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Impact of Changes in Medicare Home Health Care Reimbursement on Month-to-Month Home Health Utilization Between 1996 and 2001 for a National Sample of Patients Undergoing Orthopedic Procedures

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Background: Beginning October 1, 1997, Medicare implemented a series of major changes to the Home Health (HH) reimbursement system. Reimbursements were first significantly reduced under the Interim Payment System (IPS) and then relaxed slightly until implementation of the HH Prospective Payment System (PPS) on October 1, 2000.

Objective: The objective of this study was to examine the impact of reimbursement policy on HH care utilization.

Research Design: We postulated that in response to the initial changes, there would be reductions in both the probability of any HH use and the number of HH visits per HH user. Under PPS, we postulated there would be further reduction in number of HH visits. We tested whether the policy response differed by HH agency structure and whether subgroups of patients were differentially affected. An interrupted time-series analysis was conducted to examine month-to-month probability of HH selection and the number of HH visits among users.

Subjects: A 100% sample of all Medicare recipients undergoing either elective joint replacement (1.6 million hospital discharges) or surgical management of hip fracture (1.2 million hospital discharges) between January 1996 and December 2001 was selected.

Results: Under the IPS, the probability of any HH use and number of visits per episode of HH care fell until the IPS was refined in October 1998. With implementation of the PPS, HH visits fell commensurately. Differentially larger reductions in care were noted at for-profit HH agencies, for the elderly, women, patients receiving state assistance, and patients first discharged to skilled nursing facility or rehabilitation hospitals.

Conclusions: Changes in month-to-month utilization of HH services were sharp and well correlated with policy implementation dates, strengthening the evidence for a causal association between policy and patient care in the midst of a sea of concurrent policy changes. Greater reductions in HH visits were noted for vulnerable groups.

Key Words: Medicare, home care, utilization

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Between 1986 and 1996, there was dramatic growth in Medicare Home Health (HH) utilization, increasing from $2.6 billion (3% of Medicare, Part A expenditures) to $17.5 billion per year (13% of Part A expenditures) as the annual number of beneficiaries served increased from 1.6 to 3.6 million and the average number of annual visits increased from 23 to 79 visits per beneficiary.[1]

In response to this rapid growth, the Centers for Medicare and Medicaid Services (CMS) implemented several changes in HH reimbursement through the Balanced Budget Act (BBA) of 1997[2] (see Appendix Table A1 for policy details, which can be found on the Medical Care website, www.lww-medicalcare.com). With the goal of the HH Prospective Payment System (PPS), CMS first implemented the Interim Payment System (IPS) on October 1, 1997. Under the IPS, aggregate per-visit payment limits were lowered to 105% of median historical costs and per-beneficiary payment limits were introduced. Because aggregate limits are assessed at the end of each HH agency's fiscal year, implementation of the policy effectively staggered the start dates. In response to expected delays in the implementation of the prospective payment system and uproar from the HH industry, Congress implemented the refined Interim Payment System (r-IPS) beginning October 1, 1998. Congress relaxed the per-visit limit to 108% of median historical and permitted older agencies to choose among per-beneficiary limit formulas.

The Prospective Payment System (PPS) was ultimately implemented October 1, 2000.[3] Under PPS, HH care was

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organized into 60-day episodes of care for 80 classes of HH resource groups (HHRGs). Mean payment per user improved for orthopedic patients.[4]

The Congressional Medicare Payment Advisory Commission (MEDPAC) reported that during the first year of IPS, total Medicare HH payments were reduced by 15%.[5] Several independent authors have confirmed these findings.[6–11] Reductions in visits with implementation of the PPS have also been reported.[4,12] These reports have either described detailed (eg, quarterly) changes in utilization[6] for the aggregate population of HH users or have examined selected subpopulations but using highly aggregated time periods.[4,7–9,12]

Because other regulatory policies were implemented during the same time period as the HH policies (see Appendix Table A2, which can be found on the Medical Care website, www.lww-medicalcare.com), other authors have expressed concern about the potential confounding of other policies on changes in HH utilization.[13] To better correlate HH policy implementation with changes in HH utilization, we selected a sample with sufficient size so that month-to-month variation in utilization could be analyzed.

We further sought clinically well-defined cohorts of patients with specified close-ended postacute care needs in which there was a high degree of clinical discretion between venues of postacute care (skilled nursing facility [SNF], rehabilitation hospitals [RH], and HH agency). Patients undergoing elective joint replacement (JR) surgery for treatment of osteoarthritis meet these requirements as they are prescreened for their good rehabilitation potential, and in January 1996, the majority (82%) were discharged to postacute care with even distribution to SNF (30%), RH (23%), and HH (29%) dispositions. With similar rates of discharge to SNF, RH, and HH, we posited there would be greater discretion in selection of postacute care venue, thereby making the cohort sensitive to change.

With an interest to analyze a more vulnerable cohort, we also selected patients undergoing surgical repair of hip fracture (FX) as a comparator group. Patients with FX are elderly, frail, and have more comorbidities, yet undergo similar surgical procedures as JR patients. Prior literature has described differential response to HH policy for vulnerable patients.[8]

We further set out to evaluate whether the policy response differed by discharging institution or HH agency structure and whether subgroups of patients were differentially affected, including whether patients were first discharged to institutional postacute care (eg, SNF or RH). To accomplish these aims, we selected a 100% sample for each of these cohorts (JR and FX).

METHODS

Patient Selection

Medicare claims for all hospital admissions, related SNF, RH, and HH bills for patients undergoing either JR (hip or knee replacement) or repair of FX between January 1, 1996, and December 31, 2001 were obtained. Patients undergoing JR surgery were identified by diagnosis-related groups (DRGs) codes 209 and 471. Verification of surgery and inclusion in the study sample was confirmed by International Classification of Diseases, 9th Revision (ICD-9) procedure codes 81.51–81.55. Patients undergoing JR for clearly nonelective reasons were excluded from this sample (eg, fracture, infection, or major trauma).

Patients undergoing surgical repair for FX were identified with an ICD-9 diagnosis of 820.xx in any 1 of the 10 diagnostic code positions. Surgical repair of FX was confirmed with the hip replacement codes 81.51–81.53 or pinning codes 79.35, 79.15, or 78.55. Patients treated nonsurgically for FX were excluded.

Identification of Home Health Care

Admission to HH care was identified to begin within 7 days of discharge from either the acute care hospital or one of the contiguous postacute care institutions (SNF or RH), thereby creating 2 main categories of patients: patients discharged to home with HH care (henceforth referred to as direct HH) and patients discharged to HH care after an intervening SNF or RH stay (referred to as supplemental HH).

To parallel the 60-day PPS reimbursement structure, intervals of 60-, 120- or 180-day periods were defined to create episodes of HH care. Each episode of HH care terminated with the end of the 60-, 120- or 180-day interval, rehospitalization, death, or a break in service greater than 7 days. When the HH claim "to" and "from" dates straddled one of the terminal 60-day end points, the visit count total was prorated assuming a uniform distribution of services across the submitted claim dates.

HH care was completed within 60 days of HH admission for 93% and 80% of all JR and FX patients receiving HH care; an additional 5% and 13% completed care within 120 days and 0.7% and 3% within 180 days. Results for the 180-day models were similar to 120-day models so were not presented.

Dependent Variables

The various policies provided different incentives between selection of HH patients versus the conditional use of HH services once selected. Given the differing incentives, we separately modeled the probability of HH care and the number of HH visits during an episode of HH care.

Probability of Home Health Utilization

To evaluate the probability of direct, supplemental, and any HH utilization, a nested logistic model was used. (see Fig. 1 for conceptual rationalization). (Multinomial logit modeling was rejected, because the test for independence of irrelevant alternatives was significant, $P < 0.0001$.)

We first modeled the probability of SNF or RH selection at the time of inpatient discharge, controlling for inpatient covariates. We subsequently modeled the probability of any HH use conditional on SNF/RH utilization controlling for either the inpatient or discharging SNF/RH covariates, respectively. The final probability of direct HH or supplemental HH utilization is the product of the probability of any SNF/RH use multiplied by the conditional probability of (direct or supplemental) HH selection, respectively.[14–16] To combine the first and second stage, we used the same monthly

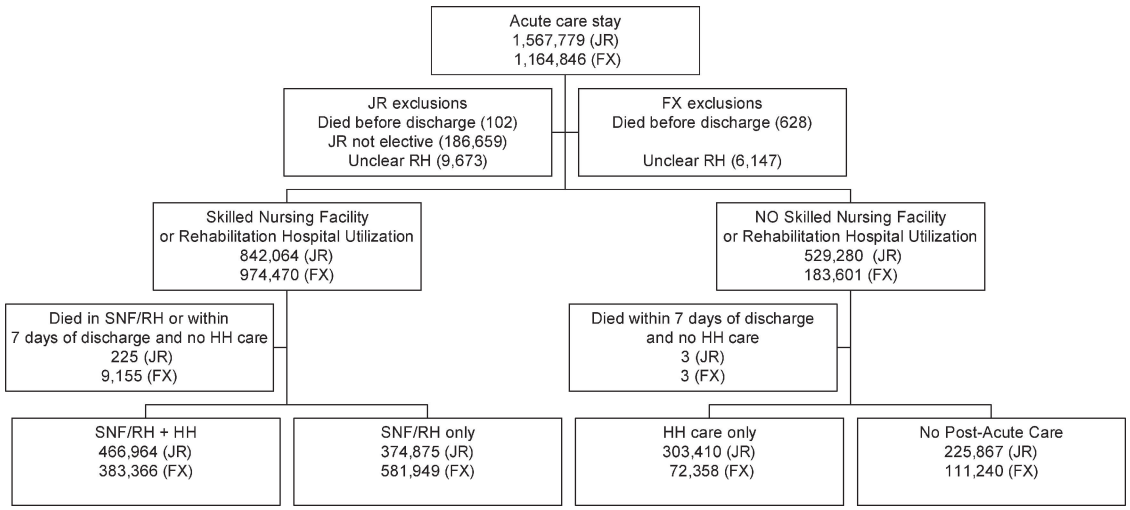


FIGURE 1. Conceptual model for nested logistic statistical model. JR indicates elective joint replacement; FX, surgical repair of hip fracture; SNF, skilled nursing facility; RH, rehabilitation hospital; HH, home health.

reference for all models (month of inpatient discharge). All models adjusted for clustering of patients within the discharging inpatient hospital. Upper and lower bounds of the combined estimates were calculated using bootstrap methodology (500 iterations).[17,18]

Number of Home Health Visits

To evaluate the utilization of HH use conditional on HH selection, the number of visits per (60-, 120-, or 180-day) episode of HH care was modeled using linear regression to control for covariates and within HH agency clustering.

Main Independent Variables

Month-to-month temporal trends in HH utilization are shown on graphs (Figs. 2 and 3) based on regressions that included 72 binary calendar month indicators (January 1996–December 2001). For the probability of HH use, these indicators represent the month of discharge from the acute care hospital with January 1996 as the reference month.

For the conditional number of HH visits, these indicators represent the month of admission to HH service after inpatient or last contiguous institutional discharge with March 1996 used as the reference (as a result of censoring, January and February were dropped). (Separate models using HH month of discharge yielded comparable results.)

To provide estimates of average change across each of the 4 policy periods, 4 spline variables were used in place of the calendar month indicators. Results of the spline estimates are illustrated on the graphs (dashed lines) and in the affiliated tables. Results for a particular month may vary between the calendar month models and the spline models describing the average change across the policy periods. All results reported in the text are derived from the models using the spline variables that describe average change across the policy period. For the analysis of conditional home care visits, a fifth spline representing the transition to PPS was added to account for the summation of claims across the October 1, 2000, implementation date.

Other Covariates

Patient Covariates

The analyses controlled for patient, institutional, HH, and regional characteristics. Patient demographic factors included age at the time of surgery (by percentile), gender, and race (white, black, or other). Patient socioeconomic status was estimated using the 2000 U.S. Census-reported median income in the patient's zip code of residence after matching patient and Census zip codes. Patient receipt of state aid (eg, dual eligible patients where states elect to buy in to Medicare benefits on behalf of patients) was also included in the model.

Patient medical characteristics included original reason for Medicare entitlement (aged, disabled, end-stage renal disease, or disabled and end-stage renal disease). Medical comorbidities identified from the 10 Medicare Provider Analysis and Review (MEDPAR) diagnostic codes were categorized into 19 categories using the Charlson Comorbidity Index.[19]

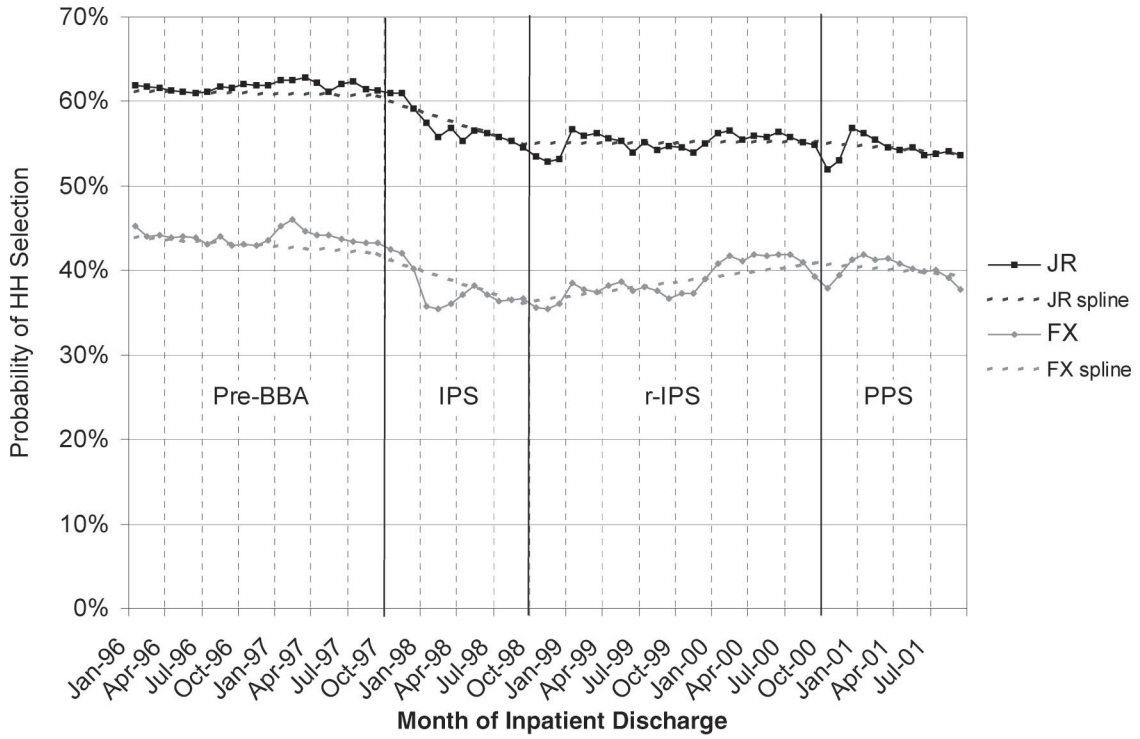
Covariate surgical characteristics varied by indication. For patients undergoing JR, the indications included hip versus knee and revision versus primary replacement. For FX patients, the indications included replacement versus pinning and whether in-hospital complications were noted (DRG 210 vs. 211).

Institutional Covariates

For probability of selection models, the analyses adjusted for characteristics of the discharging inpatient, SNF, or RH institution. The institutional characteristics included teaching status (acute care hospital only), profit status, day of discharge, relative size (within own venue of care), and rural versus urban status.

Home Health Covariates

For the number of HH visit models, the analyses adjusted for characteristics of the HH provider. Characteris-



JR patients	Mean Percentage Point Change in Proportion of Patients: Prior to BBA	Under IPS	Under r-IPS	Under PPS	Proportion of Patients: 1/96	10/97	10/98	10/00	9/01
Any HH	-0.3%[1]	-5.7%	+0.1%[1]	-1.3%	61%	60%	55%	55%	54%
Direct HH	-3.8%	-3.8%	+0.1%[1]	-1.7%	31%	24%	21%	21%	19%
Supplemental HH	+3.5%	-1.9%	-0.1%[1]	+0.4%[1]	30%	36%	34%	34%	34%
FX patients									
Any HH	-1.1%	-5.6%	+2.3%	-1.3%	44%	41%	36%	40%	39%
Direct HH	-1.5%	-1.2%	+0.2%[1]	-0.3%[1]	9%	7%	6%	6%	6%
Supplemental HH	+0.4%[1]	-4.5%	+2.2%	-0.9%	35%	35%	31%	35%	34%

[1]All estimates in column significantly different than 0 except where noted.

FIGURE 2. Adjusted probability of any home health care selection after elective joint replacement (JR) or surgical repair of hip fracture (FX). Percentage Point Change and Proportion of Patients by Pattern of Post-Acute Care derived from linear trend spline estimates.

tics included HH profit status, the age of the HH agency, and whether it operated under a certificate of need or simple business licensure.

Regional Covariates

Indicators for the 10 CMS regions were used to control for regional variation. Postacute care supply variables by zip code (number of SNF beds, RH beds, HH nurses, and HH aides) were matched to hospital zip codes. All values were per capita adjusted by including the per zip code total population aged 65 years or older in the model using the 2000 U.S. Census data. The county-level Medicare managed care market penetration rates for 1999 reported by the Centers for Medicare and Medicaid Statistics were also included.[20]

Differential Policy Effects

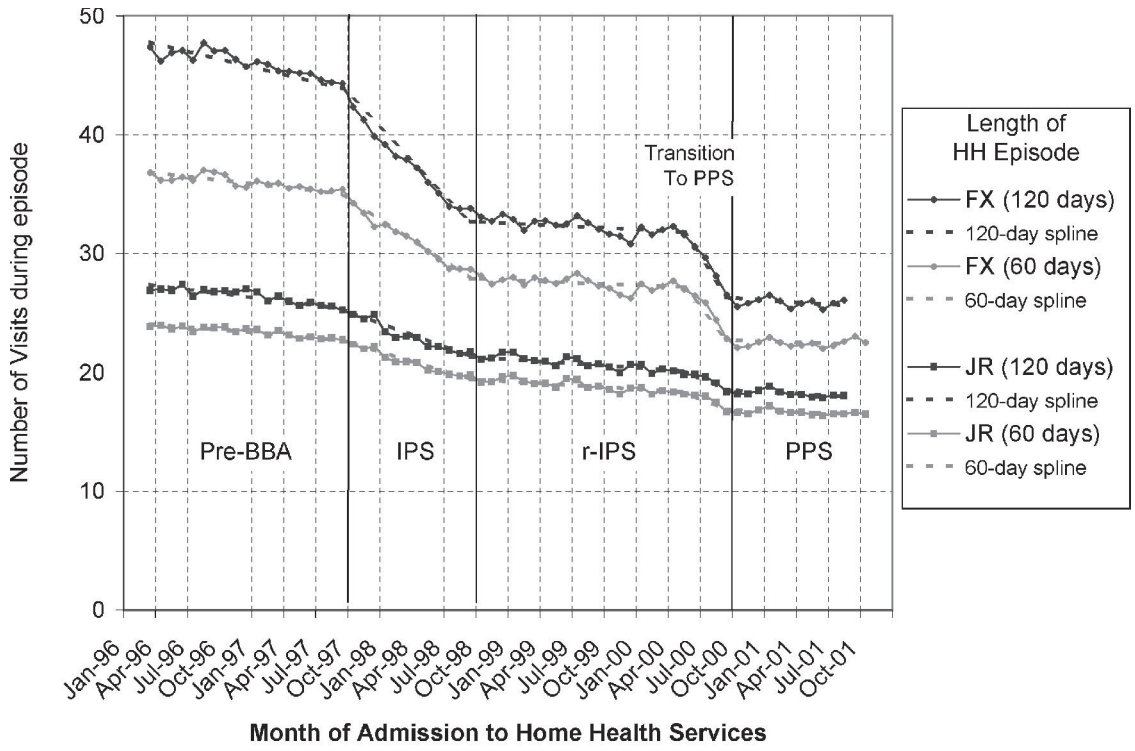
Based on prior literature,[8] we hypothesized that for-profit HH agencies might respond differentially to the policy or that potentially costlier patients (eg, patients who were elderly, poor, female, had more comorbidity, or were discharged first to SNF or RH) might be treated differentially. These hypotheses were tested by adding interaction variables between the covariate(s) of interest and the policy spline variables.

Statistical Analysis

STATA version 7.0[21] was used to perform all statistical analyses. As a result of the large size of the study cohort, estimates were deemed significant only when $P < 0.0001$ or when the absolute upper or lower limits of the bootstrap estimate distribution did not include the value tested in the null hypothesis.

RESULTS

From the MEDPAR database, 1,567,779 JR cases (for indication other than FX) with hospital discharge dates be-



	Adjusted Change in Number of Visits		Adjusted Mean Number of Visits					
	Under IPS	Transition to PPS	3/96	10/97	10/98	5/00	10/00	8/01
FX (120 days)	-11.2	-5.6	47.8	42.9	32.7	31.8	26.2	25.6
FX (60 days)	-7.1	-4.4	36.8	34.4	27.9	27.2	22.7	22.4
JR (120 days)	-4.0	-1.6	27.4	25.0	21.3	20.1	18.5	18.0
JR (60 days)	-3.3	-1.5	24.1	22.4	19.4	18.3	16.8	16.5

All estimates significantly different than 0, $p < 0.0001$.

FIGURE 3. Adjusted conditional number of Home Health (HH) visits per 60- and 120-day episodes of HH care after elective joint replacement surgery (JR) or surgical repair of hip fracture (FX). Adjusted changes across periods and Number of Visits per HH episode.

tween January 1, 1996, and December 31, 2001, were identified. In all, 102 patients died before discharge. A total of 186,659 discharges were excluded in which the elective nature of the surgery was unclear from the coded diagnoses (including a majority of revisions). Sensitivity analyses with and without these patients did not reveal meaningful differences. An additional 9673 patients were excluded who had atypical billings in which the type of postacute care could not be easily identified. For the conditional analyses, 228 patients were excluded who died either while at SNF or RH or within 7 days of discharge (and no HH care provided) (see Fig. 1).

A total of 1,164,946 cases of FX treated surgically were identified. Patients who died before hospital discharge (n = 628), whose postacute care venue was unclear (n = 6147). or those who died while either at SNF or RH or within 7 days of discharge (n = 9158) were excluded from analysis.

Discharges with missing data (3–6% depending on the covariates included in the analysis) were dropped.

Adjusted Probability of Home Health Use

Joint Replacement

The regression-adjusted proportion of JR patients receiving any HH care between January 1996 and October 1997 (before implementation of the BBA) was relatively stable at 61%. The pre-BBA change in any HH utilization was only −0.3 percentage points per annum and not statistically significant. After implementation of the IPS, utilization of any HH fell significantly from 60.1% in October 1997 to 54.9% in September 1998 (a per annum rate of −5.7 percentage points). The impact of the policy is best noticed on the graph beginning December 1997 because the fiscal year ends in December for most HH agencies. Beginning October 1998, reimbursement cuts were relaxed under the refined IPS. Consistent with this fact, the decline in any HH utilization abated thereafter, remaining essentially flat (+0.1 percentage point per annum change, not significant).

Looking at probability of HH selection by category of HH care (direct vs. supplemental) is complicated by concurrent changes in SNF/RH utilization. Between 1996 and 2001, there was steady linear growth in the probability of RH use. Through June 1998, there was steady growth in probability of SNF selection until implementation of the SNF PPS, at which time selection of SNF falls (at a rate equal to RH growth) (results not shown). As a result, there is substantial growth in use of any SNF/RH through June 1998 (from 50−65% of discharges) and thereafter stable use of SNF/RH. As a result of these market changes, the inflection in any HH use observed October 1997 reflects the reversal of supplemental HH growth combined with continued reduction in direct HH utilization. By the end of this study period, use of direct HH fell from 31% in January 1996 to 19% in September 2001, whereas use of supplemental HH increased from 30% to 34%.

Hip Fracture

Similar findings were noted for patients undergoing FX surgery. Before the BBA, there had already been a small but significant decline in use of any HH, falling from 43.8% in January 1996 to 41.3% in October 1997 (per annum rate of −1.1 percentage points). After implementation of the IPS, utilization of any HH fell significantly to 36.1% in September 1998 (a per annum rate of −5.6 percentage points, significantly greater than the pre-BBA decline). Under the r-IPS, utilization of any HH recovered to 40.7% in October 2000 (significant per annum increase of +2.3 percentage points). There was a slight decline again under PPS (−1.3 percentage points).

Similar although less marked patterns in SNF/RH selection were noted for the FX market. Selection of any SNF or RH increased from 79% in January 1996 to 85% in June 1998 and thereafter remained stable. With the majority of patients first receiving SNF/RH, changes in any HH use were driven by changes in supplemental HH.

Number of Home Health Visits Among Patients Receiving Any Home Health Care

Joint Replacement

For either 60- or 120-day episodes, the number of HH visits before implementation of the BBA was relatively stable decreasing from 27.4 visits in March 1996 to 25.0 visits in October 1997 per 120-day episode (per annum rate of −1.4 visits per episode, $P < 0.0001$). Under IPS, the decline increased to −4.0 visits per 120-day episode per year ($P < 0.0001$), dropping to an average 21.3 visits in October 1998. The number of HH visits stabilized under r-IPS, falling at a rate of only −0.7 visits per episode per year ($P < 0.0001$).

During the "transition" to PPS (as the end of the fixed 120-day window begins to overlap into the PPS period), the total reduction in number of visits fell from 20.1 in May 2000 to 18.5 visits per episode in October 2000 ($P < 0.0001$). After this initial reduction in service attributable to PPS, utilization remained flat, holding at 18.0 visits per episode (no significant change).

Hip Fracture

The number of HH visits before BBA starting at 47.8 visits per 120-day episode in March 1996 fell little in the months preceding BBA implementation (−2.6 fewer visits per 120-day episode per year, $P < 0.0001$). After implementation of the IPS, visits fell sharply, from a mean 42.9 visits in October 1997 to 32.7 visits in September 1998 (−11.2 fewer visits per 120-day episode per year, $P < 0.0001$). The number of HH visits remained stable under r-IPS (−0.5 fewer visits per 120-day episode per year, not significant). As the 120-day episodes began to cross over into the PPS period, number of HH visits dropped from 31.8 to 26.2 visits in October 2000 ($P < 0.0001$), thereafter remaining stable under PPS.

Differential Effects

As noted by other authors,[6] no large differential effects on the probability of any HH use were seen for patient groups stratified by age, gender, ethnicity, comorbidity, or other major covariates. However, differential effects were noted for changes in the number of HH visits among users.

Number of Home Health Visits (Joint Replacement Patients)

After controlling for the measured covariates, the number of visits at for-profit HH agencies began at a significantly higher level of service in October 1997 than either nonprofit or government (37.9 bd 23.5 or 22.0 visits per 120-day episode, $P < 0.0001$) (Table 1). Under IPS and during the transition to PPS, the number of visits fell more sharply at for-profit HH agencies than other agencies ($P < 0.0001$ comparing for-profit with either not-for-profits or government agencies). By the beginning of PPS, the average number of visits per episode at for-profit, not-for-profit, and government-owned HH agencies had fallen to 23.3, 16.5, and 15.5, respectively.

Likewise, dual-eligible patients compared with those not eligible for Medicaid had larger reductions in HH visits under IPS (−7.3 vs. −3.7, $P < 0.0001$) and during the transition to PPS (−3.2 vs. −1.4, $P < 0.0001$). Larger reductions were also noted for women compared with men, both under IPS (−4.7 vs. −2.6, $P < 0.0001$) and PPS (−2.0 vs. −0.8, $P < 0.0001$). Furthermore, compared with the reference group (patients aged 65–69 years), for each older percentile, there were larger reductions in care (significant for all percentiles 75 years of age and older) under IPS. However, this age-related differential effect was not noted during the transition to PPS.

Patients discharged first to SNF/RH care (supplemental HH) started at slightly higher utilization levels (25.8 vs. 23.6 visits) but experienced larger reductions in HH care under IPS than did patients discharged directly to HH. Thereafter, the number of visits between the 2 groups of HH users was similar.

Number of Home Health Visits (Hip Fracture Patients)

After controlling for covariates, for-profit HH agencies again provided a significantly higher number of HH visits than nonprofit or governmental HH agencies (65.2 vs. 39.5 or

TABLE 1. Adjusted Mean Number of Visits and Mean Change in Number of Visits (per 120-d episode) by Institutional and Patient Characteristics After Elective Joint Replacement

	Adjusted Change in Number of Visits*		Adjusted Mean Number of Visits					
	Under IPS	Transition to PPS	3/96	10/97	10/98	5/00	10/00	8/01
All HH users	−4.0	−1.6	27.4	25.0	21.3	20.1	18.5	18.0
At profit HH	−7.0‡	−2.8‡	37.9	34.0	27.5	26.1	23.3	22.5
At nonprofit	−3.0†	−1.2†	23.5	21.7	18.9	17.7	16.5	16.0
At government	−3.5‡	−0.3*‡	22.0	20.5	17.2	15.8	15.5	14.8
Not eligible for Medicaid	−3.7†	−1.5†	26.7	24.5	21.1	19.9	18.5	18.0
Dual-eligible	−7.3‡	−3.2‡	33.5	29.3	22.5	21.4	18.2	17.4
Aged <65	−4.9	−0.9	23.8	20.9	16.4	15.8	14.9	15.8
Aged 65–69	−2.8†	−1.1†	23.5	21.8	19.2	18.1	17.0	16.4
Aged 70–74	−3.5	−0.8	24.4	22.4	19.1	18.4	17.6	19.4
Aged 75–79	−4.0‡	−1.1	29.0	26.4	22.7	21.3	20.2	20.2
Aged 80–84	−5.0‡	−0.9	29.9	27.1	22.4	21.2	20.3	22.2
Aged 85–89	−6.6‡	−1.1	33.2	30.0	23.9	21.7	20.6	22.4
Aged ≥90	−7.5‡	−0.5	36.2	28.2	21.3	21.2	20.8	24.7
Male	−2.6†	−0.9†	22.9	21.5	19.0	18.1	17.2	16.7
Female	−4.7‡	−2.0‡	29.5	26.7	22.3	21.1	19.1	18.5
Direct HH	−2.8‡	−1.0	25.5	23.6	21.1	20.1	19.0	18.7
Supplemental HH	−4.8†	−1.9†	28.8	25.8	21.3	20.1	18.1	17.4

*All estimates significantly different than zero, $P < 0.0001$, except where noted by asterisks.
†Referent group.
‡Significantly different than referent group.
HH indicates Home Health; IPS, Interim Payment System; PPS, Prospective Payment System.

37.7 visits in October 1997, $P < 0.0001$) and responded with a significantly larger reduction in number of visits under IPS (−18.4 vs. −8.1 or −8.0, $P < 0.0001$) and during the transition to PPS (−8.8 vs. −4.2 or −2.9, $P < 0.0001$) (Table 2). By the beginning of PPS, the number of visits at for-profit, not-for-profit, and government-owned HH agencies were 31.1, 23.3, and 20.9, respectively.

The differential effects of state aid (dual-eligible patients) and age were seen for FX patients but proportionately smaller than seen for JR patients (only significantly different for patients aged >90 vs. the referent patients aged 65–70). No differential effect of gender was noted for FX patients. Partly owing to the relatively small proportion of direct HH users, although supplemental HH users experienced larger reductions in HH visits under IPS, this did not achieve statistical significance.

DISCUSSION

HH reimbursement policy has changed dramatically over the last few years. Agencies responded swiftly to the implemented changes with reductions in services. Under IPS, there was a reduction in both the selection of HH and a sharper reduction in the number of visits provided to HH users. With the transition to PPS, there was a further reduction in the number of HH visits provided from the already depressed levels seen under the IPS and r-IPS.

It is difficult to tell if these changes reflect a reduction in inefficient services (as Medicare intended) or a reduction in services needed by patients. Murtaugh and colleagues reported that the majority of reductions in HH visits were at the expense of HH aide rather than physical therapy visits.[4]

Reports on the clinical outcomes from other authors are mixed. McCall and colleagues reported an increase in mortality for FX patients after IPS.[9] In a separate report, it was concluded that there was no change in satisfaction after IPS[22] among a sample of all HH users. Finally, with the exception of a few categories, overall, no deterioration in functional outcomes after PPS was seen among a sample of all HH users.[12]

Although there was a reduction in the proportion of patients selected for HH care, for the conditions studied, there was no evidence that differential access to HH care was reduced for more vulnerable patients. Confirming the findings of other authors, there were significantly larger reductions in the number of visits at for-profit HH agencies[8] and for dual-eligible patients,[23] older patients and female patients.[24]

Implementation of other concurrent Medicare or regulatory policies potentially limits the interpretation of these findings (see Appendix Table A2). The large sample size allowed us to analyze month-to-month changes, demonstrating tight correlation between HH payment policy implementation and change in utilization. Although we only briefly described changes observed in RH and SNF markets, none of the SNF/RH changes observed for these conditions correlate well with the HH policy implementation dates.

TABLE 2. Adjusted Mean Number of Visits and Mean Change in Number of Visits (per 120-d episode) by Institutional and Patient Characteristics After Surgical Repair of Hip Fracture

	Adjusted Change in Number of Visits*		Adjusted Mean Number of Visits					
	Under IPS	Transition to PPS	3/96	10/97	10/98	5/00	10/00	8/01
All HH patients	−11.2	−5.6	47.8	42.9	32.7	31.8	26.2	25.6
At profit HH	−18.4‡	−8.8‡	65.2	57.2	40.3	39.9	31.1	29.6
At nonprofit	−8.1†	−4.2†	39.5	36.4	29.0	27.5	23.3	23.2
At government	−8.0‡	−2.9‡	37.7	33.6	26.1	23.7	20.9	20.6
Not eligible for Medicaid	−10.7†	−5.4†	47.3	42.6	32.7	31.9	26.5	25.8
Dual-eligible	−14.1‡	−6.9	51.1	45.1	32.2	31.6	24.7	24.0
Aged <65	−10.4	−6.8	39.5	36.2	26.5	24.0	22.6	17.9
Aged 65–69	−9.0†	−5.4†	39.7	36.2	27.9	27.8	26.5	22.3
Aged 70–74	−8.9	−5.9	42.1	38.7	30.5	29.6	28.2	20.6
Aged 75–79	−10.1	−5.7	45.7	41.1	31.8	31.1	29.7	24.4
Aged 80–84	−11.3	−5.7	48.3	43.7	33.3	32.4	31.0	25.5
Aged 85–89	−12.2	−5.5	51.2	45.2	33.9	33.0	31.6	28.4
Aged ≥90	−13.8‡	−5.3	54.0	48.0	35.3	34.9	33.5	31.4
Male	−11.1†	−5.4†	47.0	43.0	32.8	31.6	26.2	25.7
Female	−11.2	−5.6	48.0	42.9	32.6	31.9	26.3	25.6
Direct HH	−7.4	−4.8	44.1	38.8	32.0	31.6	26.4	25.4
Supplemental HH	−11.8†	−5.7†	48.7	43.7	32.8	31.9	26.2	25.6

*All estimates significantly different than zero, $P < 0.0001$.
†Referent group.
‡Significantly different than referent group.
HH indicates Home Health; IPS, Interim Payment System; PPS, Prospective Payment System.

These findings could be biased by changes in patient mix arising from secular trends, closure of HH agencies, or increases in the proportion of HH patients first receiving SNF/RH care. However, there were few meaningful changes over the years in the measured patient sociodemographic, clinical, or regional covariates for the overall JR or FX cohorts or either of the conditional HH user cohorts.

The proportion of patients receiving supplemental HH rather than direct HH care increases with SNF/RH trends through June 1998. Although supplemental HH patients tend to be older (75 vs. 72 years of age) and more likely female (75% vs. 57%), there was little change in the final mix of observed patient characteristics among conditional HH users. Although multivariate analyses did control for these observed changes, bias (among HH users) could still exist if interim use of SNF/RH was positively associated with unmeasured characteristics (eg, less social support). So long as the proposed unmeasured characteristics were associated with more HH visits, the bias would underestimate the observed reductions after implementation of the HH policies. It is likely this potential bias would be small because the number of HH visits stratified by category of HH user did not show large differences in response to policy implementation.

Finally, caution should be used extrapolating these findings to other groups of HH patients.

CONCLUSIONS

The IPS effectively reduced utilization of HH care. Although there was reduction in the proportion of patients selected for HH care, for the conditions studied, there was no evidence that differential access to HH care. Among HH users, there were sharp reductions in number of visits with larger reductions for more vulnerable patients.

The month-to-month analyses reveal that agencies responded swiftly to the policies.

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