nurse intervention was able to increase the use of personal assistance services to prevent or postpone permanent nursing home admissions, at least during the first year of the study. This probably occurred because, unlike the voucher group, the nurse group was not eligible to receive additional funds that could be used to purchase personal assistance services.

Combination of Voucher Benefit and Nurse Services

Adding the nurse intervention to the voucher appears to have had a synergistic effect above and beyond the effect of the voucher alone on the likelihood of personal assistance services use. We surmise that the nurse advised and worked with the patients on how to spend the voucher.

The data on the effect of the combination of the use of the voucher and the nurse on skilled home health care are more equivocal: Although the impact we calculated by using standardized predictions was significant at $p = .03$, the effect in the bivariate model itself was only marginally significant and the bootstrapped confidence intervals for the combination and control groups overlapped, indicating no difference between the two groups. These findings thus suggest that a voucher combined with a nurse intervention

would result in only a minimal (if any) increase in the probability of skilled home health care use.

Conclusions

This is, to our knowledge, the first study of the effect of a Medicare consumer-directed voucher for in-home supportive services and one of the first concerning a disease-management–health-promotion nurse intervention on the probability of skilled home health care and unskilled personal assistance services use. One promising implication of our findings is that a modest consumer-directed voucher benefit under Medicare improves access to much-needed unskilled personal care services without unnecessarily increasing the probability of use of more costly skilled home health care services.

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