
Constraining Medicare Home Health Reimbursement: What Are the Outcomes?

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The implementation of the Balanced Budget Act (BBA) of 1997 resulted in substantial decreases in the amount of Medicare home health use. Use among home health users decreased by two-fifths from fiscal year (FY) 1997, just before the passage of the BBA to FY 1999, the first full year after the implementation of the home health interim payment system. This article examines whether these dramatic reductions in use resulted in increased incidence of potential adverse outcomes, i.e., increases in hospitalizations, skilled nursing home facility admissions, emergency room (ER) use, or death among home health users.

The use of home health services under Medicare has undergone dramatic changes in the last 15 years: first accelerating growth and then substantial contraction. Whenever service reductions occur, there are concerns about what the unintended effects may be. This study examines the outcomes experienced by Medicare beneficiaries who use home health services before and after the contraction in utilization that followed enactment of the 1997 BBA.

From the late 1980s through 1996, Medicare's payments for home health increased dramatically as home health services grew more than 30 percent per year

(Medicare Payment Advisory Commission, 1999a). Efforts to rein in Medicare home health costs began with Federal compliance initiatives focused on the home health industry in the mid-1990s and culminated in July 1997 with the enactment of the 1997 BBA.

In 1995, three government agencies—the Health Care Financing Administration, the Office of the Inspector General (OIG), and the Administration on Aging—jointly implemented Operation Restore Trust, an effort to identify fraud and abuse in home health agencies (HHAs). The Health Insurance Portability and Accountability Act of 1996 imposed civil and monetary penalties on physicians who knowingly certified non-eligible patients for Medicare home health, and in September 1997, HCFA enacted a 6-month moratorium on certification of new HHAs and increased cost audits and claims reviews.

In addition to enacting compliance initiatives, attention was also focused on reforming home health's relatively open-ended reimbursement system. The BBA addressed this issue by legislating the implementation of a home health prospective payment system (PPS) and the immediate enactment of an interim payment system (IPS) to limit costs until the PPS was implemented in October 2000. The BBA also clarified some definitions related to home health eligibility and coverage.

The IPS was phased in beginning October 1997 with the start of each HHA's financial reporting period. Under the IPS, agency reimbursement was limited by

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both a restriction of an already existing aggregate per-visit cost limitation and the enactment of a new agency aggregate per-beneficiary limit. The home health industry and policy analysts immediately voiced concerns about whether these aggressive reforms would result in reduced access to home health care for beneficiaries who were most in need, resulting in poor outcomes (Komisar and Feder, 1998; Smith, Rosenbaum, and Schwartz, 1998; Lewin Group, 1998; Gage, 1999; Medicare Payment Advisory Commission, 1999a).

Review of Medicare claims experience after the BBA's passage dramatically demonstrated its rapid and substantial effect. While the rate of home health use per Medicare beneficiary and the number of home health visits per user had been surprisingly level for the seven quarters before October 1997, rates of both plummeted beginning in the first quarter of the phase-in of the IPS. Comparing the year before the phase-in began (FY 1997) with the year after full IPS phase-in (FY 1999), the rate of use decreased 21 percent and visits per user decreased 41 percent. Overall interim Medicare payments for home health services were cut in one-half (McCall et al., 2001) and vulnerable subgroups of the population were differentially impacted in their reduction of service use (McCall et al., forthcoming).

But were the utilization reductions simply the appropriate response to efforts to make the Medicare home health benefit more consistent with its intent or did they result in harm to the program's beneficiaries? This article looks at this issue through an analysis of outcomes that can be identified in the claims files. These occurrences may be reflections of either worse or better quality of care or the substitution of less or more appropriate care. Other analyses will examine the BBA's impacts on the quality of home health pro-

vided and on HHAs care users' satisfaction with the services provided, and will study effects on HHAs and on the health care system.

BACKGROUND

Immediately after the BBA's enactment, several Federal agencies began to examine its impact. In 1999, the U.S. General Accounting Office (GAO) conducted a study of agency closures to assess the magnitude of the reductions in home care providers and to determine if access, especially in rural areas, had been affected. The study found that 14 percent of HHAs had closed during the 15 months from October 1997 to January 1999. Interviews conducted in rural counties that had a large number of agency closures did not indicate concern about access (U.S. General Accounting Office, 1999). Their second study in 2000 examined the impact of basing the PPS payment rates on data from 1998 (i.e., after the IPS implementation). The report showed that the declines in utilization were for the patients and agencies that had used the most services in 1996 and that PPS could reverse these declines. It also argued for incorporation of risk sharing into the PPS to moderate agency gains and losses both to ensure adequate care for beneficiaries and to protect Medicare from overpayments (U.S. General Accounting Office, 2000).

OIG has conducted three studies (1999, 2000a,b) on the impact of the BBA. Two studies focused on access to home health care and the third on hospital readmission and ER visit rates. The access studies interviewed hospital discharge planners and reviewed claims. Both studies concluded that most discharge planners did not have trouble placing Medicare hospital patients with HHAs. However, they also found some discharge planners felt that delays

were more common under the IPS and that patients might not be getting the home health care they needed (Office of the Inspector General, 1999, 2000a). Their third report looked at this latter concern by examining claims data to assess whether hospital readmissions or ER use had been affected. The rates of readmission and ER use of 2 months of hospital discharges to home health care in 1997 were compared against these rates for discharges to home health care in a 2-month period in 1999. They found no differences in the rates of hospital readmissions or ER visits for the period during which the beneficiary was receiving home health care services and for the 30 days following home health discharge (Office of the Inspector General, 2000b).

The Medicare Payment Advisory Commission (MedPAC) (1999b) also conducted studies on the issue. In 1999, MedPAC surveyed approximately 1,000 HHAs and held a panel with 14 professionals knowledgeable of beneficiary access problems (medical professionals, lawyers, and advocates) from different geographical areas. The report found that the home health environment had changed considerably since the BBA, with some agencies reporting that they avoided clients who they thought would be costly, but determined that it was not possible to tell if the changes were appropriate.

Researchers at The George Washington University conducted telephone interviews with 28 HHAs and 41 hospital discharge planners (in the same geographical areas), collecting information on changes in HHAs service delivery patterns as a result of the IPS. They concluded that agencies had altered their case mix and clinical treatment patterns, making it more difficult for more chronically ill beneficiaries, especially those with diabetes, to receive care (Smith, Maloy, and Hawkins, 1999). They

also found that a little over 40 percent of discharge planners believed hospital readmissions for home health patients had increased (Smith, Maloy, and Hawkins, 2000).

METHODOLOGY

Data

This analysis uses a specially constructed data file from a 1-percent random sample of Medicare beneficiaries. The sample includes all new admissions to home health in FY 1997, the last full year before the beginning of the IPS implementation, and FY 1999, the first full year after the IPS was fully implemented. Data contained in the analysis file include information on utilization of Medicare Part A services for 120 days after the date of the beneficiary's first home health admission during the FY. The population studied is restricted to Medicare fee-for-service (FFS) beneficiaries eligible for Part A who reside in 1 of the 50 States or the District of Columbia.

The date of admission to home health is defined as the first service date on a home health claim during the FY of study that is preceded by at least 60 days without a home health claim. Information on home health, hospital, skilled nursing facility (SNF), and ER utilization is summarized for the 120 days after the date of admission. The data are linked to information from CMS's Medicare Eligibility File, Provider of Service Files, the Area Resources File, and specially-collected information on State Medicare and Medicaid home health utilization experience.

Analytical Approach

The study examines whether certain outcomes are more common after implementation of the IPS. A logistic regression

model is employed with the dependent variable a dummy variable indicating whether the beneficiary had a particular outcome. The independent variables in the model are whether the observation was in the post-BBA period and a set of control variables, the control variables include the demographic characteristics of the beneficiary; use of Medicare services before the home health admission; characteristics of the beneficiary's community; characteristics of the agency providing the services; and the diagnoses for which the beneficiary was receiving services.

Particular subgroups of the population are also highlighted for study to see if they are differentially impacted in their incidence of these outcomes. This is done by introducing interaction terms into the logistic regression. The interaction terms measure the effect of both being in the subgroup of interest and in the post-BBA period. The model employed is a fully interacted one that controls for all the independent variables in the model and all the independent variables interacted with the post-BBA variable.

Defining the Dependent Variable: Outcomes

Defining outcomes in home health is difficult because of the general lack of consensus about what kind of quantifiable outcomes can be expected (Weissert et al., 2001), and even more fundamentally, who should be getting services and what kind and how many services they should be getting (Vladeck, 2000). Death, hospitalization, ER use, and SNF stays can be undesirable events, but how closely they can be tied on an individual level to the home health care that is delivered is debatable, especially in a population whose health is deteriorating because of advancing age

and increasing disability. Yet, these measures are among the few available from claims data to provide insight about changes in the outcome of care.

Several researchers have used these claims-based measures in their analysis of home care outcomes. The earliest studies of home care focused on effectiveness and cost of the use of home care on the outcomes of mortality, acute care hospitalization, nursing home placement, physical functioning, and cost. These studies examined the impact of home care use loosely defined across the various types of home care (i.e., skilled and personal care, hospice, Medicaid home and community-based services waiver programs, etc.) on a range of these measures including claims-based utilization (Weissert, 1985; Kemper, Applebaum, and Harrigan, 1988; Hedrick and Inui, 1986; Weissert, Cready, and Pawelak, 1988; Hedrick, Koepsell, and Inui, 1989; Weissert and Hedrick 1994; Hughes et al., 1997).

Shaughnessy et al. (1994a) describe utilization outcome measures as "...a quantification of health service use (or non-use) that is potentially attributable to the (home) health care under consideration." He and his colleagues use the measure hospitalization within 12 weeks of admission to home care as one of the outcome measures in their analysis of home health outcomes under capitation and FFS (Shaughnessy, Schlenker, and Hittle, 1994b).

Kane et al. (1994) list hospitalization, nursing home admission, and death as three home care outcomes. Employing panels by six different constituencies, their study rated 21 home care outcomes according to the "...extent to which home care providers should be held responsible for achieving positive outcomes..." for different types of home care clients. Two of the utilization measures used in our study

(hospitalization and nursing home admission) rated about two-thirds down the list of the 21 outcome measures rated (most commonly numbers 14 and 15). Death was always at the bottom of the list.

Schore (1994; 1995) and Chen (2000) looked at hospital, SNF, and ER visits as measures of adverse outcomes. They examined these occurrences in general and for the same general diagnosis as the home health care episode, within defined periods of time from home health admission or discharge. Their studies also looked at mortality.

In general, most of these studies did not find significance in either hypothesized direction (i.e., more home care, less potentially adverse outcomes or less home care, more potentially adverse outcomes) between the utilization of home care services and the incidence of these utilization-defined outcomes. Shaughnessy, Schlenker, and Hittle (1994b) found significant differences in other outcome measures between home care users in capitation and FFS, but no differences for the incidence of hospitalization. Schore (1994; 1995) examined data by census region to see if there appeared to be a relationship between areas with low home health utilization and those experiencing more utilization outcomes considered to be adverse, but found no relationship.

Chen (2000) used several utilization variables and mortality as measures of adverse outcomes in his analysis of the quality of home health care. He found that beneficiaries in agencies receiving prospective reimbursement despite having less home health use had fewer—not more—hospitalizations for same body system diagnoses (at 8 months and 1 year) and fewer—not more—ER visits to physician offices/ urgent care clinics. He found no significant effect for other utilization outcome measures studied, i.e., SNF admission for same body system diagnosis, hospital ER visits, and mortality.

The following eight claims-based utilization measures are examined. (It should be noted these outcomes are sometimes correlated; for example, those who are hospitalized may be more likely to die.) The observation period was selected because it would include the average length episode in both years, was consistent with one of the observation periods in the Per-Episode Home Health PPS Demonstration, and was a multiple of 60 days, the period over which PPS capitation payments are made. Each of these measures is defined over 120-day observation period beginning with the date of admission to home health care. The measures include having:

- A hospital admission.
- A hospital admission for a diagnosis in the same body system as the diagnosis for which the beneficiary received home health care.
- An avoidable hospitalization.
- A SNF admission.
- A SNF admission for a diagnosis in the same body system as the diagnosis for which the beneficiary received home health care.
- An ER visit.
- An ER visit for a diagnosis in the same body system as the diagnosis for which the beneficiary received home health care.
- Mortality.

For hospital, SNF, and ER events, both utilization of these services in general and utilization for diagnoses in the same body system as those for which home health was being received are examined. A diagnosis in the same body system is defined as having a primary or first secondary diagnosis within the same *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) (Public Health Service and the Health Care Financing Administration, 1980) body system category as either the primary or first secondary

diagnosis for which home health care was being received at the time of admission to home health. Admissions for the same diagnoses may be more likely to be related to the home health care than admissions for unrelated conditions; however, and especially for this population which often has many health conditions occurring concurrently, complications for one diagnoses often involve other body systems. Thus, both measures are included.

Another event requires some definition. Avoidable hospital admissions are defined using ICD-9-CM codes associated with conditions where it was thought hospitalizations could be avoided with good primary care (Murtaugh and Litke, 2000; Weissman, Constantine, and Epstein, 1992; Culler, Parchman, and Przybylski, 1998; Pappas et al., 1997; Blustein, Hanson, and Shea, 1998).

Specifying the Independent Variables

The probability of having a specific outcome is estimated in a logistic regression that includes an independent variable for post-BBA and a set of independent variables to control, to the extent possible, for the differences between the pre- and post-BBA period. The control variables fall into five groups: (1) data about the demographic characteristics of the home health user (age, sex, race, Medicaid buy-in status, original reason for entitlement); (2) data about beneficiaries' prior use of Medicare Part A services (number of inpatient days 6 months prior to home health admission, number of SNF days 6 months prior to home health admission, whether the home health admission follows a hospitalization); (3) data about the communities in which they live, including general information (urbanization, census region, Medicare managed care penetration), supply of home health resources and substitutes for

home health care (hospital occupancy, nursing home bed availability, home health employees), and historical Medicare and Medicaid health care and home health use; (4) agency characteristics (profit status, affiliation, age, size); and (5) primary and secondary diagnoses for which the home health user was receiving home health care.

Limitations

Because the study examines the impact on the incidence of various outcomes using populations of users from two different time periods, considerable effort was made to include variables to control for shifts in the characteristics of the population of home health users over time. Thus, we attempted to include as many variables as possible to control for what might be a home health user population post-BBA that is sicker and therefore more prone to experience these outcomes. During the course of the study many different specifications of the prior use variables were explored including various institutional use measures aggregated over 6- and 9-month periods prior to the home health admission. While the models do include measures developed from the data available, it should be noted that the data are limited by what is recorded in the claims and eligibility files and thus, do not include measures of functional status. This limitation may restrict our ability to separate the impact of the policy change from the change in the types of patients using home health care.

In addition to not being able to fully control for the characteristics of the populations being studied, this analysis does not directly control for changes in environmental factors between the two time periods. Two are important to mention. First, the BBA legislated other changes to Medicare reimbursement methodologies

that could directly or indirectly affect outcomes. In addition to modifying home health payment methodology, the BBA also legislated movement to prospective payment for all post-acute care providers. A case-mix adjusted prospective per diem payment methodology began in July 1998 for SNFs and for rehabilitation facilities in January 2002. A PPS for long-term care (LTC) facilities is under development.

Further, the BBA changed hospital reimbursement in a way that could affect the kind of beneficiary entering home health care by enacting the acute care hospital post-acute transfer policy. The transfer policy, which began in October 1998, applied the payment methodology used for transfers from one acute care hospital to another acute care hospital to post-acute care transfers from acute care hospitals for 10 diagnosis-related groups (DRGs). Early analysis suggests this policy change has resulted in fewer post-acute transfers and longer acute hospital stays before transfer to post-acute care (Gilman et al., 2000).

Second, there have been changes in the supply and secular trends in utilization and mortality. While comparison of Medicare data between the two periods indicates a smaller number of hospital days among Medicare beneficiaries, the percentage having one or more hospitalizations in 1999 was slightly larger, but not significantly, than the percentage in 1997. The percentage of beneficiaries having a Medicare SNF admission was also not significantly different between the two periods and the number of covered SNF days per beneficiary was smaller despite the fact that the supply of SNF beds increased 22 percent (Centers for Medicare & Medicaid Services, 2001). The number of ER visits was also not significantly different between the two periods, but the percentage having an ER visit during the year was smaller.

Crude mortality rates among the entire Medicare population increased 0.05 percent, a difference that is not statistically significant.

Identifying Population Subgroups

While the goal of the BBA was to provide more appropriate care, there was concern that its incentives translated most directly to changing HHA's behavior toward Medicare beneficiaries needing the most care. As agencies reacted to the IPS' financial incentives, they could change their practices by avoiding high-cost cases, reducing the number of visits per person, and shifting the mix of services. This, in turn, may affect beneficiaries by resulting in lowered quality of care or increased use of more costly or less appropriate substitute services.

In selecting the subgroups of Medicare beneficiaries to examine, the focus was on those who were both hypothesized to be differentially impacted by the policy changes and found in earlier analysis to have differential effects post-BBA in their Medicare home health utilization (McCall et al., forthcoming). Table 1 shows the subgroups examined in the previous study and indicates whether differential effects were found for either the probability of home health use or the number of home health visits. It should be noted that while these groups did have significant differential effects post-BBA, the magnitude of most effects was generally small on an absolute or relative basis.

Several studies have highlighted four specific demographic subgroups (i.e., the oldest old, females, non-white, and those also eligible for Medicaid) as representing particularly frail and vulnerable individuals who might be adversely affected by the IPS and other BBA reforms (Komisar and

Table 1

Differential Impacts in the Probability of Home Health Use and Number of Home Health Visits, by Subgroups: Fiscal Year 1999

Subgroup	Differential Impact on	
	Probability of Use	Number of Visits
Demographic		
85 Years or Over	Yes (-)	Yes (-)
Female	No	Yes (-)
Non-White	No	Yes (-)
Buy-In	Yes (-)	No
Community		
High Medicare States	Yes (-)	Yes (-)
Agency		
For-Profit	NA	Yes (-)
Hospital-Based	NA	Yes (+)
Primary or Secondary Diagnoses		
Diabetes	NA	Yes (-)
Hypertensive Disease	NA	No
Heart Failure	NA	Yes (-)
Cerebrovascular Disease	NA	Yes (-)
Chronic Airway Obstruction	NA	No
Skin Ulcers	NA	Yes (-)

NOTES: +/- signs in parentheses indicate the direction of the impact when it is significant. NA is not available.

SOURCE: (McCall, N., Petersons, A., Moore, S., and Korb, J., forthcoming.)

Feder, 1998; Smith, Rosenbaum, and Schwartz, 1998; Lewin Group, 1998). GAO (2000) found that beneficiaries who reside in States that have had historically relatively high Medicare home health care use experienced disproportionate utilization reductions after BBA implementation. Negative differential reductions in utilization were found for at least one of the measures for each of these subgroups in the earlier analysis (Table 1).

For-profit agencies were hypothesized to be more reactive to the new financial pressures than not-for-profit or public agencies, both because they may be able to more quickly react to reduced revenues and because they had higher pre-BBA use than did other ownership categories (U.S. General Accounting Office, 2000; Lewin Group, 1998; Franco and Leon, 2000; Goldberg and Schmitz, 1994; Leon, Neuman, and Parente, 1997). The hypothesized effect on hospital-based agencies was in the other direction. Patients served by

hospital-based agencies were less likely to be high users of home health care, and with their focus on post-acute rather than chronic patients, hospital-based agencies likely provided less discretionary home health care use (Leon, Neuman, and Parente, 1997; Lewin Group, 1998). In addition, hospital-based agencies may be better able to sustain losses because of their access to additional financial resources (Franco and Leon, 2000). A MedPAC study (1999b) found that proprietary agencies reported larger cutbacks in utilization than not-for-profit or public agencies, while hospital-based facilities had smaller utilization decreases than freestanding agencies. Our utilization study found negative differential impacts in the amount of home health care use for beneficiaries served by for-profit agencies and positive differential impacts for those served by hospital-based agencies.

Relatively healthy beneficiaries requiring short-term, low-intensity services could be hypothesized to face fewer cut-

backs as compared with subacute patients (who may have more intensive short-term needs) and chronic care patients. Our previous study found negative differential effects for four of six diagnosis-defined subgroups, which were among the highest users pre-BBA and/or were highlighted in interviews with home HHAs and discharge planners as diagnoses subject to admission avoidance or utilization reductions post-BBA (McCall et al., 2001; Smith, Maloy, and Hawkins, 1999, 2000). These four diagnoses were diabetes, heart failure, cerebrovascular disease, and skin ulcers. Differential utilization effects were not found for the other two diagnoses examined, hypertensive disease and chronic airway obstruction.

Beneficiaries whose home health admission follows a hospitalization could be thought to be less impacted by the IPS. Since their treatment follows an acute care hospital stay, it could be hypothesized that their treatment is more likely to be rehabilitative and, therefore, of a less discretionary nature. To the extent that those without prior hospitalizations tend to be associated with more chronic LTC personal services, this hypothesis would be consistent with the legislation's intent to return the focus of the Medicare home health benefit to post-acute and rehabilitative care from one that increasingly included chronic LTC services. Our analysis of differential utilization effects was not conducted on an episode-based file, so a post-hospitalization variable could not be included.

Thus, subgroups selected in this study are four demographic subgroups (age 85 or over, females, non-white, beneficiaries with State Medicaid buy-in), one community subgroup (beneficiaries residing in high-use Medicare States), two agency subgroups (for-profit, hospital-based), four diagnostic

subgroups (diabetes, heart failure, cerebrovascular disease, skin ulcers), and one prior use subgroup (post-hospitalization).

RESULTS

The following describe the study population in the two years, compare the raw incidences of the occurrence of these events, and examine the incidence of the outcomes in a multivariate model.

Characteristics of the Study Population

Table 2 compares the beneficiary, community, and agency characteristics controlled for in the regression analysis before and after the implementation of the BBA (FYs 1997 and 1999). The population post-BBA was older and included a larger percentage of beneficiaries with State Medicaid buy-in and those originally entitled for Medicare because of disability. It also included significantly more people who came to home health care after a hospitalization. New home health admissions in the post-BBA period also had a larger number of hospital days during the 6 months prior to their home health admission.

The 1999 group of users had a larger percentage in the South Atlantic census region and a smaller percentage in the West South Central census region. Post-BBA beneficiaries lived in communities that, on average, had lower Medicare managed care penetration and less availability of nursing home beds than in the pre-BBA period.

Characteristics of agencies from which new admissions received services also differed between the pre- and post-BBA periods. Beneficiaries in the post-BBA period were less often served by for-profit agencies

Table 2
Characteristics of Medicare New Admissions to Home Health: Fiscal Years 1997 and 1999

Characteristic	1997	1999
Number of Admissions	23,691	20,338
Demographic		
Age		Percent
Under 65 Years	8.20	8.54
65-74 Years	29.20	*27.7
75-84 Years	40.88	40.35
85 Years or Over	21.72	23.41
Female	63.08	63.85
Non-White	13.70	14.35
State Medicaid Buy-In	19.10	*20.93
Original Medicare Entitlement Disabled or End Stage Renal Disease	17.44	**18.36
Prior Medicare Use		
Inpatient Days 6 Months Prior to Admission	8.01	*8.77
Skilled Nursing Facility Days 6 Months Prior to Admission	3.90	3.76
Post-Hospital Admission	62.72	*64.95
Community		
General		
Urban	74.78	74.16
Census Region		
New England	7.18	7.09
Middle Atlantic	16.77	17.35
South Atlantic	20.04	**20.86
East North Central	17.18	16.68
East South Central	6.88	7.32
West North Central	6.94	6.76
West South Central	10.39	**9.79
Mountain	4.29	4.26
Pacific		
Medicare Managed Care Penetration	14.17	*13.6
Supply of Resources in County pre-BBA		
Hospital Occupancy Rate	60.27	60.43
Nursing Home Beds per 100 Persons Age 65 or Over	5.71	*5.63
Medicare Home Health Agency Employees Per Person Age 65 or Over	1.20	1.19
Historical Medical Use		
County Part A/B Reimbursement Per Beneficiary (1,000s)	3.30	3.30
State Medicare Home Health Visits Per Beneficiary	7.10	7.11
State Medicaid Waiver Expenditures Per Capita	5.23	5.16
Agency		
For-Profit	34.87	*31.52
Hospital-Based	39.87	*41.82
New (Date of Participation After October 1993)	13.11	*15.21
More Than 30,000 Visits	66.28	**65.13
Primary or Secondary Diagnoses		
Diabetes	11.09	**10.37
Hypertensive Disease	14.76	*12.93
Heart Failure	9.52	9.70
Cardiac Dysrhythmias	4.55	4.23
Chronic Ischemic Heart Disease	5.66	5.54
Cerebrovascular Disease	8.56	*7.84
Osteoarthritis and Related Disorders	7.84	7.80
See notes at end of table.		

Table 2—Continued
Characteristics of Medicare New Admissions to Home Health: Fiscal Years 1997 and 1999

Characteristic	1997	Percent	1999
Skin Ulcers	2.70		*3.48
Chronic Airway Obstruction	5.76		5.34
Skin Ulcers	2.70		*3.48
Fractured Femur	3.60		3.81
Cancer	7.00		6.86
Burn and Trauma or Non-Healing Surgical Wounds	4.05		4.42
Urinary or Bowel Incontinence	0.92		0.84
Selected Neurological Diagnoses	5.07		4.72
Selected Orthopedic Diagnoses	12.48		*14.24

* Significantly different from 1997 at $p \leq 0.01$.

**Significantly different from 1997 at $p \leq 0.05$.

SOURCE: (McCall, N., Petersons, A., Moore, S., Korb, J., forthcoming.)

or agencies providing more than 30,000 Medicare visits per year than beneficiaries in the pre-BBA period. A larger percentage of new admissions were served by hospital-based agencies and new agencies post-BBA than pre-BBA. Primary and secondary diagnoses for which users of Medicare home health care were seen also differed between the two periods. Post-BBA there were a smaller percentage of clients with diagnoses of hypertension, diabetes, and cerebrovascular disease and a larger percentage of home health users with selected orthopedic diagnoses and skin ulcers than in the pre-BBA period.

Incidence Rates

The actual incidence of outcomes increased significantly for four of the eight dependent variables examined. The measures and their mean values in 1997 and 1999 are shown in Table 3. No significant differences were found for any of the three hospital measures. In the pre-BBA period 30.6 percent of the home health users had an admission to a hospital within 120 days of their admission to home health care as compared with 30.5 percent post-BBA. The rate of hospital use within 120 days of home health admission for the same body system diagnoses decreased

0.7 percentage points from 20.0 to 19.3 percent, a difference not significant at $p \leq 0.05$, but significant at $p \leq 0.07$. The incidence of avoidable hospitalizations declined from 1997 to 1999, from a little less than 1 percent pre-BBA to a little more than 0.8 percent, but the difference was not statistically significant.

There was a significant increase from 1997 to 1999 in the percentage of home health users having a SNF admission during the 120 days after their admission to home health, from 7.8 to 8.8 percent. SNF admissions for the same body system also increased post-BBA, but not significantly, from 3.2 to 3.5 percent. This finding indicates the limits on home health payment under the IPS may have encouraged an increase in the use of other forms of care during the post-acute period.

Significant differences were found for both ER measures. The percentage of home health users having an ER visit increased from 17 to 19 percent. ER use for the same body system diagnoses as the home health care also increased significantly post-BBA to a rate more than 1 percentage point larger (8.2 percent) than in the pre-BBA period. Mortality among the home health users was significantly greater in the post-BBA period. The percentage who died was 9.0 percent in 1997, growing

Table 3**Percentage of New Home Health Admissions Having the Following Outcomes Within 120 Days of the Home Health Admission, Pre- and Post-Balanced Budget Act of 1997: Fiscal Years 1997 and 1999**

Outcome	1997	1999	Difference	p-Value
Number of New Admissions	23,691	20,338	—	—
		Percent		
Acute Hospital Admission	30.58	30.51	-0.07	0.8704
Acute Hospital Admission for the Same Body System	19.96	19.25	-0.71	0.0610
Avoidable Hospitalization	0.96	0.82	-0.14	0.1279
Skilled Nursing Facility Admission	7.84	*8.77	0.93	0.0004
Skilled Nursing Facility Admission for the Same Body System	3.24	3.50	0.26	0.1400
Emergency Room Use	16.95	*18.96	2.01	<0.0001
Emergency Room Use for the Same Body System	7.07	*8.2	1.13	<0.0001
Mortality	8.98	*9.72	0.74	0.0079

* Significantly different from 1997 at $p \leq 0.01$.

SOURCE: (McCall, N., Petersons, A., Moore, S., and Korb, J., forthcoming.)

to 9.7 percent in 1999. These outcomes also may reflect the change in the clinical characteristics of home health users.

Multivariate Analysis

There are two parts to the multivariate analysis—the first part estimates main effects and the second part looks at differential effects for selected subgroups of beneficiaries. Logistic regression models are used to estimate the impact of being in the post-BBA period on the incidence of each of the outcomes. The dependent variable in the model is a dummy variable indicating that the event happened during the 120 days after the Medicare beneficiary's home health admission. Independent variables are a dummy variable indicating the observation is in the post-BBA period and control variables for a range of beneficiary, community and agency characteristics. In the analysis of subgroup impacts, the same basic model is employed except that addi-

tional independent variables are added to fully interact all of the independent variables with the variable post-BBA. Interaction variables that are significant indicate a differential impact for the subgroup indicated by the independent variable interacted with the variable post-BBA.

Main Effects

Table 4 shows the regression-adjusted estimates of the difference of the probability of the occurrence for each of the outcomes in the post-BBA period. To estimate the difference, the parameter estimates from the regression model are used to calculate two predicted probabilities for each observation, one assuming that the observation is in the pre-BBA period and one assuming it is in the post-BBA period. The mean of the difference in these predicted probabilities is the estimated difference in probability post-BBA controlling for all the other independent variables in the model.

Table 4
Estimated Difference in the Percentage of New Home Health Admissions Having an Outcome Within 120 Days of Home Health Admission, Post-Balanced Budget Act of 1997

Outcome	Estimated Difference	<i>p</i> -Value	1997	Estimated Difference ¹ as Percent of 1997
Acute Hospital Admission	-0.55	0.2065	30.58	-2
Acute Hospital Admission for the Same Body System	-0.85	0.0221	19.96	-4
Avoidable Hospitalization	-0.16	0.0704	0.96	-17
Skilled Nursing Facility Admission	0.80	0.0021	7.84	10
Skilled Nursing Facility Admission for the Same Body System	0.24	0.1591	3.24	7
Emergency Room Use	1.65	<0.0001	16.95	10
Emergency Room Use for the Same Body System	0.96	0.0001	7.07	14
Mortality	0.70	0.0090	8.98	8

¹ Logistic regression adjusted to control for differences between the groups. The adjustment controls for beneficiary demographic, prior use, community, agency characteristics, and the diagnoses for which home health care was received.

SOURCE: (McCall, N., Petersons, A., Moore, S., and Korb, J., forthcoming.)

This estimated difference is shown in Table 4, as is the probability of that difference being significant (i.e., different from zero), the actual incidence rate of each adverse event pre-BBA, and the estimated difference as a percentage of actual pre-BBA occurrence. As compared with the unadjusted differences in the rates of use, the logistic regression-adjustment increased the estimated differences post-BBA for the hospital-based measures, but decreased the estimated differences post-BBA for SNF, ER use, and death.

The estimated effect post-BBA for hospital admissions for the same body system was to lower its incidence an estimated 0.9 percentage points from a 20-percent rate of hospital use within 120 days pre-BBA. This change represented a 4-percent decrease in the rate of having a hospitalization for the same body system diagnoses. The differences in the incidence of hospitalization overall and in the incidence of an avoidable hospitalization occurred less often post-BBA, but were not statistically significant. The finding of fewer hospitalizations for the same body system for the group receiving

less home health is consistent with findings by Cheh (2001). These results are also consistent with the lower hospitalization results post-BBA found by the OIG (2000b).

It is important to keep in mind that hospital readmissions do not necessarily signal poor quality of care as they may reflect appropriate referral by home health nurses and aides who in the higher intensity service use period (i.e., pre-BBA for this study) are more often present to observe the condition of the beneficiary and activate transfer to hospital care. In addition, the changes in hospital reimbursement in the post-BBA period that lengthened the term of stay in acute hospitals before transfer to post-acute care for 10 common post-acute DRGs may have resulted in a home health care population post-BBA that was less prone to rehospitalization. Approximately 6 percent of our new admission sample were hospitalized with these DRGs prior to their admission to home health care.

On the other hand, given the substantial cost of a hospital stay and the fact that the incidence of hospitalization for the entire Medicare population did not change

significantly between the two periods, the decline of hospital readmissions is a possibly positive finding. This finding needs to be considered as balance to some of the possibly negative effects found in the post-BBA period.

The percentage of home health users having a SNF admission within 120 days from admission was 0.8 percentage points larger post-BBA, increasing the rate of SNF use from 7.8 to 8.6 percent. This effect represented a 10-percent increase in the incidence of having a SNF admission. The percentage of home health users having a SNF admission for the same body system was also larger, but not significantly, in the post-BBA period.

In addition to the IPS, one possibility for this increase in admissions might be increased supply of facilities. However, while the supply of Medicare SNF beds did increase 22 percent between 1997 and 1999, the overall number of days of use by Medicare beneficiaries was smaller in 1999 and the incidence of using SNF Medicare services was not significantly different between the two years. Another possibility might be incentives created by the change in SNF reimbursement in the post-BBA period. Prospective payment for Medicare SNF care began in July 1998 just before the start of FY 1999. While it is not clear what specific incentives were created through the new per diem case-mix adjusted reimbursement system for SNFs, one reviewer has suggested that it increased the number of hospital to home health to SNF episodes, which in turn increased the incidence of SNF use following home health admission. Whether this new pattern of care observed was widespread enough to impact our data is not known.

For both measures of ER use, incidence increased by at least 10 percent in the post-BBA period, a 10-percent increase for the

incidence of any ER visit and a 14-percent increase in the incidence of an ER visit for the same body system diagnoses. The incidence of any ER use increased from 17.0 percent of home health users visiting an ER within 120 days of their admission to 18.6 percent in the post-BBA period. ER use for the same body system as the home health admission increased more dramatically by 1 percentage point from a pre-BBA rate of 7.1 percent. Any increase in ER use would be a negative finding as it suggests the need to access care through a non-regular care provider or in an emergency situation. This is especially true since the number of visits overall did not change significantly between the two years for the Medicare population as a whole. It might be hypothesized that the home health visits provided the opportunity to give beneficiaries medical advice and emotional support that mitigated the need to visit an ER. An alternative or additional explanation is that the beneficiary's inability to receive home health care activated a condition requiring emergency treatment. Thus, these increases in ER use may signal lower quality of care.

Mortality among the home health user population increased significantly in the post-BBA period. The mortality rate was 9.0 percent pre-BBA and increased to 9.7 percent post-BBA. This finding, however, needs to be considered in light of the crudeness of its linkage to home health care and the likelihood that the analysis may not adequately control for the risk of the population to die. This finding also may bolster the argument that the population post-BBA is different from the pre-BBA user population in ways that cannot be controlled with the variables available. Even though death is the ultimate bad outcome and the results were reasonably strong, they may be more reflective of the inadequacy

Table 5
Significance and Direction of Effect of Selected Interaction Terms in the Logit Estimation of the Probability of Having an Outcome

Interaction Term ¹	Hospital	Hospital Same Body System	Avoidable Hospitalization	Skilled Nursing Facility	Skilled Nursing Facility Same System	Emergency Room	Emergency Room Same Body System	Mortality
85 Years or Over	No	No	No	No	No	No	No	No
Female	No	+	No	No	No	No	No	No
Non-White	No	No	No	No	No	No	No	No
Buy-In	No	No	No	No	No	-	-	No
Post-Hospital Admission	No	No	No	No	No	No	No	No
High Medicare Home Health States	No	No	No	No	No	No	No	No
Agency For-Profit	No	No	+	No	No	-	No	No
Agency Hospital-Based	No	No	No	No	No	-	No	No
Diabetes	No	No	No	No	No	No	No	No
Heart Failure	No	No	No	No	No	No	No	No
Cerebrovascular Disease	No	No	No	No	No	No	No	No
Skin Ulcers	No	No	No	No	No	-	No	No

¹ This is the interaction term of the listed subgroup and the variable post the Balanced Budget Act (BBA). It measures the independent effect of both being in the subgroup and in the post-BBA period.

NOTES: +/- indicates direction of effect and significance at $p \leq 0.05$. No indicates that the variable is not significant at $p \leq 0.05$.

SOURCE: (McCall, N., Petersons, A., Moore, S., and Korb, J., forthcoming.)

of the control variables in our model than a true increase in mortality experience caused by the home health care provisions of the BBA.

Subgroup Differential Effects

Table 5 shows the significance and direction of selected interaction terms in the fully interacted logistic regression models. The significance of the variables that interact the variable defining the subgroup of interest with the post-BBA variable in the logistic regression indicates whether a subgroup is differentially affected in the post-BBA period. This interaction term measures the independent effect, over and above the effects of the variables themselves, of being both a member of the group identified by the variable of interest and being in the post-BBA period.

Of the 96 interaction terms only 7 were significant and of these only 2 added to the incidence of the outcome occurring. The other five interaction terms indicated significant additional decreases in the incidence of the outcome for the subgroup of interest in the post-BBA period.

There are only a few interaction terms that are significant in the fully interacted models, indicating that very few subgroups had experienced differential effects in the post-BBA period with respect to the outcomes observed. Only seemingly random effects were found. Moreover, none of the eight fully interacted models were preferred over the corresponding non-interacted model using a chi-squared test.

Only two of the effects observed were in a positive direction, indicating an additional incidence of the outcome for being both in the subgroup of interest and the post-BBA period. Females in the post-BBA period

were more likely to be hospitalized for a condition within the same body system and beneficiaries being served by a for-profit agency were more likely to be hospitalized for an avoidable hospitalization. None of the selected subgroups had differential positive or negative effects with respect to hospital SNF admissions or SNF admissions for the same body system or mortality.

There were significant negative differential effects in the post-BBA period for several subgroups for ER visits. Negative differential impacts indicated that in addition to the effect for the variable that identifies the subgroup and for the variable which identifies the post-BBA period, there is an additional negative effect for being both in the subgroup of interest and in the post-BBA period. These negative differential impacts for ER visits were found for Medicaid buy-in beneficiaries, beneficiaries served by for-profit agencies, beneficiaries served by hospital-based agencies, and beneficiaries seen for diagnoses of skin ulcers. The incidence of ER visits for the same body system diagnosis was also lower for Medicaid buy-ins in the post-BBA period.

This lack of observed differential effects for the outcomes studied for the subgroups whose home health utilization was decreased differentially suggests that we can observe no effects on these variables for the groups of beneficiaries for whom one would expect to see effects, if there were any. This combined with main effects that go in both directions, suggests that if effects existed they were not clearly in a negative direction.

SUMMARY AND DISCUSSION

This article examines whether the reductions in home health care use resulted in adverse occurrences for Medicare

beneficiaries. Utilization-defined outcomes for new Medicare home health admissions were compared between FYs 1997 and 1999, the years just before and after the IPS implementation. Outcomes were defined from review of the Medicare claims for the 120 days immediately after each beneficiary's home health admission.

The events examined were admission to an acute care hospital: for a diagnosis within the same body system as the diagnosis for which they were receiving home health care; for an avoidable hospitalization; a SNF; a SNF for the same body system diagnosis; an ER visit; an ER visit for the same body system diagnosis; and death. Some of these may represent problems with quality of care or they may signal substitution of other Medicare services when home health services were not provided through the Medicare Program.

While previous researchers have used these occurrences as measures of adverse outcomes, it is important to be cautious about linking them to reduced home health care provision. These outcomes are identified from the claims and eligibility files, and information about the extent to which the occurrence was related to the home health care cannot be directly determined. On a population basis, however, if the populations being compared have the same underlying health status, an increase in these occurrences should be a cause for concern among program funders.

The difference in the percentages of beneficiaries having each outcome in the post-BBA period was estimated using logistic regressions. Also explored was whether there were differential effects for selected subgroups. Subgroups selected were those hypothesized to be most strongly affected by the IPS and found to have differential utilization impacts post-BBA. It should be remembered that the differential utilization effects found were often small on an

absolute or relative basis. The basic regression model included independent variables that defined beneficiary demographic characteristics, prior Medicare use, community characteristics, agency characteristics, and the diagnoses for which the care was being provided. For the subgroup analysis, interaction terms were added for all the independent variables interacted with the variable post-BBA.

Despite the independent variables for prior Medicare use that are included, the models may not fully account for differences in the population pre- and post-BBA that may make the post-BBA population sicker, and therefore, more prone to having potentially adverse outcomes. In addition, changes in environmental factors between the two time periods, such as the changes occurring in other Medicare service reimbursement as a result of the BBA, changes in the supply of post-acute care facilities, and time trends in service utilization are not directly accounted for in the models.

Results from the logistic regressions indicated that the incidence of hospitalizations decreased among the home health user population. Before the BBA, the incidence of hospitalizations within 120 days for the same diagnosis as that for which the home health was received was 20 percent. This rate was 0.9 percent lower post-BBA. The incidence of hospitalizations in general and avoidable hospitalizations was also smaller post-BBA, but the differences were not statistically significant.

SNF admissions within 120 days of the home health admission had the opposite effect than hospitalizations in the post-BBA period, with admissions in general increasing 0.8 percent from a pre-BBA rate of 7.8 percent. SNF admissions for the same diagnoses also increased, but not significantly. ER use in general and for the same diagnosis as that for which home health was received also

increased significantly—1.7 percent (from a pre-BBA rate of 17 percent) and 1 percent (from a pre-BBA rate of 7.1 percent), respectively. Mortality increased 0.7 percent from 9 percent in the pre-BBA period.

None of the subgroups highlighted for study showed a pattern of differential adverse outcomes. Of the 96 interaction terms in the 8 models examined, only 7 were significant and only 2 of the 7 added to the incidence of the outcome occurring.

The period of study was a turbulent one with a great number of changes for home health, for the potential substitutes for home health care, and for the health care environment in general. This unsettled atmosphere combined with the difficulties of controlling for changes in the characteristics of the users of home health services in the two periods make it difficult to conclude that any of the results were directly related to the IPS. In addition, among the groups that had differential utilization reductions in the post-BBA period, there were no corresponding increases in the incidence of these outcomes and therefore no evidence to support a connection between the contraction in home health utilization and an increase in potentially adverse outcomes.

More fundamentally, this points to an underlying problem with the provision of home health care in general. Although home health care continues to be one of Medicare's most popular services, it neither has an established, unambiguous set of criteria for coverage (Donelson et al., 2001) and service provision nor agreement as to how to measure benefits and conceptualize outcomes. Until these issues are addressed directly, a public program such as Medicare will continue to face difficulties administering the provision of a benefit with potentially unlimited demand.

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