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The Effect of Publicized Quality Information on Home Health Agency Choice

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Abstract

We examine consumers' use of publicized quality information in Medicare home health care markets, where consumer cost sharing and travel costs are absent. We report two findings. First, agencies with high quality scores are more likely to be preferred by consumers after the introduction of a public reporting program than before. Second, consumers' use of publicized quality information differs by patient group. Community-based patients have slightly larger responses to public reporting than hospital-discharged patients. Patients with functional limitations at the start of their care, at least among hospital-discharged patients, have a larger response to the reported functional outcome measure than those without functional limitations. In all cases of significant marginal effects, magnitudes are small. We conclude that the current public reporting approach is unlikely to have critical impacts on home health agency choice. Identifying and releasing quality information that is meaningful to consumers may help increase consumers' use of public reports.

Keywords

public reporting; quality information; consumer choice; Medicare home health care

Introduction

Public reporting of provider quality information is a common element of the current U.S. health care system. Almost every state has its own public reporting programs for hospitals (Cronin & Riedel, 2011). Medicare publicly releases quality scores of its diverse provider groups, including health plans, hospitals, nursing homes, and home health agencies. Large

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⁴For example, new branches of an agency should be open within the county in states with Certificate of Need (phone interviews with state officials).

employers and health care systems in the private sector also disclose provider quality information to their employees or enrollees (Scanlon, Christianson, & Ford, 2008). The rationale behind this movement is compelling. Limited information on quality in health care has long been identified as an issue for effective health care markets (Arrow, 1963), and economic literature suggests that consumers' uncertainty about quality leads to poor quality because providers do not have incentives to invest in quality (Akerlof, 1970). Thus, public disclosure of quality information is considered as a step toward improving health care quality and market outcomes.

A critical mechanism by which public reporting can incentivize providers to improve quality is that consumers use this information in choosing providers. Whether this premise holds in reality is an important question for assessing the value of public reporting. Literature on this question is limited to certain settings, and the results are mixed. Studies of health plans found that the effect of report cards on choice is significant and relatively large among new enrollees (Scanlon, Chernew, McLaughlin & Solon, 2002; Beaulieu, 2002; Jin & Sorensen, 2006), while studies of hospital choice produced mixed findings (Baker et al., 2003; Dranove & Sfeekas, 2008). A relatively large effect was found in fertility clinic choice, where consumers are young and educated and thus are likely to engage in information seeking (Bundorf, Chun, Goda, & Kessler, 2009). While limited, these findings suggest that consumer response to public reporting differs across settings. Public reporting programs are expected to proliferate in varied markets as emphasis on consumerism and transparency increases (Huckman & Kelley, 2013). Extending evidence on consumers' use of publicized information in diverse settings can help explore ways to increase the effectiveness of public reports.

We examine how information disclosure influences consumer choice in Medicare home health care, which is an important and growing postacute care option for the elderly. Several unique features of home health care suggest that the demand responsiveness to quality information may be different from other markets. Unique to home health care is the absence of travel cost and consumer price. Service delivery takes place in patients' homes, and Medicare requires no cost sharing to beneficiaries. The lack of variation in prices/costs across providers can provide further motivation for patients to search for quality information because any additional consumer benefits from high quality will not be offset by high prices or travel cost (Hirschleifer & Riley, 1979). However, because switching home health providers does not disturb a course of treatment, home health shoppers may be more likely to determine quality through experience rather than through quality report cards.

We use 6 years of Medicare home health care data over a span that includes both pre- and postpublic reporting periods so that we can compare how the relationship between reported quality and consumer choice changes with the introduction of public reporting. The difference in that relationship between the pre- and post-reporting periods captures the effect of information disclosure on choice because the relation prior to reporting controls for the correlation between reported quality and consumers' perceived quality, which is not observable to researchers.

New Contribution

This is the first study that examines the effect of public reporting on consumer choice in Medicare home health care—a setting that has unique features of zero consumer price, no travel costs, and low costs of switching providers. Thus, the results from other settings may not be readily translated to home health care. No variation in price and travel cost also helps better isolate consumers' reaction to quality information.

In addition, we examine potential differences in the responsiveness to public reporting by patient group. Home health care is the only Medicare postacute care that does not require a prior hospitalization. It thus serves both patients who are discharged from a hospital and those who are from a community without a prior hospitalization. These two groups may have different responses to public reporting: hospital-discharged patients may be more pressed for time in selecting providers compared with community patients. Hospital-discharged patients may also be influenced by the discharging hospital, which could lower the likelihood of using public information. Prior work in skilled nursing home—another postacute care setting—is limited to the analysis of hospital-discharged patients because a prior hospitalization is required for Medicare nursing home use (Werner, Norton, Konetzka, & Polsky, 2012).

Background

Medicare Home Health Compare

Medicare home health care is an increasingly important source of postacute care for the elderly. Home health spending increased by about 10% annually between 2001 and 2009, reaching \$19.6 billion in 2011 (Medicare Payment Advisory Commission, 2012). As demand for home health care increases, ensuring high quality of home health services is important. The Centers for Medicare and Medicaid Services (CMS) has taken several initiatives to improve home health quality during the past decade. The first step was to establish quality measurements in home health care. In the late 1990s, CMS developed a standardized assessment tool known as Outcome and Assessment Information System (OASIS), which provides comprehensive information about patients' health risk and home health care outcomes.

As part of its home health quality initiatives, in 2003, CMS introduced a public reporting program, Home Health Compare (HHC), which posts a subset of each agency's OASIS-based performance measures on its website. HHC was implemented in eight pilot states in May 2003, and its national rollout occurred in November 2003.¹ All Medicare-certified agencies are required to release quality scores except for HHC indicators with fewer than 20 cases over 12 months. A consumer visiting the website is asked to specify the ZIP/city/state where she lives. Once the consumer types in a ZIP/city/state, a comparison table pops up and presents quality information of agencies serving that area. Figure A1 in the appendix shows an example of the HHC reports.

¹Pilot states are Florida, Massachusetts, Missouri, New Mexico, Oregon, South Carolina, West Virginia, and Wisconsin.

On launching the HHC program, CMS publicized the initiative through media to promote public awareness of the program. CMS placed newspaper advertisements in 73 major newspapers covering all 50 states and District of Columbia. The advertisement in each state presented an example of the HHC reports (similar to Figure A1 in the appendix) using actual quality data of agencies operating in the state and included the HHC website address, as well as Medicare contact information.

Quality measures reported in HHC focus on key home health care outcomes. Home health staff teach patients specific skills necessary to manage their daily activities and assist patients in reaching the maximum achievable level of independence in daily activities. Thus, a main dimension of home health quality is patients' functional outcomes—how independently patients perform important daily activities, such as ambulation, transferring from/to beds, bathing, and so on. For each activity, quality is measured by whether the patient's independence improved during an episode (a care period between admission and discharge from the agency). HHC calculates each activity's score as the patient's risk-adjusted probability of having improvement in the functional status.

HHC also uses an indicator of risk-adjusted hospitalization during an episode. Another focus of home health care is on patient/caregiver education and self-monitoring. Through periodic visits, a nurse checks the patient's dietary status and basic health indicators, and instructs patients how to identify signs of problems, such as infection or shortness of breath, and what to do or whom to contact when those signs are identified. These medical monitoring and early interventions help prevent the patient from being (re-)admitted to a hospital. Thus, hospitalization rates have been used in HHC to capture potential poor quality of care.

HHC releases each agency's performance on these targeted outcomes² and updates them quarterly. Quarterly HHC scores represent an average 3-month lagged performance over prior 12 months. For example, the quality scores released in May 2004 are based on data between March 2003 and February 2004.

Possible Consumer Response to Public Reporting in Home Health Care

Literature suggests that consumers' use of disclosed information may depend on particular features of markets. Werner et al. (2012) found a small impact of public reporting on nursing home choice. They attributed their finding to the possibility that nursing home users may have to choose providers under time pressure (during a hospital discharge), or they are often cognitively impaired and thus may not understand disclosed information. Bundorf et al. (2009) discussed that their relatively large effect of report cards on fertility clinic choice may be due to consumer characteristics (young and educated) and the release of meaningful information (birth rates).

Medicare home health care is unique, in that choosing high-quality providers does not incur any additional cost due to zero travel cost and zero cost sharing. Hirshleifer and Riley (1979) suggest that the value of information can be defined as the gain in expected utility from

²Since July 2011, HHC has included items on evidence-based processes, such as how often the home health team taught patients about foot care for patients with diabetes, checked patients for pain, and so on.

switching to another choice after receiving the new information. Thus, incentives to search for information and the likelihood of choosing high-quality providers increase as the costs of selecting high-quality providers decrease (i.e., large “net” benefits). This implies that no trade-off between quality and cost in home health care can motivate patients to use quality information.

However, this effect may be countered if home health care patients consider switching to another provider during a course of treatment. Unlike acute care use (e.g., hospital use for surgery), changing a home health care provider may not significantly interrupt the course of treatment. Consumers may consider switching providers after experiencing one provider, although switching an agency is not cost free in Medicare home health as it requires a physician’s (re)certification (CMS, 2010).³ If consumers use their experience as a source of information, they may not rely on publicized quality information in home health care.

We empirically examine how consumers respond to public reporting in home health care. We analyze potential differences in responses to public reporting between patients with and without a prior hospitalization, referred to as hospital-discharged and community patients, respectively.

Data

The primary data source is OASIS files, which contain health risk and demographic information of each home health patient. We use 6 years of OASIS data (2001–2006), which include both pre- and post-HHC periods. We construct each agency’s quality scores and market shares in each quarter from the OASIS file. We define the market by county because agencies tend to serve within an administrative boundary¹ and use quarter as the unit of time because HHC updates scores quarterly.

We augment the OASIS data with Medicare denominator and Provider Analysis and Review (MedPAR) files to identify all Medicare beneficiaries who are eligible for home health care (regardless of use of home health care). The denominator file contains beneficiaries’ demographics, residence, and fee-for-service enrollment status. The MedPAR file includes records on beneficiary hospitalizations. We obtain agency attributes from Provider of Service file.

Our study population is Medicare fee-for-service beneficiaries. Enrollees in Medicare Advantages plans are excluded because they may have restricted provider networks. To obtain reliable estimates, we limit our analysis to agencies with at least 10 patients in a given year. We consider that an agency is active in a market when the agency has at least 3 patients from the market. The final sample consists of 5,759 unique agencies with HHC information (61,671 agency-quarters). See Table 1 for characteristics of agencies included in our analysis.

³Switching rates during the study period were low: The share of patients who use more than one agency in a year is about 5%. This may be due to switching costs or because patients change nurses or aides without agency switching.

Model

Our study focuses on the demand side response to public reporting. We model consumers' agency decisions in a traditional discrete choice framework, with consumers' expected utilities depending on quality signals they receive. Along with the introduction of HHC, new information about agency quality arrives. Receiving this new quality signal, consumers choose a provider that maximizes their utility based on agency quality and other agency attributes. The contribution of the new signal to consumers' utility depends on several factors, including consumers' valuation of quality, time to search for information, and availability of other information sources. When consumers obtain larger benefits from high-quality providers, have less time constraints in making provider decisions, or do not rely on other information sources (e.g., experience), they are more likely to seek new quality information. Consumers' inability to understand information can also deter information search. In home health care, patients are relatively old and often have cognitive problems, implying that they may not actively seek information. However, they can use assistance from family, social workers, discharge planners, or certifying physicians, who may be responsive to new quality signals. Patients are likely to make decisions on agency choice jointly with these agents. Other agency attributes (e.g., facility-affiliation status, staffing) also contribute to expected utility of consumers in making an agency choice.

For a complete discussion of the demand for home health care, we should consider agency choice in the presence of alternatives in the market. Consumers can choose one of the agencies in the market or select an "outside good"—an alternative provider group that offers postacute care. For example, hospital-discharged patients can use skilled nursing care or rehabilitation facilities to receive postacute care. For community patients, no alternative Medicare service is available because a preceding hospitalization is required for other postacute providers. We account for the movement between home health care and its alternatives by estimating a nested logit model, which incorporates the postacute market size, the share of outside goods, and the agency's market share among home health care users.

Supply-side factors also affect consumer demand. First, providers may change covered benefits or service bundles that are correlated with reported quality and enrollment decisions, for example, low-quality providers could include additional services in benefit packages to attract consumers. If a model does not capture this, its estimate on public reporting partially reflects the impact of the benefit changes. However, this possibility does not bias our estimation because Medicare home health care bundles are fixed, and no price change is likely due to zero cost sharing.

Second, some agencies with low scores may have exited the market after HHC. Frequent entries are observed during the study period. However, discrete choice models we use take into account changes in the choice set and do not depend on specific competitors in a market.

Finally, agencies are unlikely to have large incentives to engage in patient selection because Medicare payment increases when agencies offer a large number of therapy visits for

potentially high-risk patients (Medicare Payment Advisory Commission [MedPAC], 2012). Medicare also specifies that agencies should not refuse to treat a patient based on the patient's condition (CMS, 2010). We are not aware of any study that reports agencies' selection motives at the patient level. Low entry/exit costs in home health care may lead agencies to selectively exit or enter market areas (in response to HHC) to avoid certain types of patients (Jung & Feldman, 2012). However, our model corrects for dynamic supply changes, which independently influence enrollment patterns.

Analysis

Identification Strategy

A key challenge in our analysis is to correct the correlation between publicized and unobserved quality. Consumers are likely to develop perceptions about provider quality based on sources other than report cards. Such perceptions may be correlated with publicized quality leading to biased estimates. Our primary strategy to address this is to use quality data from both pre- and post-HHC periods and to compare the relation of reported quality to choice before and after public reports. We capture the effect of HHC by the difference in that relation between the two periods. The relation prior to HHC controls for the correlation between reported and perceived quality. This approach was used by Bundorf et al. (2009) and Werner et al. (2012).

In addition, we exploit the staggered implementation of HHC: HHC was introduced 6 months earlier in eight pilot states than the remaining states (nonpilot). Our model includes quarter fixed effects, as well as the interactions between HHC ratings and the post-HHC indicator. Because the timing of the HHC implementation varies by state, this model allows us to use an additional source of identification. This strategy is similar to Grabowski and Town (2011) and Konetzka, Polsky, and Werner (2013).

Finally, we observe some quality measures that are never disclosed to consumers. We use them to partially account for contemporaneous changes in the correlation between the reported and the perceived quality in response to HHC. The unreported quality includes patients' functional outcomes on activities such as grooming or phone use. It controls for time-varying relations between reported and unobserved quality to the extent that it is correlated with the reported quality. Table A1 in the appendix indicates the unreported quality is significantly correlated with the reported quality. Although limited, the use of unreported quality is an improvement on prior work, most of which assumed a time-fixed correlation between reported and unobserved quality.

Empirical Specification

Our empirical specification is based on a discrete choice model, where consumer utility is a function of agency quality and other attributes. We model a separate "nest" for home health. A nested model considers that the substitution among agencies differs from the substitution between home health care and the "outside good" and accounts for the correlation in unobserved utility among home health users. The utility of consumer i from choosing agency j in nest g in quarter t is

$$U_{ijt} = \sum_k \left[\beta_1^k QUAL_{jt}^k + \beta_2^k QUALY_{jt}^k * POST_{st} \right] + \gamma_1 UNREPO_{jt} + \gamma_2 UNREPO_{jt} * POST_{st} + X_{jt}\alpha + \xi_{jt} + \zeta_{ig} + (1 - \delta) \varepsilon_{ijt}, \quad (1)$$

where $QUAL_{jt}^k$ is the agency's k th reported score at quarter t . $UNREPO_{jt}$ is the agency's score on unreported quality indicators at quarter t . $POST_{st}$ indicates the post-HHC period (after the 2nd and 4th quarters of 2003 for pilot and nonpilot states, respectively). X_{jt} is a vector of observed agency attributes, ξ_{jt} is the mean utility of the unobserved agency attributes, ζ_{ig} is the mean utility associated with a nest, and ε_{ijt} is an independent and identically distributed extreme value random variable. The distribution of ζ_{ig} depends on the value of δ , which ranges from 0 to 1. As δ is closer to 0, the within-nest correlation vanishes. As δ is closer to 1, the within-nest correlation is high. $\zeta_{ig} + (1 - \delta)\varepsilon_{ijt}$ also follows an extreme-value distribution (Cardell, 1997). Based on this utility function, consumer i chooses agency j if $U_{ijt} > U_{ikt}$ for all k , where $k \neq j$.

Our individual-level data consist of home health users only, while we have market shares of the outside goods. We thus estimate a model that collapses the individual-level model into a market-level model. Berry (1994) showed that parameters of an individual utility model can be estimated using aggregated data by specifying market shares as a function of market and choice characteristics. This approach allows us to estimate the effect of quality on choice while accounting for nesting. Compared with a reduced-form demand model, it recovers parameters of structural choice models, which measure mean utilities associated with agency attributes. Following Berry (1994), we write Equation (2) as follows:

$$\ln(S_{jmt}) - \ln(S_{0mt}) = \sum_k \left[\beta_1^k QUAL_{jt}^k + \beta_2^k QUALY_{jt}^k * POST_{st} \right] + \gamma_1 UNREPO_{jt} + \gamma_2 UNREPO_{jt} * POST_{st} + \delta \ln(S_{jmt}|_{nest}) + X_{jt}\alpha + M_m + T_t + \xi_{jt} \quad (2)$$

S_{jmt} is the agency's market share among all patients eligible for home health care, and S_{0mt} is the share of patients using outside goods. Both terms are related to the post-acute market size and the movement between home health care and outside goods. $S_{jmt|nest}$ is the agency's market share within the nest (i.e., among home health users). County fixed effects (M_m) and quarter fixed effects (T_t) are added to control for market and time-specific effects influencing enrollments.

Our variables of interest are the interactions between the reported quality and the post dummy, which represent the difference in the relation of the reported quality to consumer choice before and after public reports. They capture the impact of publicized information on agency choice beyond the influence of consumers' (time-constant) perceived quality on choice. Possible changes in the correlation between the reported and the perceived quality in response to HHC are partially accounted for by the interaction between unreported quality and the post dummy.

We estimate Equation (2) with a linear regression. The within-group market share ($S_{jmt/nest}$) is endogenous because it is correlated with unobserved agency quality and characteristics, which are in the error term. Those unobserved agency attributes are also likely to affect the dependent variable, leading to biased estimates. We thus instrument the within-group market share variable. Valid instruments should influence the agency's share relative to competing agencies but should not be related to the agency's unobserved quality. Following Berry (1994), we use competitor attributes that are stable over time and that agencies would not choose responding to (unobserved) quality of other agencies: the proportions of agencies operating branches, offering occupational therapy, having pharmacist staff, and being facility-affiliated. They are good predictors of the within-nest market share: F -statistics in the first-stage range from 39.1 to 66.1 (Table A2 in the appendix).

Quality Measures

We use two measures to capture the publicized quality: (1) a composite score of functional outcome measures and (2) discharges without hospitalizations. We construct agency-specific quality scores by quarter following the method used for HHC as described in Murtaugh, Peng, Aykan, and Maduro (2007). The functional composite score is calculated as the mean of the risk-adjusted scores of HHC functional indicators, including ambulation, transferring, bathing, taking oral medication, and constant pain. All HHC functional indicators are positively correlated with each other, with correlation coefficients ranging between 0.43 and 0.75. This supports our composite score approach, but we also estimate the model with individual indicators to check the sensitivity of our results. For discharges without hospitalizations, we calculate each agency's risk-adjusted hospitalization rates during a 12-month period and then transform those rates to the percent of discharges without hospitalizations. We not only include both quality measures in the primary analysis, but also estimate the model using only one quality measure at a time.

As in HHC, we calculate quarterly quality scores using 12 months of data with an average 3-month lag and construct quality scores in both pre- and post-HHC periods consistently. We check our calculated scores against the reported scores in HHC using the postperiod data. The correlation coefficients between the two scores range from 0.8 to 0.9, indicating a good match.

To measure the unreported quality (UNREPO), we use indicators that are not included in HHC—grooming, preparing meals, housekeeping, and phone use—but are used in another Medicare home health quality initiative, Outcome-Based Quality Improvement (Murtaugh et al., 2007). We create scores of each indicator as changes in independence during an episode and calculate a composite unreported quality score as the mean value of the four indicators. We measure the unreported quality based on prior 12 months of data without a lag.

Separate Analysis

We estimate the model separately for hospital-discharged and community patients because the two groups have different choice sets of postacute providers. Hospital-discharged patients can consider other postacute providers, while community patients cannot. Outside goods are thus defined differently for each group. For the hospital-discharged group,

outside-good users are those who select skilled nursing or rehabilitation facilities or who do not receive postacute care. For community patients, we calculate the share of outside-good users as the proportion of the untreated among all beneficiaries who are not hospitalized.

Analyses With Alternative Identification Specifications

We perform several robustness checks. First, we conduct a falsification test using a false HHC implementation date: We limit the data to the pre-HHC period (up to first quarter of 2003) and create a false POST dummy (1 for third/fourth quarters of 2002, and first quarter of 2003). Under this counterfactual, we expect no significant change in home health choice related to quality scores.

Second, we conduct two analyses that do not use the additional identification source (the variation in timing of the implementation of HHC). We analyze the model excluding the pilot window but with all states and also estimate the model using only nonpilot states.

Third, we estimate the model including only markets that have agencies with different levels of quality—markets with a range of quality larger than one standard deviation of quality. Public reporting is likely to influence choice when agencies with different quality compete in a market.

Finally, we estimate a model specifying a separate time trend for each quality measure. We capture underlying changes in market shares by agency quality using a log trend, which reflects that a decreasing proportion of the population learns each time (Dafny & Dranove, 2008). We replace quality terms in Equation (2) with $\text{quality_score}_{jt} * \log(\text{quarter}_t)$. The HHC effect is thus captured as deviations from over-time market learning (time trends in market share changes).

Results

Descriptive statistics on the home health markets are presented in Table 1. Within-market variation in agency quality is sufficient: The average quality range (the difference between the maximum and minimum scores in a market-quarter) is 11 and 10 percentage points for functional outcomes and discharges without hospitalizations, respectively. An agency admits on average 19 and 18 percentage of hospital-discharged and community patients in the market, respectively.

Table 2 reports the results from the choice model. In the analysis of hospital-discharged patients (column 1), the coefficients on the noninteracted quality scores indicate that prior to HHC, both functional outcome and discharges without hospitalizations measures are negatively associated with utility. This is counterintuitive and suggests that agencies with high scores may have some unobserved attributes that consumer do not value (e.g., difficulties in scheduling nurse visits at convenient times). Not observing HHC ratings prior to reporting, consumers may have given large weights on those attributes in choosing agencies. However, the introduction of HHC changes that pattern. The coefficients on the interactions between the reported scores and the post dummy reveal that agencies with high functional outcome scores and discharges without hospitalizations are more likely to be

preferred after HHC than before. This suggests that consumers use publicized quality information in choosing an agency.

When the unreported quality measure is added to the model (column 2), its effect is positive and significant, suggesting that hospital-discharged patients use other sources of quality information in choosing agencies. More important, we find an independent effect of the publicized ratings on choice after controlling for the concurrent unreported quality score. The significant results on the interactions between the reported quality measures and the post dummy from this model confirm that hospital-discharged patients are responsive to public reporting.

Columns 3 and 4 report the estimates from the analysis of community patients. The results are similar to those above. After HHC, agencies with better performance had an increase in market shares. This finding stays robust when unreported quality is included, supporting that community patients are responsive to public reporting. The coefficients on the interaction between unreported quality and the post dummy are insignificant, implying that community patients do not value or use the unreported measure used in the analysis.

Using the results in Table 2, we obtain the marginal effect of public reporting on agency choice for an agency with a base market share of 20% (average within-market share). For hospital-discharged patients, the marginal effect is similar between the two quality measures. A one standard deviation increase in quality scores would increase the agency's annual market share for this group by 0.6 percentage points. In contrast, community patients have larger responses to functional outcomes than avoided hospitalizations: A one standard deviation increase in functional outcomes and avoided hospitalizations would increase the agency's annual market share of community patients by 0.9 and 0.5 percentage points, respectively.

These marginal effects indicate that community patients have larger responses to functional outcomes than hospital-discharged patients, while their responses to the avoided hospitalization measure is similar. This may be because hospital-discharged patients are less likely to seek publicized information due to time constraints or influence by the discharging hospital on their agency choice. It might be due to the difference in the condition composition. The top five diagnoses among hospital-discharged patients are diabetes, rehabilitation procedures, symptoms involving musculoskeletal/nervous system, other aftercare, and heart failure. Among these five diagnoses, the first three are also top diagnoses among community patients whose common conditions include arthritis and chronic ulcer (Murtaugh, Peng, Moore, & Maduro, 2008). While our result may partially reflect that patients choose an agency specializing in their condition (e.g., arthritis), it is unlikely to be entirely driven by that, given the degree of overlap in the common conditions. Alternatively, the differential response observed only for functional outcomes may imply that functional outcomes are meaningful information to community patients. Literature has shown that community patients tend to need a high level of functional assistance than hospital-discharged patients (MedPAC, 2013; Murtaugh et al., 2008). We conduct an additional analysis to explore this possibility using an individual-level choice model in the next section.

Table 3 displays the findings from robustness checks, which show consistent results with the primary analysis. The analysis with a false HHC implementation date supports that the effect of quality scores on choice from the primary analysis is not driven by time trends. Most interactions between the false dummy and scores are insignificant, and there is no evidence that market shares for high-quality agencies increased after the false implication date. Second, the results from the analyses that do not use the variation in the HHC implementation timing are similar to the primary analysis. Finally, the analysis with markets only including agencies with different quality also supports the finding that consumers use publicized information in choosing an agency.

The model with a separate time trend for each quality measure indicates upward deviations from enrollment trends toward high-scored agencies after HHC, and analyses with individual quality measures also produce consistent results that community patients are more responsive to functional outcomes than hospital-discharged patients (Table A3 in the appendix).

Additional Analysis

We found above that community patients have larger responses to the reported functional outcome measure than hospital-discharged patients. We posited that functional outcomes may be meaningful information to community patients, who tend to use a high level functional assistance (Murtaugh et al., 2008).⁵ We explore our potential explanation by examining whether patients with greater functional limitations are more responsive to the reported functional outcome measure. We estimate a patient-level (conditional logit) choice model separately for those with and without functional limitations at the start of care.⁶

We estimate an individual's utility function—Equation 1—conditional on home health care use. We use a 5% random sample of home health users to reduce computational burdens. For hospital-discharged patients, the coefficient on the interaction between functional outcomes and the post dummy is greater among those with functional limitations than those without (Table 4).⁷ This implies that hospital-discharged patients who would get greater benefits from functional assistance have larger responses to functional outcomes than those who do not. We observe this pattern only among hospital-discharged patients. This may be because a poor functional status at the end of a hospitalization can be potentially temporary, and thus hospital-discharged patients with functional limitations may form higher utility from functional outcomes than those without. While explorative, our finding suggests that consumer response to public reporting may be larger to more meaningful or valuable information.

⁵Our data also indicate that community patients are more functionally limited at the start of care than hospital-discharged patients (not shown; available on request).

⁶A patient's functional limitation is measured by whether she or he requires others' assistance in performing daily activities included in HHC (ambulation, transferring, bathing, taking oral medication, and pain) at the start of care.

⁷It is difficult to directly compare coefficients across logit models due to differences in the scale parameters. But we can compare relative contributions of the variable of interest to the contribution of another (specific) variable. In Table 4, the difference in the coefficient on $\text{FUNC} \times \text{POST}$ between the two groups is greater than the difference in the coefficient on $\text{HOSP} \times \text{POST}$. This implies that the relative contribution of functional outcomes to utility compared with that of hospitalizations is greater among patients with functional limitations than those without.

Discussion

We find that agencies with high quality scores were preferred by beneficiaries after the introduction of public reporting. This finding is robust to alternative specifications that account for over-time learning about agency quality or do not use the variation in the timing of the HHC implementation. However, the magnitude of the effect of public reporting on home health choice is small, suggesting that the current public reporting approach is unlikely to have critical impacts on home health agency choice in Medicare.

The analysis indicates that a one standard deviation increase in each reported quality score increases an average agency's annual market share by 0.6 to 0.9 percentage points for each type of patients. This is similar to the estimate reported in postacute nursing home choice (Werner et al., 2012) but is smaller than those in fertility clinic or health plan choice (Bundorf et al., 2009; Jin & Sorensen, 2006; Scanlon et al., 2002). The small responsiveness may be because home health patients can relatively easily change nurses/aides after experience without disturbing the course of a treatment and without agency switching. It may also be because home health patients are often frail and cognitively impaired and thus may not search for information or easily assess the information with a multitude of quality indicators. While these factors are expected to lower the demand for quality information, given the absence of consumer price and travel cost in home health, that is, the responsiveness would be smaller if high-scoring agencies had higher prices/costs, our estimate suggests that further efforts are needed to increase use of quality information by consumers.

Our analysis indicates that consumer response to information disclosure differs by patient group. Community-based patients are more sensitive to functional outcomes than hospital-discharged patients. This may be partially because community patients are more engaged in seeking information due to less time constraints than hospital-discharged patients. Alternatively, it may reflect the possibility that consumers are more likely to search for meaningful information.

An exploratory analysis at the individual level shows that at least among hospital-discharge patients, those with a functional limitation(s) at the start of care have greater responses to functional outcomes than those who do not. This is suggestive evidence that consumers are likely to search for quality information that is valuable or meaningful to them. While we cannot quantify the degree to which the difference in consumers' valuation contributes to the difference in the responsiveness, our finding suggests that releasing relevant information can increase the effectiveness of public reporting.

Recently, Medicare added process measures, such as pain status check, to HHC (MedPAC, 2013). Use of process-oriented, clinical quality measures has been common in public reporting programs in health care. The effect of those process-oriented measures on agency choice is not yet known; yet a study of hospital choice reported that the contribution of process-oriented clinical quality is only one third of that of consumer satisfaction (Jung, Feldman, & Scanlon, 2011). Clarifying what types of information consumers value in

making home health choices would help devise effective public reporting in home health care markets.

Certain strategies would also improve the use of publicized quality information. Designing financial incentives, such as tiered cost sharing (by provider quality), for consumers to choose high-quality providers is a possibility. Another strategy would be to increase awareness about public reporting. Harris and Buntin (2008) reported that only 9% to 24% of consumers were aware of provider quality information and that less than a quarter of consumers who were aware of quality information used it in provider choice. This low awareness of report cards remains unchanged in recent years (Scanlon, Shi, Bhandari, & Christianson, 2015). Furthermore, a study reported that consumers' searching for quality information did not influence provider switching (Abraham et al., 2006). Given this, ensuring that their joint decision makers know about public reporting could help effective use of quality information. In home health care, if physicians, discharge planners, or social workers are aware of quality information in HHC, they could incorporate such information in their recommendations for agencies.

Small consumer response to quality information is an indication that public reporting programs do not critically affect consumers' provider choice. However, it does not necessarily imply that report cards do not offer values. Other ways that publicized quality information can be useful should be noted. For example, providers can compare their own scores with those of their peers or competitors, and improve quality to preserve reputation or professional responsibilities. Purchasers/payers use quality information in making contract decisions with individual providers or in developing provider payment systems. While it would be ideal to have large consumer response to quality information, the value of report cards can go beyond consumer response and should be assessed with consideration of all pathways through which quality information is used.

We note several limitations of the study. First, we use unreported quality to account for the changes in the relation between the publicized and perceived quality that are timed to HHC. However, this controls for those changes only to the extent that the unreported measure captures the perceived quality. While imperfect, our approach is an improvement over most prior studies that assumed no over-time changes in the perceived quality. Second, the analysis to explore consumer response to meaningful information is limited to patients with functional limitations. Using patients' conditions that are specifically related to quality measures would be ideal to draw a complete picture of whether consumers use relevant information. Third, we do not account for the possibility that agencies with high ratings may not be able to accept new patients. It is not clear how to define provider capacity in home health care, where patients receive care at home. An exploration of this issue using the level of workforce in our data shows no clear pattern in staffing between high- and low-quality agencies. This suggests that the study results are not greatly affected by agency capacity. Fourth, we do not have information on whether patients actually "used" public information. Thus, we cannot tell whether the small effect is because consumers did not use quality information or because consumers did not change their choice after using the information. Identifying reasons for small consumer response is an important topic to pursue in future research. Finally, we examine the impact of public reporting on agency choice during the

early years of HHC. The study results thus captures initial responses to HHC and may not be generalizable to recent years. Consumer response to HHC may have changed over time. Particularly, HHC has added new quality measures, which focus on process-oriented quality of care. The impact of those new measures on consumer choice has yet to be examined.

Despite these limitations, we are the first to study Medicare beneficiaries' responses to public reporting in home health care—a setting where consumer price and travel costs are zero, and costs of switching providers may be low. We find that the effect of public reporting on agency choice is small. Further efforts and strategies are necessary to increase the effectiveness of public reporting.

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Appendix

Table A1

Correlations Among Quality Measures.

	Functional outcomes (composite scores)	Discharges without a hospitalization	Unreported quality (composite scores)
Functional outcomes (composite scores)	1.000	0.033 ***	0.266 ***
Discharges without hospitalization		1.000	0.019 **
Unreported quality (composite scores)			1.000

**
 $p < .05$.

 $p < .01$.

Table A2

First-Stage Results.

Variable	Coefficient (standard error)	
	Hospital-discharged patients	Community-based patients
Functional outcomes (FUNC)	−0.060 (0.080)	−0.075 (0.080) ***
Discharges without hospitalizations (NO_HOSP)	0.369 (0.078) ***	−0.398 (0.078) **
FUNC × POST	0.208 (0.094) **	0.220 (0.100) ***
NO_HOSP × POST	−0.353 (0.090) ***	−0.334 (0.100)
Unreported quality	−0.011 (0.047)	0.039 (0.047) ***
UNREPO × POST	0.076 (0.056)	0.093 (0.056) ***
Number of home health aides ^a	0.003 (0.001) ***	0.020 (0.001) **
Number of registered nurses ^a	0.003 (0.0001) **	0.004 (0.0000) ***
Facility-affiliated agency	0.093 (0.008) ***	0.087 (0.008) ***

Variable	Coefficient (standard error)	
	Hospital-discharged patients	Community-based patients
New agency (<5 years)	-0.202 (0.009) ***	-0.245 (0.009) ***
Percentage of branch-operating agency	0.013 (0.022)	-0.059 (0.022) ***
Percentage of facility-affiliated agency	-0.039 (0.032)	0.049 (0.032) **
Percentage of agencies occupational therapy	-0.225 (0.023) ***	-0.278 (0.023) ***
Percentage of agencies with pharmacy	0.214 (0.064) ***	0.103 (0.064) **
Constant	-2.249 (0.041) ***	-2.126 (0.042) ***
<i>N</i>	154,112	162,250

^aUnit is 10 persons; *F*-statistics of the excluded instruments are 66.06 and 39.07 for the analyses of hospital-discharged and community-based patients, respectively; all models include market fixed effects, time fixed effects, and a post dummy.

* $p < .1$.

** $p < .05$.

*** $p < .01$.

Table A3

Results From Analysis With Separate Time Trends for Quality Measures.

Variable	Coefficient (standard error)	
	Hospital-discharged patients	Community-based patients
<i>Analysis with log-trends for quality measures</i>		
FUNC × ln(quarter)	-0.105 (0.086) ***	-0.052 (0.014) ***
NO_HOSP × ln(quarter)	-0.060 (0.0185) **	-0.028 (0.052) *
FUNC × POST	0.198 (0.055) ***	0.220 (0.042) ***
NO_HOSP × POST	0.199 (0.053) ***	0.129 (0.042) **
<i>Results from Analysis with Individual Quality Measures</i>		
Functional outcome measure only		
FUNC	-0.233 (0.035) ***	-0.149 (0.026) ***
FUNC × POST	0.158 (0.039) ***	0.227 (0.031) ***
Hospitalization measure only		
NO_HOSP	-0.147 (0.033) ***	-0.114 (0.028) ***
NO_HOSP × POST	0.166 (0.038) ***	0.173 (0.030) ***
Analysis with individual functional outcome indicators		
Ambulation × POST	0.032 (0.033)	0.118(0.028) ***
Transferring × POST	-0.014(0.026)	0.011(0.018)
Bathing × POST	0.060(0.027) **	0.164(0.022) ***
Taking oral medication × POST	0.092(0.025) ***	0.178(0.020) ***
Pain × POST	0.011(0.022)	0.108(0.017) ***

* $p < .1$.

** $p < .05$.

*** $p < .01$.

Figure A1.

An example of Home Health Compare (HHC).

Note. The comparison table pops up when a consumer visiting the HHC website types in a ZIP/city/state. Consumers can choose quality measures of interest and select up to three agencies for a comparison.

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Table 1

Summary Statistics on Agency and Market Characteristics.

Variable	Mean	Standard deviation
Agency characteristics ^a		
Number of home health aides	7.78	25.04
Number of registered nurses	16.41	98.09
Facility-affiliated agency	0.26	0.44
New agency (<5 years)	0.17	0.37
Agency quality scores ^a (min: 0, max: 1)		
Functional outcomes	0.42	0.08
Discharges without hospitalization	0.75	0.06
Unreported quality	0.53	0.17
Range of reported quality scores within markets ^b		
Functional outcomes	0.11	0.09
Discharges without a hospitalization	0.10	0.10
Number of agencies per market	5.99	11.22
Average market share per agency among home health users		
Hospital-discharged patients	0.19	0.21
Community-based patients	0.18	0.20

^aThe unit of observation is agency-year and agency-quarter for agency characteristics ($N = 21,439$) and agency quality scores ($N = 61,671$), respectively. The study data are not balanced. Any agency meeting the inclusion criteria is used regardless of its number of time periods observed.

^bThe differences between the minimum and maximum quality scores in a market.

Table 2

Estimates From the Analyses of Home Health Agency Choice.

Variable	Coefficient (standard error)			
	Hospital-discharged patients		Community-based patients	
Functional outcome (FUNC)	−0.046 (0.030) *	−0.219 (0.034) ***	−0.129 (0.025) ***	−0.140 (0.026) ***
Discharges without a hospitalization (NO_HOSP)	−0.154 (0.032) ***	−0.128 (0.033) ***	−0.098 (0.029) ***	−0.103 (0.028) ***
FUNC × POST	0.144 (0.037) **	0.138 (0.037) **	0.231 (0.030) ***	0.211 (0.032) ***
NO_HOSP × POST	0.152 (0.036) ***	0.160 (0.036) ***	0.147 (0.030) ***	0.150 (0.031) ***
Unreported quality (UNREPO)		0.288 (0.025) ***		0.020 (0.016)
UNREPO × POST		0.088 (0.021) ***		0.031 (0.019)
Nesting parameter	0.689 (0.022) ***	0.678 (0.023) ***	0.720 (0.026) ***	0.719 (0.026) ***
No. of aides ^a	0.002 (0.0006) ***	0.002 (0.0005) ***	0.005 (0.0006) ***	0.005 (0.0006) ***
No. of nurses ^a	0.002 (0.0001) ***	0.001 (0.0001) ***	0.001 (0.0001) **	0.001 (0.0001) *
Facility-affiliated agency	0.156 (0.011) ***	0.157 (0.012) ***	0.023 (0.004) ***	0.023 (0.003) ***
New agency ^b	−0.131 (0.011) ***	−0.123 (0.012) ***	−0.038 (0.007) ***	−0.039 (0.007) ***
Constant	−2.741 (0.057) ***	−2.87 (0.065) ***	−5.939 (0.061) ***	−5.947 (0.061) ***
R ² (within)	0.907	0.906	0.871	0.871
N ^c	154,112		162,250	

Note. All models include market fixed effects, time fixed effects, and a post dummy.

^aUnit is 10 persons.

^b<5 years.

^cUnit of observation is agency-market-quarter.

* $p < .1$.

** $p < .05$.

*** $p < .01$.

Table 3

Results on Selected Variables From Alternative Identification Strategies.

Variable	Coefficient (standard error)	
	Hospital-discharged patients	Community-based patients
Falsification test ^a		
FUNC × POST (false date)	−0.115 (0.060) *	0.026 (0.055)
NO_HOSP × POST (false date)	0.036 (0.058)	0.076 (0.050)
Analysis without using variation in HHC implementation timing due to pilot		
Excluding pilot window (all states)		
FUNC × POST	0.187 (0.046) ***	0.288 (0.390) ***
NO_HOSP × POST	0.176 (0.044) ***	0.190 (0.037) ***
Nonpilot states only		
FUNC × POST	0.129 (0.044) ***	0.161 (0.031) ***
NO_HOSP × POST	0.143 (0.042) ***	0.107 (0.030) ***
Analysis limited to markets with a range of quality ^b		
FUNC × POST	0.129 (0.039) ***	0.193 (0.025) ***
NO_HOSP × POST	0.128 (0.037) ***	0.200 (0.024) ***

Note. HHC = Home Health Compare.

^aData are limited to the prereporting period, and the post dummy is based on a false public reporting implementation date.

^bMarkets with a range of quality greater than one standard deviation of quality scores.

*
 $p < .1$.

**
 $p < .05$.

 $p < .01$.

Table 4

Consumer Response to Home Health Compare by Patients' Functional Limitations: From Patient-Level Conditional Logit Estimation.

Variable	Coefficient (standard error)	
	With functional limitations ^a	Without functional limitations ^a
Among hospital-discharged patients		
FUNC × POST	0.983 (0.141) ***	0.827 (0.165) ***
NO_HOSP × POST	0.434 (0.149) ***	0.398 (0.174) **
N ^b	917,194	691,152
Among community-based patients		
FUNC × POST	0.898 (0.147) ***	0.935 (0.183) ***
NO_HOSP × POST	0.184 (0.159)	0.129 (0.200)
N ^b	736,040	534,711

Note. Analyses are based on a 5% random sample of home health care users between 2001 and 2006; all models use agency attributes (agency size, staff size, being a new agency, operating branches, and offering occupational therapy and pharmacy services).

^aWith (without) functional limitations on daily activities (ambulation, transferring, bathing, taking oral medication, and pain) at the start of care.

^bUnit of observation is patient-choice.

*
 $p < .1$.

**
 $p < .05$.

 $p < .01$.