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RESEARCH ARTICLE

Effects of the Ten Percent Cap in Medicare Home Health Care on Treatment Intensity and Patient Discharge Status

Hyunjee Kim and Edward C. Norton

Objective. To estimate the effect of the 10 percent cap introduced to Medicare home health care on treatment intensity and patient discharge status.

Data Sources. Medicare Denominator, Medicare Home Health Claims, and Medicare Provider of Services Files from 2008 through 2010.

Study Design. We used agency-level variation in the proportion of outlier payments prior to the implementation of the 10 percent cap to identify how home health agencies adjusted the number of home health visits and patient discharge status under the new law.

Principal Findings. Under the 10 percent cap, agencies dramatically decreased the number of service visits. Agencies also dropped relatively healthy patients and sent sicker patients to nursing homes.

Conclusions. The drastic reduction in the number of service visits and discontinuation of relatively healthy patients from home health care suggest that the 10 percent cap improved the efficiency of home health services as intended. However, the 10 percent cap increased other types of health care expenditures by pushing sicker patients to use more expensive health services.

Key Words. Home health care, outlier payments, treatment intensity, patient discharge status

Many insurers, including Medicare and Medicaid, use outlier payments in their prospective payment system (PPS) to compensate providers when the actual costs far exceed the prospective payment rate (MedPAC 2008; OIG 2011; CMS 2014). Because outlier payments increase with the amount of services provided, however, many providers strategically adjusted their service patterns to increase outlier payments without improving patients' health status. This has contributed to surging health care expenditures (Silverman 2003; Baser et al. 2009; CMS 2009). In response, insurers have increased

monitoring of outlier payments and cut outlier payment rates (Baser et al. 2009; CMS 2009). The hope behind these efforts is that providers would eliminate inefficient services without harming the quality of care. Inconsistent with this hope, however, providers could respond by reducing treatment intensity or selectively serving profitable patients (Ellis 1998). These unintended responses could exacerbate patients' health, and the affected patients might incur greater health care costs in the long run.

This study explores how Medicare's outlier payment adjustment for home health care influenced treatment intensity and discharge status for home health patients. In 2010, Medicare home health care introduced the 10 percent per-agency cap on outlier payments. The 10 percent cap restricts total outlier payments for each home health agency to no more than 10 percent of that agency's total annual prospective payments from Medicare (CMS 2009). Notably, the level of the cap varies depending on the total annual Medicare payments for each agency. This allows important variation for identifying the effect of the 10 percent cap. That is, only agencies that had outlier payments close to or higher than 10 percent prior to 2010 would have an incentive to decrease outlier payments.

We find that the 10 percent cap dramatically decreased the treatment intensity and also affected agencies' decision on patient discharge status. However, this overall treatment effect may mask important treatment heterogeneity. That is, the effect of the 10 percent cap could be more evident among costly patients who require many visits and are likely to be eligible for outlier payments, such as those with diabetes with long-term use of insulin. Diabetic patients tend to need multiple daily injections of insulin and greatly rely on home health visits to lead independent lives (CMS 2009). Therefore, we also analyze the effects of the 10 percent cap on this subgroup.

To date, research on outlier payments has primarily focused on ones embedded to Medicare hospital PPS. Some hospitals' proportion of outlier payments was substantially high even after controlling for patients' length of stay, which suggests potential gaming of the payment system (OIG 2013). Baser et al. (2009) found that the increased scrutiny of Medicare's outlier payments for cardiac surgery decreased the proportion of procedures eligible for

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Address correspondence to Hyunjee Kim, Ph.D., Center for Health Systems Effectiveness, Oregon Health & Science University, 3181 SW, Sam Jackson Park Rd, MDY 200K, Portland, OR 97239-3098; e-mail: kihy@ohsu.edu. Edward C. Norton, Ph.D., is with the Department of Health Policy and Management and Department of Economics, University of Michigan, NBER, Ann Arbor, MI.

outlier payments. As far as we know, however, no studies have explored the effect of the outlier payment adjustments in Medicare home health care.

Background

In 2000, Medicare home health introduced the PPS. The PPS makes a fixed, risk-adjusted payment for each patient every 2-month-long episode. Home health agencies therefore end up bearing extra treatment costs beyond the fixed payment rate under the PPS. The PPS was thus expected to control rising home health expenditures, but home health expenditures continued to increase under the PPS (MedPAC 2011, 2012, 2013, 2014).

One of the primary reasons for the expenditure growth is the retrospective feature embedded in the PPS. That is, agencies get reimbursed more if they provide more visits for certain cases. Medicare added the retrospective features to the PPS because the PPS can potentially discourage agencies from treating high-cost patients whose treatment costs would most likely exceed the fixed payment rates. Thus, certain patients might struggle to receive the quantity and quality of care they need. However, many agencies took advantage of these retrospective features only to get higher payment rates. For example, the PPS reimbursed an agency $2,000 once the agency had provided 10 therapy visits each episode, providing a strong incentive for agencies to target the 10th therapy visit. The episodes that provided 10 or more visits and received extra payments increased almost twice as fast as all other episodes under the PPS (MedPAC 2011, 2012, 2013). In 2008, Medicare replaced the single threshold at the 10th therapy visit with multiple staggered thresholds to prevent agencies' targeting the 10th visit, but this new reimbursement schedule still encourages agencies to provide more therapy visits for higher reimbursement amounts (MedPAC 2012, 2013, 2014).

Agencies also exploited outlier payments of the PPS, which is the focus of our study. If a patient's episode incurs an unusually high cost and her estimated cost exceeds a threshold amount, the patient becomes eligible for outlier payments and the patient's agency receives an extra payment (i.e., outlier payment) in addition to the regular prospective payment (HCFA 2000). The outlier payment amount is set as a proportion (80 percent) of estimated cost beyond the threshold amount. (Appendix Table S1 provides information about the calculation of outlier payments.) Thus, agencies may find outlier payments attractive because the marginal benefit of one visit increases from zero to positive once their patients qualify for outlier payments. Outlier payments might encourage agencies to provide extra visits for patients whose

estimated treatment costs are high enough to make them eligible for outlier payments (HCFA 2000). Agencies might also want to increase the number of visits as much as possible for each patient eligible for outlier payments.

In fact, many agencies manipulated outlier payments. There had been a dramatic rise in outlier payments in a few counties. For example, in 2008, 52 percent of all outlier payments nationwide were made to agencies in one county, Miami-Dade in Florida, where only 2 percent of all home health patients resided. In the same year, 23 other counties exhibited similar outlier payment patterns to that of Miami-Dade County (OIG 2009; MedPAC 2010).

As a result, in 2010, Medicare implemented an agency-level cap for outlier patients, such that, in any given year, an individual agency would receive no more than 10 percent of its total home health reimbursement in outlier payments. If a claim with an outlier payment causes an agency to exceed the 10 percent cap, then Medicare would not make the outlier payment of the claim (CMS 2009).

The outlier share of total payments is calculated on a continuous basis. Medicare tracks both the total and outlier payments for each agency when each claim is processed and determines whether the 10 percent cap has been met. If the cap has been met, any outlier payments are not then paid. If subsequent payments change whether an agency has met the 10 percent cap, Medicare may then pay the unpaid outlier payments (CMS 2013).

Medicare expected that the 10 percent cap would diminish agencies' incentives to provide unnecessary service visits. However, the 10 percent cap could penalize agencies that legitimately served costly patients and affect the care for expensive patients. One group of patients potentially affected by the 10 percent cap was those with diabetes who need multiple daily injections of insulin. Many diabetic patients cannot safely administer their insulin because they have visual, cognitive, or dexterity impairments. If such patients have no access to informal caregivers, then they must receive home health visits that provide multiple daily insulin injections. This makes them costly outlier patients. Without home health visits, however, these patients cannot live independently and might end up relying on more expensive health care services, such as nursing home or inpatient services (CMS 2009).

Expected Effects of the Ten Percent Cap

This section explains how agencies could adjust treatment intensity and patient discharge status under the 10 percent cap.

First, agencies would decrease the number of visits for patients under the 10 percent cap. Without the 10 percent cap in place, agencies would increase the number of visits as much as possible to take advantage of a positive marginal value of one visit among outlier patients. Under the 10 percent cap, however, agencies would be compelled to keep their proportion of outlier payments under 10 percent. Otherwise, they would have to bear the full cost of extra treatments beyond the 10 percent cap. Therefore, if an agency's outlier payments exceeded the 10 percent cap in prior years, the agency would face pressure to reduce the number of visits for outlier episodes. This reduction in the number of visits could either make a patient no longer eligible for outlier payments or allow them to remain eligible for outlier payments while receiving fewer visits than before. The pressure to adjust the number of visits within each agency would increase with the level of outlier payments, if higher than 10 percent.

Second, the 10 percent cap would affect agencies' decisions on patient discharge status. Notably, the effect on patient discharge status would be most evident among patients who most likely require many visits and are potentially eligible for outlier payments because agencies would want to drop patients who are highly likely to contribute to total outlier payments. However, this adjustment would vary based on each patient's relative health status. Relatively healthy patients would be more likely to be discontinued from home health care because they could be more capable of taking care of themselves without home health care. On the other end of the spectrum, the sickest patients would tend to require many visits, greatly contributing to the increase in total outlier payments. However, it would be challenging to decrease the number of visits for these sickest patients because even a small reduction in the number of visits could lead to a significant decline in their health. To avoid these high-cost patients, agencies could send them to nursing homes or hospitals. However, the incentive for an agency to send their patient to a hospital might not be strong because the percentage of patients admitted to a hospital is one of the quality measures publicly reported on Home Health Compare. High hospitalization rates would adversely affect an agency's reputation.

Data

This study uses year 2008–2010 data from CMS 5 percent Limited Data Set-Denominator File, CMS 5 percent Limited Data Set-Home Health Claims, and CMS Provider of Services File. Using the first two datasets,

we create a panel of 5 percent of Medicare home health patients that contains their demographics, health condition, and home health service use. The last dataset is a panel of all agencies across the nation and includes their basic characteristics, including location, ownership type, and date of initial Medicare certification. We merge the first two and last datasets, creating a patient-agency linked, unbalanced panel. Each observation in this dataset corresponds to a patient's 60-day-long episode of care. Descriptive statistics on main variables are presented in Table 1.

Table 1: Descriptive Statistics: Demographic Characteristics, Health Conditions, and Home Health Service Use in 2008

Patient Characteristics	*All Patients*	*Diabetes Patients*
Demographic factors		
Age	76.3 (11.7)	71.5 (11.9)
Female (%)	63.5	60.3
Race (%)		
White	82.8	65.8
Nonwhite	17.2	34.2
Buy-in (%)	25.7	46.4
Total number of patients	119,007 Episodes for All Patients	2,798 Episodes for Diabetes Patients
Health condition		
Prior acute-care stay (%)	28.77	16.1
Clinical severity (%)		
Low	19.8	1.6
Moderate	35.2	31.7
High	45.0	66.6
Functional severity		
Low	28.6	30.1
Moderate	49.7	50.5
High	21.7	19.4
Service use		
Outlier episode (%)	2.9	31.9
Number of visits	18.3 (20.8)	49.0 (56.4)
Discharge status		
Discontinuation from home health care (%)	49.5	29.1
Nursing home admission (%)	0.6	0.4
Hospitalization (%)	2.4	2.9
Total number of episodes	214,650	5,294

Note. We present each main variable's mean and standard deviation (in parentheses).

Empirical Strategy

We exploit agency-level variation in the proportion of outlier payments and identify the effect of the 10 percent cap on treatment intensity and patient discharge status. We first create a measure of each agency's proportion of outlier payments at a base year (Appendix Table S2 explains how we calculated each agency's proportion of outlier payments at a base year). The base year is year 2008 for an agency that served any episodes in 2008 and year 2009 for an agency that served episodes in 2009, but none in 2008. We drop agencies that had episodes only in 2010.

We then model each agency's outlier proportion as a spline function where the knots are at 10, 20, and 30 percent. We choose the highest knot as 30 percent because the highest outlier proportion in our dataset was 46 percent and there were relatively few agencies with more than 30. We use splines because splines allow substantial flexibility in capturing the relationship between the outcome variables and each agency's outlier proportion at a base year (Marsh and Cormier 2002). We then interact these splines with year dummy variables. We consider these interactions because a patient would have experienced a more drastic change in home health use in 2010 if the patient was served by an agency that had outlier payments higher than 10 percent of total prospective payments at a base year.

We estimate an episode-level regression (1) to understand the effect of the 10 percent cap on treatment intensity. The dependent variable Y_{kijt} represents (1) each episode's likelihood of being eligible for outlier payments and (2) number of visits per episode:

$$Y_{kijt} = \beta_0 + \sum \beta_{1a} prop_j^a + \sum \beta_{2t} year_t + \sum \beta_{3at} prop_j^a \times year_t + Agency_{jt}\delta + patient_{kijt}\gamma + Seasonality_{kt}\theta + State_s\varphi + \epsilon_{kijt} \quad (1)$$

where k, i, j, and t refer to an episode, patient, agency, and year. $Prop_j^a$ represents four splines for each agency j's outlier proportion out of total prospective payments at a base year (α = 0 to 10, 10 to 20, 20 to 30, and 30 and above). $Year_t$ refers to the year dummy variables with the omitted group of year 2008. $Agency_{jt}$ represents each agency's characteristics, including ownership, annual number of episodes served by each agency, and facility-affiliation status. $Patient_{kijt}$ denotes each patient's characteristics, including age, gender, race, participation in the Medicare Buy-in program, clinical and functional severity, an indicator whether each patient was on first/second or third and after

episode of care, an indicator of whether each patient stayed in an acute-care setting prior to a home health admission, and indicators of most frequent health diagnoses. We also control for $Seasonality_{kt}$, an indicator for the quarters of each year. We include state fixed effects $State_s$ because each state might have different regulations affecting home health services.

To understand the effect of the 10 percent cap, we further predict outcome values for a typical patient served by a typical agency based on spline regression estimates. We then present how predicted outcomes vary each year, depending on each agency's proportion of outlier payments at the base year. The predicted outcome value is expected to be significantly different in 2010 if an agency's proportion of outlier payments was close to or beyond the 10 percent cap at the base year.

We also examine the effect of the 10 percent cap on each patient's discharge status. Patient discharge status could vary based on each patient's health condition. We thus consider three-way interaction terms between year dummy variables, splines of each agency's proportion of outlier payments, and measure of each patient's level of functional severity. We use the level of functional severity as a proxy of each patient's health condition because many patients rely on home health services when they have functional limitations and it could substantially affect a patient's use of home health services (MedPAC, 2009). In addition, this measure is unlikely to be affected by home health visits provided because agencies are required to assess each patient's health and determine the level of functional severity at the beginning of each episode.

Agencies give a score to each of the five factors of a patient's functional status (dressing upper or lower body, bathing, toileting, transferring, and ambulation) at the beginning of episode of care. Agencies then assign one functional score out of three (low, moderate, and high) to each patient based on the added scores from each factor, along with the duration of care (whether a patient was on her first/second or third and after episode of care) and the expected number of therapy visits (0–13, 14–19, or 20+ therapy visits) (CMS 2007).

Using this functional limitation assessment system, we run regression (Equation 2) among two different groups: patients on their 1st and 2nd episode with 0 to 13 therapy visits (50.9 percent of total sample) and patients on their 3rd or later episode with 0 to 13 therapy visits (32.5 percent of total sample). We do not consider other groups of patients for separate regressions due to their relatively small number of episodes.

The basic episode-level regression (2) takes the following form:

$$\begin{aligned} Y_{kijt} = \beta_0 &+ \sum \beta_{1a} prop_j^a + \sum \beta_{2t} year_t + \sum \beta_{3f} Function_{kijt}^f \\ &+ \sum \beta_{4at} prop_j^a \times year_t \\ &+ \sum \beta_{5af} prop_j^a \times Function_{kijt}^f \\ &+ \sum \beta_{6tf} year_t \times Function_{kijt}^f + \sum \beta_{7atf} prop_j^a \\ &\times year_t \times Function_{kijt}^f + Agency_{jt}\delta + Patient_{kijt}\gamma + Seasonality_{kt}\theta \\ &+ State_s\varphi + \epsilon_{ijkt} \end{aligned} \tag{2}$$

where Y_{kijt} represents patient discharge status, including discontinuation from home health care (at the end of each episode of care), nursing home admission (in the middle of an episode of care), and hospitalization (in the middle of an episode of care). $Function_{kijt}^f$ represents two dummy variables of each patient's level of functional severity (low [reference group], moderate, and high level).

In both regression (1) and (2), we estimate linear probability models for each dependent variable. Results are essentially the same when we estimate probit models instead. However, we prefer the ordinary least-squares results due to the more straightforward inference with the interaction term estimates. Standard errors are clustered on agency.

The critical identifying assumption of this empirical strategy is that there were no differential trends between agencies that had low and high proportions of outlier payments. In other words, the correlation between each agency's proportion of outlier payments and unobserved factors of each patient's service use and discharge status did not change contemporaneously with the implementation of the 10 percent cap. For example, if there were mean reversion in home health utilization, agencies with high outlier proportion prior to 2010 would experience decreases in utilization in 2010, even in the absence of any policy change. Because mean reversion is a concern, we address it by checking whether there was any evidence of mean reversion in the early period of time. If we see no mean reversion in the early period of time, then we should not expect mean reversion in later years, before and after 2010. For that purpose, we use the early period of data, 2005–2007, and replicate the analysis in regression (Equation 1).

The effect of the 10 percent cap might be more evident among costly patients who require many visits and are likely eligible for outlier payments, such as those with diabetes with long-term use of insulin (termed as *diabetes patients* hereafter). Thus, we also conduct the same analyses on this subgroup

of patients. Diabetes patients deserve separate analysis also because many of them cannot lead independent lives without home health visits because of their vulnerable health conditions.

RESULTS

Effect on Treatment Intensity

Overall results indicate that the 10 percent cap reduced treatment intensity. Figure 1 presents the predicted likelihood of having episodes eligible for outlier payments and predicted number of visits between 2008 and 2010. As seen in Figure 1A, in 2008, if a patient was served by agencies with 10, 20, 30, and 40 percent of outlier payments, then the patient's predicted likelihood of having episodes eligible for outlier payments was 0.11, 0.19, 0.29, and 0.73, respectively. In 2010 following implementation of the 10 percent, the corresponding likelihoods decreased to 0.09, 0.15, 0.17, and 0.34, respectively. Relative to the average likelihood of having episodes eligible for outlier payments in 2008 (0.029), the size of these decreases seems substantial. As predicted in the conceptual framework, the decrease in patients' likelihood of having outlier episodes by the addition of the 10 percent cap was significant only when their agency's proportion of outlier payments was beyond the 10 percent prior to implementation of the policy. In addition, both the size and significance of the decrease increased with agencies' proportion of outlier payments at a base year.

Even when patients continued to have episodes eligible for outlier payments, the 10 percent cap caused agencies to decrease the number of visits drastically. As seen in Figure 1B, in 2008, patients whose agency had 10, 20, 30, and 40 percent of outlier payments were predicted to receive 89.3, 100.7, 110.1, and 139.9 visits per episode, respectively. In 2010, the corresponding numbers of visits per episode decreased to 85.1, 84.6, 89.2, and 94.2. The size of the decreases was (statistically significantly) larger if patients were served by an agency with a higher proportion of outlier payments, if higher than 10 percent. Relative to the average number of visits among outlier episodes in 2008 ($n = 103.6$), these decreases are not trivial.

As a robustness check, we examine the number of visits for nonoutlier patients, but we do not find the same pattern of service number decreases among this population (see Figure 1C). This reconfirms our finding that the

big decrease in the number of visits among patients in 2010 was exclusively due to the 10 percent cap. Appendix Table S3 provides the spline regression estimation results used to calculate the predicted likelihood and number of visits.

As a test for problems of mean reversion, we also replicate the analysis using 2005–2007 data. If mean reversion were driving the results in Figure 1, we should find similar patterns in the falsification exercise in the absence of the 10 percent cap. However, as seen in Appendix Figure S1, the results in the falsification exercise suggest no mean reversion and thus mean reversion does not drive findings in Figure 1.

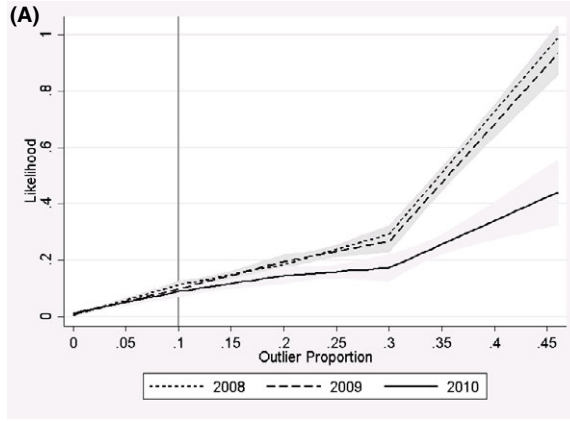
Figure 2 presents the effect of the 10 percent cap on treatment intensity among diabetes patients. We find similar effects on diabetes patients. In 2010, diabetes patients were less likely to have episodes eligible for outlier payments (see Figure 2A). The 10 percent cap also decreased the number of visits for outlier diabetes patients (Figure 2B), but it did not influence the number of visits for nonoutlier diabetes patients (Figure 2C).

Effect on Patient Discharge Status

Figure 3 presents the effect of the 10 percent cap on patient discharge status among all home health patients. As seen in Figure 3A, the 10 percent cap led agencies to discontinue care from patients with a low level of functional severity (who were on their first or second episode of care) without sending

Figure 1: Influence of Ten Percent Cap on Treatment Intensity. (A) Predicted Likelihood of Having Outlier Episode and 95 Percent Confidence Interval between 2008 and 2010; (B) Predicted Number of Visits and 95 Percent Confidence Interval among Outlier Episodes between 2008 and 2010; (C) Predicted Number of Visits and 95 Percent Confidence Interval among NonOutlier Episodes between 2008 and 2010

Notes: We estimated each equation using an ordinary least-squares regression, with standard errors clustered on home health agency. In each equation, other control variables include agency's characteristics, including ownership type, facility-based status, and the number of employed nurses, physical therapists, and home health aides; each patient's characteristics, including age, gender, race/ethnicity, participation in the Medicare buy-in program, clinical severity, functional severity, acute-care stay prior to home health care, and most frequent major health diagnoses; seasonality; and state indicators. We then predicted each outcome variable on a typical patient served by a typical agency and present how the predicted outcome varies each year.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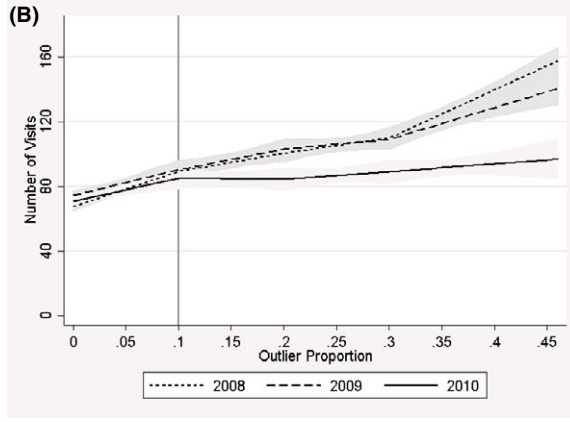
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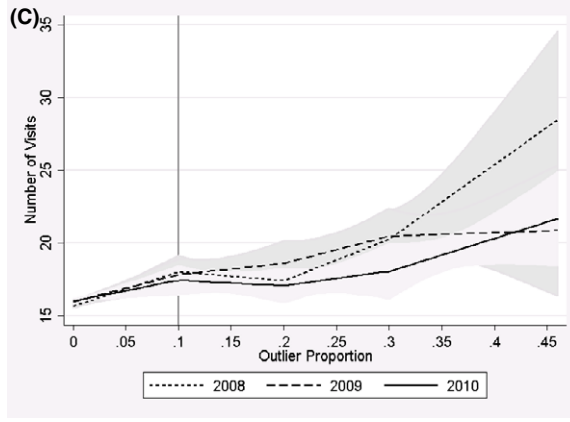
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Outlier Proportion
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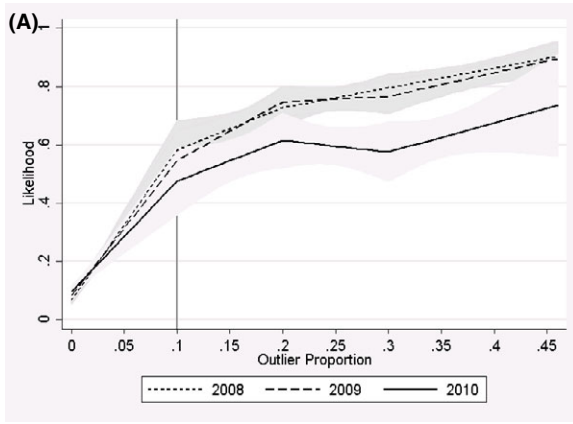
them to a nursing home or hospital. These mildly disabled patients, if they were served by agencies with 30 percent or higher outlier payments, were more likely to discontinue from home health care in 2010 than in 2008. The discrepancy in the likelihood of discontinuation between 2008 and 2010 increased in agencies' outlier proportion (if higher than 30 percent). However, the likelihood of discontinuation was not different between 2008 and 2010 for patients with a high level of functional severity (as seen in Appendix Figure S2a, there is an overlap between 95 percent confidence intervals for the likelihood of discontinuation for the years 2008 and 2010 of patients with a high level of functional severity). Agencies might find it easier to discontinue care from relatively healthy patients who are more likely to be able to take care of themselves. We find the similar pattern among patients on their third or later episode of care, but the size of discrepancy in the likelihood of discontinuation between 2008 and 2010 was smaller and less significant (see Appendix Figure S4a). Inconsistent with our prediction, the 10 percent cap did not lead agencies to send their patients to a nursing home or hospital (see Figure 3B and C).

Figure 4 illustrates the effect of the 10 percent cap on diabetes patients' discharge status. The effect of the 10 percent cap is expected to be more evident for diabetes patients who are highly likely eligible for outlier payments, which turned out to be true in our analysis. The 10 percent cap led agencies to adjust diabetes patients' discharge status in two ways.

Figure 2: Influence of Ten Percent Cap on Treatment Intensity among Diabetes Patients. (A) Predicted Likelihood of Having Outlier Episode and 95 Percent Confidence Interval between 2008 and 2010; (B) Predicted Number of Visits and 95 Percent Confidence Interval among Outlier Episodes between 2008 and 2010; (C) Predicted Number of Visits and 95 Percent Confidence Interval among Non-Outlier Episodes between 2008 and 2010

Notes: We estimated each equation using an ordinary least-squares regression, with standard errors clustered on home health agency. In each equation, other control variables include agency's characteristics, including ownership type, facility-based status, and the number of employed nurses, physical therapists, and home health aides; each patient's characteristics, including age, gender, race/ethnicity, participation in the Medicare buy-in program, clinical severity, functional severity, acute-care stay prior to home health care, and most frequent major health diagnoses; seasonality; and state indicators. We then predicted each outcome variable on a typical patient served by a typical agency and present how the predicted outcome varies each year.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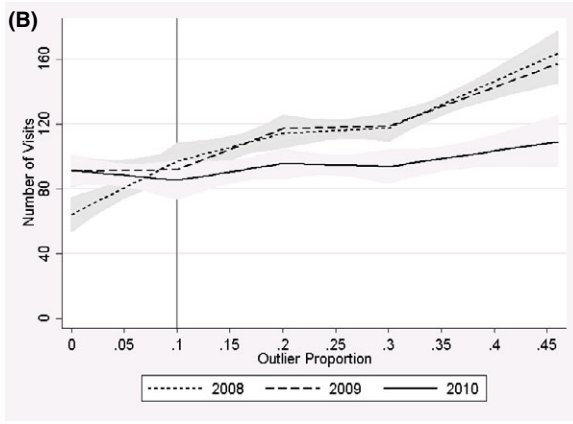
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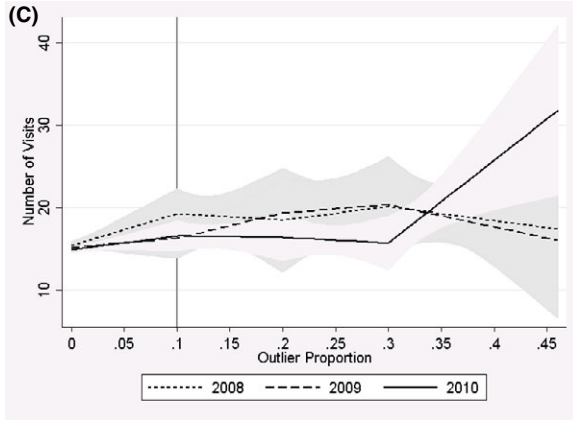
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Outlier Proportion
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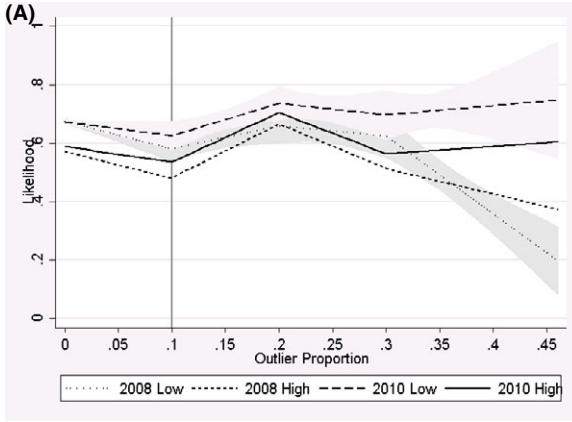
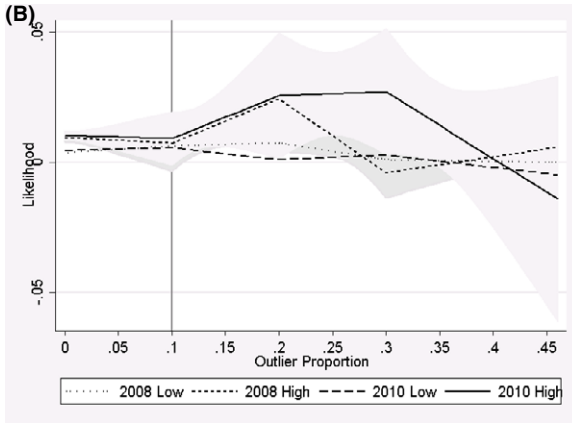
First, agencies were more likely to discontinue care from diabetes patients with a low level of functional severity under the 10 percent cap (see Figure 4A). We find the same effect in the analysis with all patients, but the increase in the likelihood of discontinuation was much greater for diabetes patients. Interestingly, the effect on the likelihood of discontinuation was obvious only among patients on their first or second episode of care, but not for patients whose duration of care was longer (i.e., those on their third or later episode of care) (see Appendix Figure S5a). Agencies might find it harder to stop providing services for diabetes patients who have received visits for a longer period of time, and the strength of relationship between a provider and patients might matter.

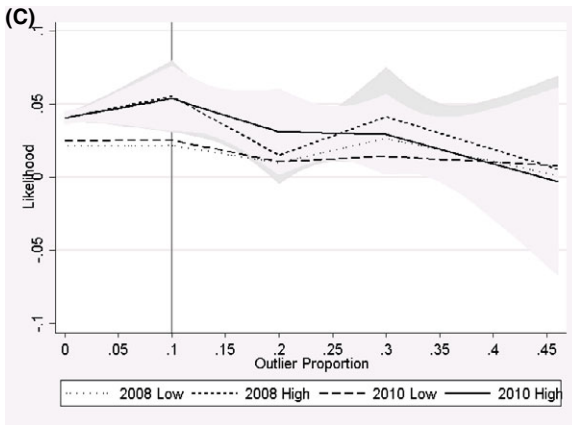
Second, under the 10 percent cap, a diabetes patient with a high level of functional severity was more likely to leave home health care and instead enter a nursing home (see Figure 4B). For example, in 2010, patients with a high level of functional severity whose agency had 25 to 35 percent of outlier payments in a base year were more likely to enter a nursing home, compared to the corresponding patients in 2008. Agencies might find it challenging to dramatically decrease the number of vis-

Figure 3: Influence of Ten Percent Cap on Patient Discharge Status by a Patient's Functional Severity (after a Patient's First or Second Episode of Care). (A) Predicted Likelihood of Discontinuation from Home Health Care and 95 Percent Confidence Interval between 2008 and 2010

Notes: (A) The 95 percent confidence intervals are only for predicted likelihoods for patients with a low level of functional severity in 2008 and 2010. See Appendix Figure S2 for the 95 percent confidence intervals for patients with a high level of functional severity in 2008 and 2010. (B) The 95 percent confidence intervals are only for predicted likelihoods for patients with a high level of functional severity in 2008 and 2010. See Appendix Figure S2 for the 95 percent confidence intervals for patients with a low level of functional severity in 2008 and 2010. (C) The 95 percent confidence intervals are only for predicted likelihoods for patients with a high level of functional severity in 2008 and 2010. See Appendix Figure S2 for the 95 percent confidence intervals for patients with a low level of functional severity in 2008 and 2010. For (A)–(C), we estimate each equation using an ordinary least-squares regression, with standard errors clustered on home health agency. In each equation, other control variables include agency's characteristics, including ownership type, facility-based status, and the number of employed nurses, physical therapists, and home health aides; each patient's characteristics, including age, gender, race/ethnicity, participation in the Medicare buy-in program, clinical severity, functional severity, acute-care stay prior to home health care, and most frequent major health diagnoses; seasonality; and state indicators. We then predict each outcome variable on a typical patient served by a typical agency and present how the predicted outcome varies each year.


(A)
Likelihood
0
.2
.4
.6
.8
0
.05
.1
.15
.2
.25
.3
.35
.4
.45
Outlier Proportion
2008 Low
2008 High
2010 Low
2010 High


(B)
Likelihood
-.05
0
.05
0
.05
.1
.15
.2
.25
.3
.35
.4
.45
Outlier Proportion
2008 Low
2008 High
2010 Low
2010 High

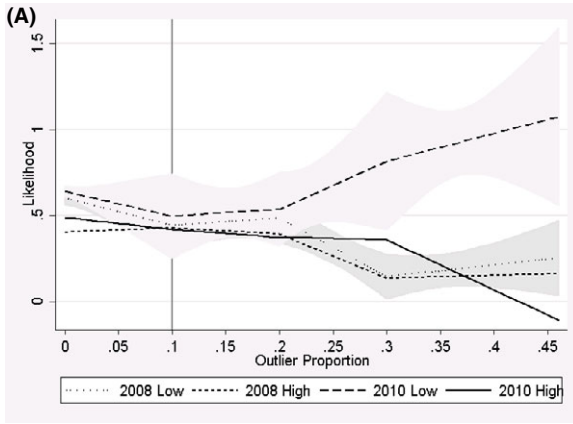

(C)
Likelihood
-.1
-.05
0
.05
0
.05
.1
.15
.2
.25
.3
.35
.4
.45
Outlier Proportion
2008 Low
2008 High
2010 Low
2010 High

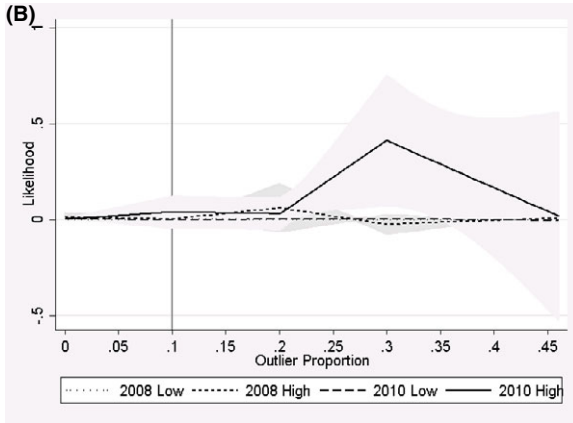
its for severely disabled diabetes patients and determine to send them to nursing homes. Again, this pattern was found only among patients on their first or second episode of care, but not those who on third or later episode of care (see Appendix Figure S5b).

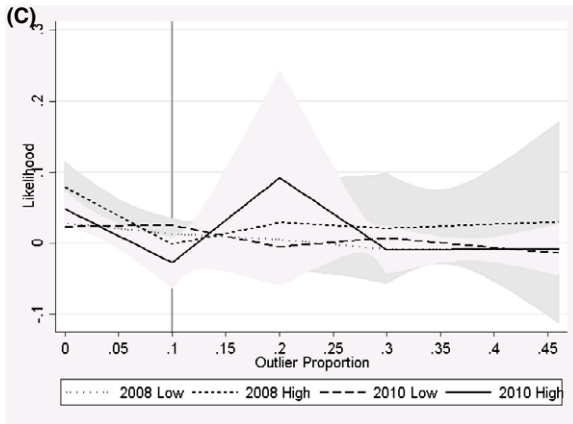
The 10 percent cap did not affect each diabetes patient's likelihood of getting admitted to a hospital. As shown in Figure 4C, a patient's likelihood of hospitalization did not vary depending on the patient's level of functional severity or her agency's proportion of outlier payments. Although this contradicts the prediction that agencies are more likely to send sicker patients to a hospital under the 10 percent cap, as discussed above, admitting patients to a hospital is not a good strategy because of the public reporting on Home Health Compare. That is, agencies might send sicker patients to a nursing home in advance rather than waiting for patients' health to get worse and then require a hospital admission.

Figure 4: Influence of Ten Percent Cap on Patient Discharge Status among Diabetes Patients by a Patient's Functional Severity (after Their First or Second Episode of Care). (A) Predicted Likelihood of Discontinuation from Home Health Care and 95 Percent Confidence Interval between 2008 and 2010; (B) Predicted Likelihood of Nursing Home Admission and 95 Percent Confidence Interval between 2008 and 2010; (C) Predicted Likelihood of Hospitalization and 95 Percent Confidence Interval between 2008 and 2010

Notes: (A) The 95 percent confidence intervals are only for predicted likelihoods for patients with a low level of functional severity both in 2008 and 2010. See Appendix Figure S3 for the 95 percent confidence intervals for patients with a high level of functional severity in 2008 and 2010. (B) The 95 percent confidence intervals are only for predicted likelihoods for patients with a high level of functional severity both in 2008 and 2010. See Appendix Figure S3 for the 95 percent confidence intervals for patients with a low level of functional severity in 2008 and 2010. (C) The 95 percent confidence intervals are only for predicted likelihoods for patients with a high level of functional severity both in 2008 and 2010. See Appendix Figure S3 for the 95 percent confidence intervals for patients with a low level of functional severity in 2008 and 2010. For (A)–(C), we estimate each equation using an ordinary least-squares regression, with standard errors clustered on home health agency. In each equation, other control variables include agency's characteristics, including ownership type, facility-based status, and the number of employed nurses, physical therapists, and home health aides; each patient's characteristics, including age, gender, race/ethnicity, participation in the Medicare buy-in program, clinical severity, functional severity, acute-care stay prior to home health care, and most frequent major health diagnoses; seasonality; and state indicators. We then predict each outcome variable on a typical patient served by a typical agency and present how the predicted outcome varies each year.


(A)
Likelihood
0
.5
1
1.5
0
.05
.1
.15
.2
.25
.3
.35
.4
.45
Outlier Proportion
2008 Low
2008 High
2010 Low
2010 High


(B)
Likelihood
-.5
0
.5
1
0
.05
.1
.15
.2
.25
.3
.35
.4
.45
Outlier Proportion
2008 Low
2008 High
2010 Low
2010 High


(C)
Likelihood
-.1
0
.1
.2
.3
0
.05
.1
.15
.2
.25
.3
.35
.4
.45
Outlier Proportion
2008 Low
2008 High
2010 Low
2010 High

DISCUSSION

This study explores the changes in treatment intensity and patient discharge status after the introduction of 10 percent cap to Medicare home health care. The cap led to a dramatic decrease in the number of service visits and also affected agencies' decisions on patient discharge status. On average, patients with the lowest level of functional severity were determined healthy enough and were discontinued from home health care without receiving any other types of formal health services. In particular, when we focus on diabetes patients with long-term use of insulin, those who are highly likely eligible for outlier payments, the effect on patients' discontinuation from home health care was more evident. These findings, along with the large reduction in the number of visits, suggest that the 10 percent cap improved the efficiency of home health services as intended. However, it is uncertain how the discontinuation from home health care and the reduced treatment intensity affect patients' health conditions and use of other health services in the long run.

We also find that the 10 percent cap pushed sicker diabetes patients to enter nursing homes. The finding indicates that the 10 percent cap had a spillover effect and might increase the other types of health care spending despite its contributing to a decrease in Medicare home health spending. The presence of this potential spillover effect may justify a policy intervention that encourages providers to retain good quality of care. For example, Medicare could introduce a pay-for-performance program, allowing the payment rates to vary depending on quality of care. Alternatively, Medicare could add an extra quality measure—the percentage of patients admitted to nursing homes—to Home Health Compare.

We find that the effect of the 10 percent cap on patient discharge status was more evident for diabetes patients who tend to require many visits and are highly likely to be eligible for outlier payments: They were more likely to stop receiving care and enter the nursing home. This finding suggests that Medicare pay special attention to care for this vulnerable patient population with diabetes under the 10 percent cap.

In sum, this study provides evidence that agencies decreased treatment intensity and adjusted patient discharge status under the 10 percent cap. In future work, we hope to calculate the spillover effect of the 10 percent cap on total health expenditures. The availability of data on each Medicare beneficiary's health service use and expenditures in all types of health services will be necessary for such future assessments.

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Disclosures: None.

Disclaimers: None.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.

Table S1. Calculation of Outlier Payment.

Table S2. Calculation of Each Agency's Proportion of Outlier Payments.

Table S3. Spline Regression Estimates: Influence of Ten Percent Cap on Treatment Intensity.

Table S4. Spline Regression Estimates: Influence of Ten Percent Cap on Patient Discharge Status after a Patient's First or Second Episode of Care by a Patient's Functional Severity.

Figure S1. Predicted Likelihood of Being Eligible for Outlier Payments and Predicted Number of Visits between 2005 and 2007.

Figure S2. Influence of Ten Percent Cap on Patient Discharge Status by a Patient's Functional Severity (after a Patient's First or Second Episode of Care).

Figure S3. Influence of Ten Percent Cap on Patient Discharge Status among Diabetes Patients by a Patient's Functional Severity (after Their First or Second Episode of Care).

Figure S4. Influence of Ten Percent Cap on Patient Discharge Status by a Patient's Functional Severity (after a Patient's Third or Later Episode of Care).

Figure S5. Influence of Ten Percent Cap on Patient Discharge Status among Diabetes Patients by a Patient's Functional Severity (after Their Third or Later Episode of Care).