Initial Home Health Outcomes under Prospective Payment

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Objective. To assess initial changes in home health patient outcomes under Medicare's home health Prospective Payment System (PPS), implemented by the Centers for Medicare and Medicaid Services (CMS) in October 2000.

Data Sources/Study Setting. Pre-PPS and early PPS data were obtained from CMS Outcome and Assessment Information Set (OASIS) and Medicare claims files.

Study Design. Regression analysis was applied to national random samples ($n = 164,810$) to estimate pre-PPS/PPS outcome and visit-per-episode changes.

Data Collection/Extraction Methods. Outcome episodes were constructed from OASIS data and linked with Medicare claims data on visits.

Principal Findings. Outcome changes (risk adjusted) were mixed and generally modest. Favorable changes included higher improvement rates under PPS for functioning and dyspnea, higher community discharge rates, and lower hospitalization and emergent care rates. Most stabilization (nonworsening) outcome rates also increased. However, improvement rates were lower under PPS for wounds, incontinence, and cognitive and emotional/behavioral outcomes. Total visits per episode (case-mix adjusted) declined 16.6 percent although therapy visits increased by 8.4 percent.

Conclusions. The outcome and visit results suggest improved system efficiency under PPS (fewer visits, similar outcomes). However, declines in several improvement rates merit ongoing monitoring, as do subsequent (posthome health) hospitalization and emergent care use. Since only the early PPS period was examined, longer-term analyses are needed.

Key Words. Medicare home health care, prospective payment, patient outcomes

The Prospective Payment System (PPS) for Medicare home health services was implemented in October 2000. The PPS replaced the Interim Payment System (IPS), which was implemented in 1997 as part of the Balanced Budget Act of 1997 (BBA). The IPS placed stringent limits on the Medicare cost-based reimbursement system then in effect. Both IPS and PPS were intended to constrain Medicare home health expenditures, which had increased rapidly in the preceding decade (from \$2 billion to over \$17 billion between 1988 and 1997 [MedPAC 1998]). IPS was associated with dramatic expenditure and visit reductions between 1997 and 1999. Medicare expenditures declined 53 percent to \$7.9 billion (CMS 2003), still comprising about 5 percent of total Medicare expenditures. Two recent articles estimate that home health visits per user declined by about 40 percent (Komisar 2002; McCall et al. 2003).

Whether the reduction in visits per user under IPS affected patient outcomes is uncertain. McCall et al. (2002) found mixed results based on selected utilization measures derived from Medicare claims data as proxy outcome indicators. Based on multivariate analyses for fiscal years 1997 and 1999, in the 120 day period after home health admission, hospital admissions decreased while skilled nursing facility admissions, emergency room use, and mortality increased. Although the study authors urge caution in attributing the changes to IPS, it is possible that the stringency of IPS resulted in a decline in patient outcomes.

The PPS encouraged further visit reductions. Under PPS, a prospectively determined per-episode payment rate is case-mix adjusted using 80 mutually exclusive Home Health Resource Groups (HHRGs). Each Medicare episode is classified into an HHRG using a subset of items from the Outcome and Assessment Information Set (OASIS), which has been collected by all Medicare-certified home health agencies since mid-1999 (HCFA 1999a). The PPS creates strong financial incentives to minimize service provision because per-episode payments do not vary according to the quantity or mix of services provided. A study by the U.S. General Accounting Office (USGAO 2002) found that average visits per episode declined by 24 percent (29–22 visits) from just prior to PPS to the first half of 2001. The reduction in visits per episode under PPS compounded the already substantial decline under IPS and raises the possibility of poorer outcomes under PPS. Alternatively, if PPS outcome changes are minimal, then the visit reductions may represent a gain in the overall efficiency and cost-effectiveness of home health care. The OASIS data provide uniform, standardized outcome measures to test these possibilities. (The late-IPS period must be used as the baseline, since national OASIS data were not collected earlier.)

METHODS AND DATA

The objective of this analysis was to determine the changes in outcomes between the pre-PPS (1999–2000) and initial PPS (2001) periods, focusing on

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home health-care episodes of Medicare beneficiaries aged 65 years and over (the main Medicare group to which per-episode PPS payments apply or would apply in the case of pre-PPS episodes). Changes in visits per episode also were analyzed, both to check the above-mentioned GAO finding of fewer visits under PPS and to obtain a preliminary indication of possible changes in the system-level efficiency of Medicare home health care provision under PPS by examining visit and outcome changes for the same samples. The analyses compared random samples of Medicare home health care episodes for the two periods. In order to assess the impact of PPS based on measurement yardsticks that are in current use, we employed the outcome measures and risk factors adopted by CMS for reports to agencies and public reporting.

Outcome Measures and Risk Factors

The OASIS was designed to provide a uniform set of data items for patient-level outcome measurement and risk adjustment. Outcome measures and associated outcome reports are key components of the outcome-based quality improvement (OBQI) approach developed to facilitate continuous quality improvement in home health care (Shaughnessy et al. 1994, 1997, 2002), and 38 end-result outcomes and three utilization outcomes derived from OASIS have been included in outcome reports provided since February 2002 by CMS (<http://www.cms.hhs.gov/oasis/>) to all Medicare-certified home health agencies. (The outcomes are listed later in Table 3.)

A patient end-result outcome is defined as a change in health status between home health start of care (SOC) (admission or readmission) and discharge, with health status covering functional, physiologic, cognitive, and emotional/behavioral dimensions. The health status changes are measured by dichotomous improvement and stabilization indicators. A patient improves when the scale value for the health attribute under consideration shows that the patient is less disabled or dependent at discharge than at SOC. If the patient is at the most independent or “healthiest” extreme of the scale at SOC, it is impossible to improve, and therefore the measure is not defined for such patients. A patient stabilizes when the scale value for the health attribute under consideration shows nonworsening in patient condition (i.e., improvement or no change). If the patient is not able to worsen according to the scale (i.e., is at the most dependent or “sickest” extreme of the scale at SOC), then the measure is not computed. The exclusions for improvement and stabilization measurement typically result in a different sample size for each outcome. End-result outcomes exclude patients transferred or discharged to an inpatient facility

(usually hospitalization), since OASIS data for improvement and stabilization measures are not collected for such patients.

The three utilization outcomes of acute care hospitalization, discharge to the community, and emergent care serve as additional proxy measures of patient health status changes. The hospitalization and discharge rates (percentages) typically account for over 95 percent of all episodes. Admissions to nursing and rehabilitation facilities and patients moving to other geographic areas account for most of the rest. Patients who die while receiving home health care are excluded from the outcome measures in the CMS reporting system.

The variables used as patient risk factors in the outcome models also are derived from OASIS data for the SOC. Most of the OASIS items are used in one or more risk models to derive predicted outcome rates for the CMS outcome reports. For each outcome, 20–40 risk factors are typically included in CMS models to estimate predicted outcome rates. Risk factors include patient demographics, functional status, prognoses, and diagnoses. Table 1 lists the 37 risk factors included in the CMS risk model for improvement in ambulation/locomotion. All estimated risk models can be found at the website noted in the table. In general, the models are similar to the example in Table 1 in terms of the number and type of risk factors.

Visit Measures and HHRGs

Medicare claims data provide information on visits by discipline and date of service for the six Medicare-covered home health disciplines of skilled nursing, physical therapy, occupational therapy, speech/language pathology, medical social services, and aide services. We used four measures of visits per episode: total, skilled nursing, therapy, and aide. The therapy measure combines physical therapy, occupational therapy, and speech/language pathology visits. We excluded medical social services from the discipline-specific measures because they represent a small proportion of total visits. (They are, however, included in total visits.)

We used the PPS HHRGs to control for patient case mix in the visit analyses. Although the OASIS was created primarily for outcome measurement and risk adjustment, a subset of OASIS items also is used to define the HHRGs to adjust PPS payment for case mix (Goldberg et al. 1999; HCFA 1999b, 2000). Each HHRG is comprised of three domains or dimensions—clinical, functional, and service. Each dimension has several levels; point scores are associated with specific OASIS item responses, and the points are summed to determine the patient's level for the dimension.

Table 1: Risk Factors for Improvement in Ambulation/Locomotion*

<i>Risk Factor</i>
Inpatient discharge from hospital (0–1) [†]
Medical regimen change in past 14 days (0–1)
Urinary catheter prior to past 2 weeks (0–1)
Moderate or better recovery prognosis (0–1)
Good functional status rehabilitation prognosis (0–1)
Obesity at SOC (0–1)
Age (in years)
Gender: female (0–1)
Patient lives in own home (0–1)
Patient lives with family member (0–1)
Patient has unpaid live-in help (0–1)
Vision impairment (0–2) [†]
Speech/language impairment (0–5)
Stage of most problematic pressure ulcer (0–4) [†]
Stasis ulcer(s) present (0–1) [‡]
Number of surgical wounds present (0–4) [‡]
Urinary incontinence severity 1 (0–4) [†]
Urinary tract infection (0–1)
Bowel incontinence frequency (0–5) [†]
Disability in bathing (0–5) [†]
Disability in transferring (0–5) [†]
Disability in ambulation (0–5) [†]
Disability in transportation (0–2)
Disability in telephone use (0–5)
Prior (2 weeks ago) disability in ambulation (0–5)
Acute condition: orthopedic (0–1) [‡]
Acute condition: open wound/lesion (0–1) [‡]
Acute condition: terminal (0–1)
Acute condition: diabetes mellitus (0–1) [‡]
Acute condition: oxygen therapy (0–1)
Acute condition: IV/infusion therapy (0–1) [†]
Chronic condition: eating disability (0–1)
Diagnosis: blood diseases (0–1)
Diagnosis: nervous system disorder (0–1)
Diagnosis: skin/subcutaneous diseases (0–1)
Diagnosis: musculoskeletal system diseases (0–1) [‡]
Length of stay: more than 31 days (0–1)

*The risk models currently used by CMS can be found on the website: <http://www.cms.hhs.gov/OASIS/riskadj1appa.pdf>.

[†]Identical OASIS item used for HHRG determination (nine items in this model).

[‡]Related OASIS item used for HHRG determination (six items in this model). For example, the status of stasis ulcers and surgical wounds is used for HHRG determination, while the presence of a stasis ulcer and the number of surgical wounds are used in this risk model.

SOC = start of care; OASIS = outcome and assessment information set; HHRG = home health resource group; IV = intravenous.

The clinical dimension is based on factors including selected diagnoses, sensory impairments, dyspnea, pressure ulcers, incontinence, and behavioral problems. The functional domain is based on six activities of daily living (ADLs)—dressing upper/lower body (two ADLs), bathing, toileting, transferring, and ambulation/locomotion. The service dimension is not based directly on patient characteristics but on (a) the patient's institutional setting in the 2-week period prior to start of the home health episode (i.e., hospital, rehabilitation facility, or skilled nursing facility) and (b) the amount of therapy received (physical, occupational, or speech/language pathology) during the 60-day home health PPS payment episode. A patient receiving 10 or more therapy visits during a payment episode is categorized into a high-therapy HHRG. The service measures are intended as proxy indicators of patient case mix and need for services.

The four clinical, five functional, and four service levels are denoted, respectively, C0...C3, F0...F4, and S0...S3 (higher numbered levels indicate more serious or complex conditions). Eighty HHRGs are formed by taking all combinations of one level from each dimension (e.g., C0-F2-S3). For the PPS episodes, we used the HHRG classification determined by CMS, adjusting the service classification, if necessary, based on actual therapy visits from the claims data. Since HHRG classifications were not available in pre-PPS OASIS or claims data, we estimated a predicted HHRG for each pre-PPS episode using the SOC OASIS data and (to determine the service level) the actual number of therapy visits during the subsequent 60 days.

Hypotheses and Statistical Methods

For each outcome, the null hypothesis was of no change between the pre-PPS and PPS periods. The alternative hypothesis was a change in either direction. Although fewer visits under PPS would suggest less favorable outcomes as the more likely alternative hypothesis, more favorable outcomes may result if agencies successfully alter their care practices to compensate for fewer visits. Another possibility is that agencies may reduce visits and concentrate on maintaining (rather than improving) the patient's health status. In such circumstances, stabilization rates may increase and improvement rates may decline, particularly for chronic conditions and cognitive/emotional/behavioral problems, which require considerable care to achieve improvement.

Our estimates of PPS outcome changes are based on the logistic regression models used by CMS to estimate predicted patient-level outcomes for the agency outcome reports. For most outcomes, we re-estimated each model

using the CMS risk factors plus a PPS dichotomy. (Using only a dichotomy to capture the effect of PPS assumes that the relationship between each risk factor and the outcome is the same in each period. This assumption should be tested in future work.) Two modifications to this approach were necessary. First, for six outcomes, the CMS risk models are stratified according to the SOC value of the OASIS item for the outcome (e.g., SOC level of transferring for the outcome of improved in transferring). For each such outcome, we re-estimated the model for each stratum and also estimated a pooled model including all risk factors that appear in any of the stratum models. Second, several outcomes are not yet risk adjusted in the CMS outcome reports. For those outcomes, we present unadjusted pre-PPS/PPS changes and associated two-sample tests of mean differences.

Our analyses of visit changes used ordinary least squares regression. The dependent variables were untransformed visits per episode, in total and by discipline. (We also used log-transformed visit variables, with similar results.) Because the HHRGs were developed to take into account differences in patient case mix that affect the utilization of services, the case-mix variables in our visit regressions were dichotomies to represent the levels of each HHRG dimension. (The same approach was used by Goldberg et al. [1999], to derive the HHRG case-mix weights for PPS payment.) However, since the number of therapy visits is largely under home health agency control, the service designation (S-level) based on therapy visits may be less a reflection of case mix than the result of agency policies and practices. Therefore, the split into high- and low-therapy categories was not included as a case-mix variable in the visit analyses.

Some OASIS items are used both to determine the HHRG for payment and as risk factors in the CMS outcome models. Since financial incentives may influence how HHRG-related OASIS items are reported by agencies (although the extent of any such “gaming” is unknown), a strength of the CMS outcome models is that they include as risk factors a considerable number of OASIS items beyond those used for HHRG determination. The variables shown in Table 1 for improvement in ambulation/locomotion are illustrative. Of the 37 risk factors, only nine are used for HHRG determination and six more are related to items used for HHRGs. The remaining 22 risk factors are not used in determining payment.

Sample and Data Sources

We selected a random sample of episodes for each period in order to compare representative pre-PPS to PPS outcomes. The pre-PPS sample covers episodes

beginning during October–December 1999 and ending prior to April 1, 2000. This time period allowed for the initial data inaccuracies in OASIS collection and transmission by home health agencies to have been overcome. It also occurred sufficiently before the start of PPS to minimize anticipatory practice changes that agencies may have undertaken in advance of PPS. The PPS sample covers the entire calendar year 2001. To check for possible seasonal variations that might affect the comparability of the two time periods, comparisons of the OASIS data for each calendar quarter in 2001 were made and no major differences were found.

Data on outcomes, risk factors, visits, and HHRGs were derived from OASIS information in the CMS national OASIS repository and Medicare claims data. The analysis focused on the impact of PPS on “mainstream” Medicare patients (i.e., age 65 years and older) receiving home health care under per-episode PPS payment. This required several exclusions from the universe of episodes. OASIS data on Medicare home health patients age 65 and older were randomly sampled from the CMS national OASIS repository. Several million OASIS assessments are included in the repository for each year. We initially sampled about 270,000 outcome episodes for the pre-PPS period and 50,000 episodes for the 2001 PPS period. (A larger pre-PPS sample was selected to meet analysis needs beyond those covered in this article.) Managed care patients were excluded because they do not come under PPS payment. Patients who died while in home health care and nonresponsive patients also were excluded, because such patients are not included in the CMS outcome reports. The outcome episodes from the OASIS data were then matched with Medicare claims data. Not all episodes could be matched because of inconsistencies in Medicare numbers and, for the pre-PPS period, a lack of precise service dates in the claims data. The match rates were 84 percent pre-PPS and 93 percent PPS. To check for possible biases resulting from the lower match rate for the pre-PPS period, we compared case mix between the matched and unmatched pre-PPS episodes (based on OASIS data) and found only minimal differences.

About 20 percent of the matched episodes had four or fewer visits; they were removed because such episodes are paid on a per-visit rather than a per-episode basis under PPS. We removed about the same number to deal with differences between the CMS outcome and payment episode definitions. Outcome episodes begin at start or resumption of care and end at discharge or admission to an inpatient facility, while payment episodes cover 60 days after SOC. Thus, a patient who, during the 60-day period after beginning home

health care, is hospitalized and then resumes home health care will have one payment episode but two outcome episodes for the period. (The second outcome episode possibly will continue into a second payment episode.) Further, an outcome episode can extend beyond 60 days and thereby apply to two payment episodes. (The outcome episode may end before the second payment episode does.)

We used the outcome episode as the unit of analysis and removed outcome episodes longer than 60 days and episodes beginning with a resumption of care rather than a SOC assessment—longer episodes because the HHRG can change for the subsequent payment period, and resumptions of care because the HHRG calculated from resumption of care OASIS information may not be the HHRG derived at SOC on which payment is based. (We conducted supplemental analyses including the two removed groups and the results were similar to those reported here.) The final analysis sample included 164,810 episodes (136,004 pre-PPS and 28,806 PPS episodes).

RESULTS

HHRG and Visit Changes

Table 2 shows the pre-PPS and PPS changes in the HHRG distribution and visits per episode. The table indicates a shift toward the higher levels of each dimension in the PPS period (i.e., toward more clinically complex and functionally dependent patients, with greater needs for therapy services). Such changes may indicate that providers responded to PPS by increasing the proportion of Medicare patients in the higher payment HHRGs. Such shifts also could result from more accurate reporting by agencies or from deliberate manipulation (i.e., “gaming”) of the data to obtain higher per-episode payments. As suggested earlier, this finding heightens the importance of including risk factors beyond those used for HHRGs in the outcome models.

The visit per episode reductions are consistent with the GAO findings noted earlier. With adjustment for the shift in the HHRG distribution, total visits per episode were 16.6 percent lower in the PPS compared with the pre-PPS period (based on outcome, not payment, episodes). However, visit changes varied by discipline. The largest reduction (44.9 percent) occurred for aide visits, while therapy visits actually increased (8.4 percent), consistent with PPS financial incentives resulting from higher payment for patients in the high-therapy categories.

Table 2: Pre-PPS and PPS HHRG Distributions and Visits per Episode

<i>HHRG Distributions</i>					
<i>Dimension Level</i>	<i>Percent^a</i>		<i>Visits per Episode</i>		
	<i>Pre-PPS</i>	<i>PPS</i>	<i>Visits</i>	<i>Pre-PPS</i>	<i>PPS</i>
<i>Clinical</i>			Total [†]	18.33	16.08
C0 (Min)	33.0	23.8	Skilled Nursing	8.96	7.30
C1 (Low)	36.1	36.5	Therapy [‡]	5.35	6.23
C2 (Mod)	26.6	33.6	Aide	3.76	2.34
C3 (High)	4.2	6.1			
<i>Functional</i>			<i>Visit Differences</i>	<i>Unadjusted[§]</i>	<i>HHRG Adjusted[§]</i>
F0 (Min)	9.0	6.0	Total [†]	− 2.25	− 3.05
F1 (Low)	28.5	25.3	Skilled Nursing	− 1.66	− 1.76
F2 (Mod)	46.1	51.6	Therapy [‡]	0.88	0.45
F3 (High)	10.3	11.2	Aide	− 1.42	− 1.69
F4 (Max)	6.1	5.9			
<i>Service</i>			<i>Percentage Differences</i>		
S0 (Min)	69.6	61.3	Total [†]	− 12.3	− 16.6
S1 (Low)	8.2	8.8	Skilled Nursing	− 18.5	− 19.6
S2 (Mod)	16.5	21.2	Therapy [‡]	16.4	8.4
S3 (High)	5.7	8.6	Aide	− 37.8	− 44.9

*The percentages for the levels of each dimension (e.g., C0, . . . , C3) sum to 100% except for rounding.

[†]Total visits include the disciplines listed plus medical social services.

[‡]Therapy includes physical therapy, occupational therapy, and speech/language pathology.

[§]All differences are significant at $p < .001$.

PPS = prospective payment system; HHRG = home health resource group.

Outcome Changes

Table 3 presents pre-PPS/PPS outcome comparisons. Within each group of end-result outcomes, improvement and then stabilization measures are presented. In the PPS period, unadjusted improvement rates (second column) range from 34.59 percent for ambulation/locomotion to 87.46 percent for urinary tract infection. All but two of the 26 improvement rates are below 70 percent, suggesting potential opportunities for outcome enhancement. All stabilization rates (indicating nonworsening) are greater than 80 percent; however, the relatively small proportions of patients who do worsen are definitely important from a care perspective. (In some instances, of course, a decline in health status is inevitable.)

Overall, most outcome rate changes between the two periods are relatively small (based on either the unadjusted or adjusted PPS rates), although even a small change in percentage rates translates into a large number of

Table 3: Pre-PPS and PPS Home Health Patient Outcomes

Outcome	Outcome Rates			PPS Odds Ratios	
	Pre-PPS (%)	PPS (%)	Adjusted PPS (%)	Unadjusted	Adjusted
End-result outcomes					
<i>ADLs</i>					
Improved in:					
Grooming	64.79	64.34	68.26	0.981	1.169***
Dressing upper body [†]	64.08	64.38	67.19	1.013	1.148***
Dressing lower body	63.49	63.91	66.02	1.019	1.117***
Bathing [†]	59.55	58.95	60.38	0.976	1.035
Toileting [†]	62.42	63.22	64.61	1.035	1.099**
Transferring [†]	55.78	51.78	53.25 [‡]	0.851***	0.903***
Ambulation/locomotion [†]	34.56	34.59	36.48	1.002	1.088***
Eating	57.66	56.16	55.48	0.941*	0.915**
Stabilized in:					
Grooming	92.97	93.92	94.99	1.167***	1.435***
Bathing [†]	89.43	91.11	90.89	1.211***	1.179***
Transferring	93.21	94.43	93.97 [‡]	1.234***	1.134***
<i>IADLs</i>					
Improved in:					
Light meal preparation	55.22	55.06	55.25	0.993	1.001
Laundry	40.26	38.96	39.62	0.947***	0.974
Housekeeping	46.55	45.95	46.55	0.976	1.000
Shopping	48.61	48.79	50.64	1.007	1.085***
Telephone use	50.43	47.03	48.11	0.873***	0.911**
Management of oral medications [†]	36.85	36.19	37.79	0.972	1.041
Stabilized in:					
Light meal preparation	90.33	90.79	90.83	1.055	1.060
Laundry	82.64	83.24	82.67	1.043	1.002
Housekeeping	81.43	83.13	83.87 [‡]	1.123***	1.186***
Shopping	87.46	89.78	89.86	1.259***	1.270***
Telephone use	92.38	92.58	93.27	1.029	1.143***
Management of oral medications	90.97	91.60	-- [§]	1.083**	--
<i>Physiologic</i>					
Improved in:					
Speech or language	44.14	43.36	--	0.969	--
Pain interfering with activity [†]	58.38	57.73	--	0.974	--
Number of surgical wounds	73.59	63.77	--	0.632***	--
Status of surgical wounds	83.37	78.88	--	0.745***	--
Dyspnea	53.30	55.02	54.24 [‡]	1.072***	1.039
Urinary tract infection	86.06	87.46 [¶]	87.70	1.130	1.155
Urinary incontinence	55.32	51.36	51.09 [‡]	0.853***	0.844***
Bowel incontinence	61.97	61.92 [¶]	62.37	0.998	1.017
Stabilized in:					
Speech or language	90.33	91.21	--	1.111***	--

continued

Table 3: Continued

Outcome	Outcome Rates			PPS Odds Ratios	
	Pre-PPS (%)	PPS (%)	Adjusted PPS (%)	Unadjusted	Adjusted
<i>Cognitive and Emotional/Behavioral</i>					
Improved in:					
Cognitive functioning	44.90	42.67	--	0.913***	--
Confusion frequency [†]	43.47	41.54	41.67 [‡]	0.924***	0.929**
Anxiety level	54.25	52.33	--	0.926**	--
Behavioral problem frequency	65.79	61.91 [¶]	--	0.845**	--
Stabilized in:					
Cognitive functioning	89.72	90.55	--	1.097***	--
Anxiety level	86.65	87.75	--	1.104***	--
Utilization outcomes					
Acute care hospitalization [†]	21.09	17.11	15.57	0.772***	0.690***
Discharge to community	75.15	79.76	81.72	1.303***	1.478***
Emergent care [†]	18.11	14.35	13.55	0.758***	0.709***

* $p < .05$,** $p < .01$,*** $p < .001$ for the PPS coefficient in the underlying logistic regression. (The 95% confidence interval will not include 1.000 if $p < .05$.)[†]Indicates an outcome that began to be publicly reported in 2003 (see Discussion section).[‡]Indicates an outcome for which the adjusted PPS rate is based on the pooled variant of the stratified CMS model.[§]Dashed lines ("--") indicate an outcome that is not risk adjusted.[¶]Indicates an outcome rate based on fewer than 5,000 episodes (minimum = 1,854 for PPS improved in behavioral problem frequency).

PPS = prospective payment system; ADL = activities of daily living; IADL = instrumental activities of daily living; CMS = Centers for Medicare and Medicaid Services.

patient episodes nationwide. The majority of outcomes relate to functional status as measured by ADLs and instrumental activities of daily living (IADLs). All but one of these measures are risk adjusted, and the adjusted ADL and IADL outcome rates and odds ratios are in most cases higher than their unadjusted counterparts (consistent with the shift toward greater functional dependency in the PPS period suggested in Table 2). All (adjusted) ADL changes are statistically significant except for improvement in bathing, which is close to significance ($p = .0502$), and all but two ADL improvement and stabilization rates are higher in the PPS period. (The exceptions are significant reductions for improvement in transferring and eating.) The pattern is weaker for IADLs. Most (four of six) adjusted IADL improvement rates are not statistically significant, and the two that are—shopping and telephone use—

move in opposite directions. The four significant IADL stabilization rates (using the unadjusted change for management of oral medications) are higher under PPS and the other two are not significant. Overall, for the ADLs and IADLs, most PPS outcome rates are higher than or not significantly different from the pre-PPS rates. An interesting question that this suggests for possible future study is whether the better functional outcomes are owing at least in part to the greater amount of physical therapy provided under PPS.

The changes for physiologic, cognitive, and emotional/behavioral outcomes are less favorable. Although CMS risk models have not been established for 10 of these outcomes, the unadjusted and adjusted odds ratios are very similar for the five with risk models. This suggests that unadjusted outcome rates present a reasonable initial approximation of changes under PPS. For this group of outcomes, the three (unadjusted) stabilization rates all are statistically significant and higher under PPS, but all improvement rates but one are either lower or not significantly different from the pre-PPS rates. The greatest reductions are for the two surgical wound measures, urinary incontinence, and behavioral problem frequency. The change for dyspnea may be positive; the unadjusted odds ratio is significant and the adjusted odds ratio is close to significance ($p = .055$, see Table 4). However, findings for the stratified dyspnea models, discussed below, suggest that this result may pertain to only a minority of dyspnea cases.

The drop in the surgical wound improvement rates may be because of data-quality problems, since providers have had difficulty understanding the wound-related OASIS items. Alternatively, the change may be because of more accurate reporting under PPS. Since the wound item affects the HHRG classification and payment amount, the importance of accurate reporting on wounds increased substantially after PPS implementation. The lower improvement rates under PPS for urinary incontinence and all four cognitive and emotional/behavioral improvement measures may point to areas warranting increased quality improvement attention, particularly since those improvement rates were not high in the pre-PPS period (43–66 percent).

The three utilization outcomes shown at the bottom of Table 3 are, as noted above, proxy measures for possible changes in health status not captured by the preceding measures. Under PPS, hospitalization and emergent care rates decreased while the community discharge rate increased. These findings suggest positive changes under PPS and are counter to the hypothesis that fewer visits are likely to lead to more hospitalizations and emergent care. However, it will be important in the future to verify the hospitalization and emergent care results derived from OASIS data against claims data. (We were

Table 4: Results for Stratified Models

Outcome and Model	Sample Size	PPS	
		Odds Ratio	Significance
Improved in transferring			
Stratified models			
Level 1	63,358	0.892	< .001
Level 2	8,021	1.142	.060
Levels 3–5	4,402	0.843	.056
Pooled model	75,781	0.903	< .001
Stabilized in transferring			
Stratified models			
Level 0	52,910	0.883	.002
Level 1	63,358	1.566	< .001
Levels 2–4	11,031	1.631	< .001
Pooled Model	127,299	1.134	< .001
Stabilized in housekeeping			
Stratified models			
Levels 0, 1	32,965	1.189	< .001
Level 2	7,884	1.075	.393
Level 3	25,260	1.152	.006
Pooled Model	66,109	1.186	< .001
Improved in dyspnea			
Stratified models			
Level 1	36,358	1.100	.001
Level 2	25,565	0.963	.257
Level 3	14,107	0.949	.280
Level 4	2,823	0.989	.920
Pooled model	78,853	1.039	.055
Improved in urinary incontinence			
Stratified models			
Level 1	8,183	0.852	.005
Level 2	2,337	0.732	.003
Level 3	17,597	0.842	< .001
Level 4	3,578	0.957	.652
Pooled model	31,695	0.844	< .001
Improved in confusion frequency			
Stratified models			
Level 1	30,802	0.940	.043
Level 2	1,959	0.912	.461
Level 3	9,643	0.924	.155
Level 4	3,175	0.915	.366
Pooled model	45,579	0.929	.004

PPS = prospective payment system.

not able to explore this question because the claims data used for this study pertained only to home health use.) In addition, subsequent Medicare service use (in particular, hospital and skilled nursing facilities use) by home health patients discharged to the community should be compared with the pre-PPS period to determine whether the posthome health use of such services increased.

As noted earlier, six CMS outcome models are stratified, and the PPS coefficients for pooled versions of those models are presented in Table 3. For comparison, Table 4 provides both the pooled and stratified PPS coefficients. (In the table, higher baseline levels indicate greater dependency or severity at SOC.) For three of the outcomes (improved in urinary incontinence and confusion frequency and stabilized in housekeeping), the PPS effects measured by the odds ratios are in the same direction for the pooled model and each stratified model. In contrast, the other three outcomes show mixed results by stratum.

For improved in transferring, the odds ratios for the pooled model and all levels except level 2 are less than one (and the odds ratios for the higher levels are marginally significant). The pooled model result thus reflects the situation for the majority of episodes, as shown by the sample sizes. For stabilized in transferring, the pooled model results also reflect the situation for the majority of episodes (with odds ratios greater than one), although a substantial minority at the least dependent level at SOC (level 0) have a greater likelihood of worsening in the PPS period. For dyspnea, the PPS result is significant only for the lowest initial severity (level 1) and indicates a greater likelihood of improvement under PPS. The odds ratios for the other levels are all less than one but not statistically significant. The pooled model odds ratio is greater than one and, as noted above, close to significance at $p = .055$. The more favorable outcome under PPS suggested by the pooled dyspnea model thus appears to pertain to the minority (46 percent) of episodes at the lowest baseline severity level.

Although differences exist between some of the stratified and pooled results, the pooled results generally reflect the PPS impacts for either all or most episodes. Dyspnea is the exception; the higher improvement rate under PPS suggested by the pooled model reflects the situation of the minority of episodes at the least severe baseline dyspnea level. Such differential findings suggest that analyzing more outcomes by strata may provide information useful for targeting quality improvement programs on specific SOC severity levels.

DISCUSSION

The generally small changes in outcomes associated with visit reductions suggest a possible gain in system-level cost effectiveness during the first year under PPS (i.e., similar outcomes, lower cost). However, underlying this overall result are varied results across outcomes. The changes for functional measures, particularly improvement in ADLs, are positive. Additional positive findings are the utilization outcome changes, particularly the lower

hospitalization rates. However, as mentioned above, subsequent hospitalization and other service use after the home health episode should be examined.

In contrast to the positive changes, the reductions in improvement rates for urinary incontinence and all four cognitive and emotional/behavioral outcomes suggest the possibility that patients with these typically chronic care problems may be more negatively affected by PPS than other patients. Analyses of changes for specific diagnoses could shed light on whether outcome effects under PPS differ by condition, with possibly more negative consequences for chronic care patients. The association between higher improvement rates for ADLs under PPS and more therapy visits should also be further explored.

The outcomes analyzed in this study are those used in the current national outcome reporting system. Additional outcome measures should be developed and analyzed, including aggregate outcomes combining the individual measures currently in outcome reports, variants based on the degree of change (rather than the current dichotomies), and measures using additional information from the OASIS items. Future outcome analyses should also explore the inclusion of risk factors beyond those in the current CMS models.

This analysis pertains to the first few years of OASIS data collection and the first calendar year under PPS. Since data inaccuracies are likely to be more prevalent in new than in mature systems, later time periods should also be studied. In addition, recently introduced quality improvement initiatives such as the OBQI approach are intended to encourage outcome enhancement efforts by home health agencies. The provision of outcome reports to home health agencies by CMS began in 2002 and represents the initial step in the OBQI process. Nationwide training efforts organized and funded by CMS have concentrated on how agencies can use outcome reports to improve care and patient outcomes. Also, public reporting of 11 outcomes began for eight states in May 2003, and was implemented nationally in late 2003 (<http://www.medicare.gov/HHCompare>). The publicly reported outcomes are a subset of those included in agency outcome reports (see Table 3), and are likely to receive particular attention from agencies as they implement OBQI. Future analyses should assess these and other developments as both PPS and OBQI evolve.

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