Published in final edited form as:

Arch Gerontol Geriatr. 2012 May ; 54(3): e300–e306. doi:10.1016/j.archger.2011.07.018.

Predictors of Functional Capacity Changes in a US Population of Medicare Home Health Care Patients with Heart Failure

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Abstract

Purpose—Functional capacity is widely recognized as a key factor in maintaining the ability of older people to live independently and safely at home. Promoting functional capacity is an important priority particularly in home health care (HHC). The purpose of the study was to examine predictors of functional capacity change among HHC patients with heart failure (HF).

Materials and methods—Clinical and administrative data from 2005 from the Medicare Chronic Conditions Warehouse were linked at the population level for HHC patients with a primary diagnosis of HF. The primary outcome was change in functional capacity score from HHC admission to HHC discharge.

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Conflict of interest: The authors report no financial or personal relationships influencing the work presented here.

Results—Over the course of the episode ($M = 44$ days), most (70%) patients improved, 15.6% stayed the same, and 14.4% declined in ADL scores. The mean change score was modest (mean = -0.74 , $SD = 1.11$) with a median change of -0.58 . Multivariate analyses ($R^2 = .23$) showed that the largest influence was the admission ADL score followed by receiving any physical therapy, admission ability to manage oral medications, cognitive functioning, rehabilitation prognosis, and urinary incontinence.

Discussion—There is a modest rate of improvement from admission to discharge that likely represents the progressive nature of HF and/or the short time frames over which home health care is provided. Providers may want to use the predictive factors to identify patients most at risk for functional decline.

Keywords

home and community based care services; heart disease; functional status

Introduction

Functional capacity is widely recognized as a key factor in maintaining the ability of older people to live independently and safely at home and is a key focus area for home health care. Home health care in the United States is provided by more than 10 000 home health care agencies to more than 3 million Americans (Centers for Medicare & Medicaid Services, 2010). Home health care is distinguished by the provision of care by health care professionals (registered and licensed practical nurses, physical, occupational and speech therapists, medical social workers) with very limited care provided by paraprofessionals. Home health care is paid for by both governmental and private insurance payers with the largest proportion of patients being age 65 and older and payments from Medicare, the governmental payment system for older Americans. However, while there is extensive research on functional capacity among heterogeneous older populations in home health care, there is substantially less condition- and disease-specific research that may more closely guide actual practice (Ryburn, Wells & Foreman, 2009).

Functional capacity in home health care patients

There has been relatively little research on functional capacity changes among home health care patients. Functional capacity in home health care is most often measured with examination of activities of daily living (ADLs) from the standardized assessment set required by Medicare for home health care patients, the Outcome and Assessment Information Set (OASIS). In a study specific to a national sample of heart failure patients within home health care, Madigan (2008) found that there were modest improvements in functional capacity for activities of daily living and 18.3% of patients had no change from admission to discharge. These findings are consistent with other studies in home health care with heterogeneous patient groups where most home health care patients are found to improve from admission to discharge. Keepnews and colleagues (Keepnews, Capitman, & Rosati, 2004), in a study within one large Northeastern agency, found that most (78%) home health care patients improve in functional capacity between admission and discharge. The strongest factor associated with functional capacity score at discharge was the admission functional capacity where higher scores at admission were associated with better abilities at discharge. Worse functional status was associated with increased age, visual impairment, confusion or cognitive status impairment, having Medicaid, and use of emergency care while better functional status was associated with having open wounds or lesions, orthopedic and cardiovascular conditions.

Functional capacity has also been found to be associated with other important outcomes within home health care including hospitalization. In a sample of Medicare home health care patients, Fortinsky and colleagues (Fortinsky, Madigan, Sheehan, Tullai-McGuinness & Fenster, 2006) found that worse functional status increased the likelihood of hospitalization, even after controlling for other important factors associated with hospitalization (AOR = 1.18; 95% CI 1.05 – 1.92).

The effects of rehabilitation type programs in home health care for improving outcomes for patients with HF have been studied with generally positive outcomes on functional status. Fusco and colleagues (Fusco et al., 2009), in a study of community dwelling older Italian people, found that one third of patients improved during home rehabilitation. A number of clinical factors were associated with worse functional status including cognitive impairment, hearing or visual impairment, depression, and urinary or bowel incontinence. In the US, the Heart Failure: A Controlled Trial Investigating Outcomes of Exercise Training (HF-ACTION) study of more than 2000 persons with HF found that exercise improved HF-related quality of life (Flynn et al., 2009) yet other research indicates that less than one-third of home health care patients, regardless of diagnosis, receive physical therapy or rehabilitative therapy (Brega, Jordon & Schlenker, 2003).

There is also evidence of functional capacity differences between racial and ethnic groups in home health care with whites (non-Hispanic) generally having better functional status by individual ADL items than the other groups and particularly better than African Americans (Brega, Goodrich, Powell & Grigsby, 2005). This is in contrast to other research by Peng and colleagues from one large Northeastern US agency where there were no differences in ADL functional status by race or ethnicity (Peng, Navaie-Waliser & Feldman, 2003).

Finally, when comparing users of home health care with non-users, Hadley and colleagues (Hadley, Rabin, Epstein, Stein & Rimes, 2000) used an instrumental variable approach to evaluate the effectiveness of home health care on functional capacity improvement for Medicare patients who had been hospitalized. Using data from the Medicare Current Beneficiary Summary file, home health care users had better functional status than non-users of home health care.

Factors beyond patient level—agency level and geographic level

In addition to the patient level factors that influence functional capacity, there also may be other factors which affect functional capacity. Home health care agency characteristics, such as being based in a hospital system or agency profit status, have had mixed results in past research on patient outcomes in heterogeneous patient groups who have multiple diagnoses and conditions (Brega et al., 2003). Research examining Medicare home health care policy changes suggest that a broader look at factors related to the geographic area also may be important in understanding home health care practice patterns and patient outcomes (Choi & Davitt, 2009; FitzGerald et al., 2006). However, within home health care specific to heart failure, most of the research to date has focused on one or a smaller number of home health care agencies, limiting the ability to examine agency and geographic factors. While Madigan (2008) examined a national population, she did not include geographic factors but focused only on patient factors.

Purpose of the Study

The purpose of the study was examine the independent effects of patient-level factors, geographic factors, agency-specific factors, and home health care resource use on functional capacity in a national sample of Medicare home health care patients with heart failure.

Materials and Methods

Conceptual model

The study was guided by an adaptation of the Andersen model (Andersen, 1995) that has been widely used within health services research and by researchers studying home health care. The Andersen model identifies patient-level, provider-level, and geographic-level factors that influence outcomes. See Figure 1 for description of the Andersen model. We identified potential predictors from the domains of environment, patient characteristics, and home care resource use as described below.

Data sources and data file merging

Data were obtained from the Centers for Medicare & Medicaid Services Chronic Conditions Warehouse (CCW) following IRB approval and completion of a Data Use Agreement with CMS. The Chronic Conditions Warehouse was designed by CMS to simplify and improve access to Medicare data for research. Starting with 2005, the CCW includes 100% of Medicare beneficiaries with the qualifying diseases. In addition, the CCW provides a CCW-specific patient identifier that removes use of Medicare and Social Security numbers from research data to provide additional identity protections to Medicare beneficiaries.

Data sources

For environment, we identified 6 county level factors including the degree of rurality of the county using the Rural-Urban Continuum code (Vanderboom & Madigan, 2007), the number of home health care agencies, the number of skilled nursing facilities, and the number of short term general hospitals. These items were derived from the Area Resource File (ARF). For agency level factors, we identified two measures from the Provider of Service (POS) file: whether the agency was hospital based and agency ownership (i.e. private/proprietary, government, or non-profit).

Patient level factors were identified following the Andersen model. The predisposing factors were age, gender and race/ethnicity. Enabling factors were whether the patient lived alone, had a caregiver and had both Medicare and Medicaid as payment for services. Need factors included admission ADL score, admission ability to manage oral medications, dyspnea, cognitive functioning, anxiety, having any depressive symptoms, having any high risk factors, having any problematic behaviors, life expectancy, primary diagnosis severity, primary caregiver, overall prognosis, rehabilitative prognosis, total number of comorbidities, and urinary incontinence. We used total number of comorbidities instead of a global measure of comorbidity as OASIS has been identified as not sufficiently broad to capture all comorbid conditions; this is a function of allowing only 5 secondary diagnoses (Koroukian et al., 2011).

From a clinical perspective, the most relevant variables for patients with HF include dyspnea (as a cardinal symptom of HF), ability to manage oral medications (important in the management of HF), cognitive functioning (influenced by blood oxygenation level and effectiveness of circulation), and depressive symptoms (as patients with HF are known to have high levels of depressive symptoms). Dyspnea, OASIS item M490, is determined by the clinician rating of when the patient is dyspneic or short of breath. It is designed to be observed by the clinician, not as an interview question. Depressive feelings (OASIS item M590) can be reported by patients or observed by clinicians and includes “depressed mood, sense of failure or self-reproach, hopelessness, recurrent thoughts of death or thoughts of suicide.” Clinicians mark all depressive symptoms that apply or none of the above. Cognitive functioning (OASIS item M560) ranges from response 0 “alert and oriented...” to response 4 “totally dependent due to disturbances such as constant disorientation, coma,

persistent vegetative state or delirium.” This item is to be based on clinician observation and patient and family report.

Ordinal items (e.g. ability to manage oral medications, dyspnea) were left as ordinal items; race was re-categorized to African American versus all other races to collapse the less common and smaller racial categories. These data were obtained from the Outcome and Assessment Information Set (OASIS). Further detail on the OASIS has been reported by others (Rosati 2009).

Home care resource use was examined by analyzing two variables: receiving any physical therapy visits and weekly visit intensity. Nursing visits were received by almost all patients (>99%), limiting the usefulness of examining the influence of nursing only services. Weekly visit intensity was calculated by dividing the total number of visits by the length of stay (Madigan & Fortinsky, 1999) and multiplying by seven. A visit intensity rate was used to control for similar numbers of visits being provided over varying lengths of stay. These data were obtained from the Home Health Standard Analytic File (SAF), the billing data file.

Finally, the outcome of interest was the functional capacity change score, calculated by subtracting the score at admission from the score at discharge for ADL items. The outcome was obtained from the OASIS.

Definition of functional capacity change

Within the OASIS, there are individual items that assess different aspects of functional performance. The ADL items include grooming, dressing upper body, dressing lower body, bathing, toileting, transferring, ambulation/locomotion, and feeding or eating. The individual items have different levels of scoring—for example, ambulation/locomotion ranges from 0 (independent) to 5 (bedfast, unable to ambulate) while dressing upper body ranges from 0 (independent) to 3 (requires total assistance to dress upper body).

As OASIS was not designed for scale scoring, there has been past research to determine whether a composite score is appropriate for use in research. Using both Rasch scaling and a simpler approach that adjusts for the number of responses within each item (referred to as the corrected Likert approach), both methods were determined to be appropriate for research (Fortinsky, Garcia, Joseph Sheehan, Madigan & Tullai-McGuinness, 2003). In the present study, we use the corrected Likert approach where each response is divided by the highest value possible for that ADL. For example, an ambulation score of 3 for an individual patient is scored as a 0.60 (3/5). The individually adjusted items are then summed for a total functional capacity score ranging from 0 to 8.

Given our focus on functional capacity change from home health care admission to discharge, we limited our sample to those patients with functional capacity data at both time points. We did not include partial episodes of care (e.g. start of care in 2005 and discharged in 2006). As 23% of patients ended their home health care episode without a discharge (e.g. were hospitalized and did not return to care, or died, in 2005), we had complete functional status data on 77% of the patients with HF available in the dataset.

Sensitivity analysis was done to evaluate the differences between the groups who had complete functional status information (77%) and the 23% who ended their home health care episode without a discharge (most often hospitalized or died). There were no statistically significant differences in age or ethnicity. The group without a discharge had substantially higher mortality (52% vs 14%, $\chi^2 = 18,070$, $p < .001$) with fewer at maximal independence at admission (Likert corrected score of 0 2.8% vs 6%, $\chi^2 = 4027.1$, $p < .0001$)

and higher levels of ADL dependence at admission (Likert corrected score 9.0 vs 7.0, $t = 64.1$, $p < .0001$).

OASIS data reliability and validity have been evaluated by a number of researchers since its implementation into clinical practice. Overall, inter-rater reliability has been found to be adequate or better with Kappas of .60 or higher (Landis & Koch, 1977) with sufficient coefficient alpha statistics by most researchers examining OASIS reliability (Hittle et al., 2003; Madigan & Fortinsky, 2000; Madigan & Fortinsky, 2004; Madigan, Tullai-McGuinness & Fortinsky, 2003). There has been some discrepancy in findings, however, with some researchers finding lower reliability scores (Kinatukara, Rosati & Huang, 2005). OASIS validity was examined by comparing OASIS scores with “gold standard” measures of 3 domains: cognitive status, functional capacity and depressive symptoms (Tullai-McGuinness, Madigan & Fortinsky, 2009). Depressive symptoms from OASIS were under-reported when compared to the Center for Epidemiologic Studies-Depression scale ($r = .36$). OASIS functional capacity items correlated highly with the Older Americans Resources and Services (OARS) instrument (overall $r = .71$) while OASIS cognitive impairment correlated highly ($r = .62$) with the Short Portable Mental Status Questionnaire (SPMSQ).

Analysis

Using the Andersen model as a conceptual guide, we identified 30 possible predictor variables and then built our analytic models using all predictors and a reduced model in which the predictors had to have an association with the outcome variable. We evaluated several approaches to how to evaluate the outcome: 1) using the discharge score as the dependent variable with the admission score as a covariate; 2) dichotomizing and trichotomizing the scores into decline/did not decline or improved/stayed the same/declined, respectively; 3) using a change score. For the first approach, despite a number of variable transformations, we could not obtain a normal distribution of the raw scores. For the second approach, change scores within the improved and declined groups varied widely and we concluded that using a categorical approach would unreasonably obscure these variations. The change score approach yielded results meeting the assumption for normality of the distribution and allowed us to examine the extent of change within the entire study population. The change score was derived by subtracting the summed ADL admission score from the summed ADL discharge score, yielding a range from -7.2 to $+7.2$, with negative scores indicating improvement in functional capacity.

We also used several approaches to determine the best set of predictor variables for the reduced model. As a preliminary step, any variable found to have a correlation with the outcome variable with a significance level less than 0.30 was retained for further consideration in the model building process. Several variables (race/ethnicity, age and gender) were included for theoretical reasons and were forced into the model. The final step was retaining independent variables with a multivariate p value of .01 or lower. A p value of .01 rather than 0.05 was chosen because of the large sample size. Multilevel modeling with regression was implemented using SAS 9.1 procedure, PROC MIXED with the agency's Medicare provider number as the random effect variable.

Additionally, as we did not sample within the agency level variable but used a population approach, we also used PROG REG for multiple regression analysis to explore differences based on the agency and geographic factors. The results for the influence of the independent variables (not reported here) were almost identical to the multilevel model results. We do report the R^2 for the multiple regression analysis as PROC MIXED does not provide this information.

Table 1 provides the demographic information for the national population of 2005 Medicare home health care patients with heart failure as a primary home care diagnosis (n=82 080). Most patients (62%, 51 224) were female and the mean age was 81.0 (SD =9.4) years. There were substantial numbers of African Americans (13%) but relatively few other minorities, likely representing the OASIS item for race/ethnicity determination that does not follow the governmental coding of Hispanic ethnicity. Most patients lived in urban areas (77%) and were served by non-profit home health care agencies (61%) with one-third served by for-profit agencies. The mean length of stay in home health care was 44.1 days with a median of 35 (SD = 36.6 days; range 0 – 359 days); 87% of the patients had one episode of home health care (60 days or fewer).

Results

There was a wide range of ADL scores at both admission and discharge (Table 2) with the entire possible range of scores represented among the patients. Few patients were at the ceiling or floor for ADL scores at admission: 5.6% of the patients were 0 (totally independent in all ADL items) and 0.02% were 8 (totally dependent in all ADL items). On average, patients had minimal impairment: mean admission ADL score was 1.92 (SD = 1.47) and discharge ADL of 1.17 (SD = 1.41). As the ranges and standard deviations were wide, we also report the medians which were 1.67 and .60, respectively. We found that 70% of the patients improved, 15.6% stayed the same, and 14.4% declined in ADL scores over the episode of care. The change score, had a mean of -0.74 (SD = 1.11) with a median change of -0.58.

Multivariate analysis results

The multivariate analysis data includes complete data on 82 080 patients as missing variables in any of the data sets resulted in the case being dropped from the multivariate analysis. For the multivariate analysis, the change score was used as the dependent variable. (See Table 3.) Negative coefficients for the independent variables indicate that there were improvements in functional capacity from admission to discharge. The independent variable with the largest influence on the outcome was the admission ADL score (standardized regression coefficient = -.55) followed by any physical therapy visits (standardized regression coefficient = -.09), admission ability to manage oral medications (standardized regression coefficient = .08), cognitive functioning (standardized regression coefficient = .07), age (standardized regression coefficient = .07), rehabilitation prognosis (standardized regression coefficient = -.06) and urinary incontinence (standardized regression coefficient = .06). The remaining standardized regression coefficients were all .05 or lower in magnitude.

For the reduced model, there were 20 independent variables that met the criteria for inclusion in the multivariate model and we used the PROC MIXED procedure in SAS. Table 3 reports the model results. Again, the admission ADL score had the highest standardized regression coefficient (standardized regression coefficient = -.55) followed by any physical therapy visits (standardized regression coefficient = -.09), admission ability to manage oral medications (standardized regression coefficient = .08), age (standardized regression coefficient = .07), cognitive functioning (standardized regression coefficient = .07), rehabilitation prognosis (standardized regression coefficient = -.06), and urinary incontinence (standardized regression coefficient = .06). The remaining standardized regression coefficients were all .05 or lower. Positive scores in the outcome indicate worsening functional capacity because of the coding for the change score. In summary, improved functional capacity change (a more negative change score) was associated with worse ADL scores at admission, receiving any physical therapy visits, better ability to manage oral medications at admission, being younger than age 85, better cognitive

functioning, worse rehabilitation prognosis and no urinary incontinence. Using PROG REG multiple regression, for the entire model, the explained variance, R^2 was .23 ($F = 836.28$, $p < .001$) while for the reduced model, the R^2 was .23 ($F = 1252.9$, $p < .001$).

Discussion

In summary, most patients (70%) improved over the episode of home health care with approximately equal numbers declining (14.4%) or staying the same (15.6%). For those who did experience change, the changes were small but positive (mean of -0.74 points). The strongest influence on the change score for improvement in functional capacity was better admission functional status score with the remaining variables all adding relatively little additional information.

Although there is little research in home health care functional capacity specific to patients with heart failure, our results are similar to work by others using heterogeneous populations (Keepnews et al., 2004). The modest rate of change between admission and discharge in our findings may represent the progressive nature of heart failure where only some improvement is possible as compared to someone with a sudden hip fracture whose surgical repair allows them to resume a previously active life. The finding that patients with the most severe clinical symptoms at admission had the most change in functional capacity scores has several possible explanations. First is that these patients had the most functional impairment at admission and thus presented the greatest opportunity for improvement by discharge. While there were few true ceiling and floor effects for functional capacity scores within this population, there was more room for improvement for those with the most functional capacity impairment. A second explanation is that these patients with the most severe clinical symptoms at admission represent the “heartiest” group—they were not hospitalized and did not die as we needed the discharge OASIS to determine the change score. As a result, those patients with the most severe symptoms who died or ended their home health care episode with a hospitalization are not represented here.

Finally, OASIS reliability has been questioned for years although the results are mixed with some investigative groups finding OASIS functional capacity items to be reliable from an inter-rater reliability perspective (Hittle et al., 2003; Madigan & Fortinsky, 2000; Madigan & Fortinsky, 2004; Madigan, et al., 2003) while others have found less reliable results (Kinatukara et al., 2005). As OASIS has been revised with a new data set beginning January 2010, more precise measures of conditions like depression (where a depressive screening instrument is one option) may improve the sensitivity of the findings for some of the items where there have been concerns about reliability and validity.

The clinical implications of the study focus on identification of the patients most likely to improve during home health care and the provision of PT services for home health care patients with HF. The most significant predictor of change in ADL score was the admission score with relatively minor contributions by the other independent variables. This finding is consistent with other research in home health care (Madigan, 2008) and suggests that improvements in functional capacity should not be focused only on specific groups of patients with heart failure (i.e. only the most functionally able) as even patients with more functional capacity impairment at admission show improvement by discharge in the present study. One important aspect to consider is that there was a relatively short length of stay in home health care for these patients (44 days), thus there was relatively little time to achieve improvement for a chronic progressive disease like HF. In addition, the admission functional capacity levels were quite skewed toward higher functional capacity, so the “opportunity” for improvement was somewhat truncated.

Having had any physical therapy visits was consistently the second most important factor predicting functional capacity change score. One explanation is that physical therapy was ordered for the patients most likely to benefit from PT. Almost half of all patients (49%) had at least one visit from physical therapy during their home health care episode. With recent clinical trials like HF-ACTION demonstrating both the safety and effectiveness of exercise for patients with HF (Flynn et al., 2009) and evidence from the current study that physical therapy (PT) is associated with more improvement in functional capacity, it may be prudent to recommend that home health care agencies consider PT referrals for patients with HF as a way to promote functional capacity improvement. Further research on patient safety and whether outcomes improve as a result of additional home health PT is also warranted.

Visit intensity, the numbers of home health care visits over the length of stay, did not have a substantial influence in either multivariate model. The influence of visit intensity has been something of a conundrum in home health care research as more visits are not associated with better outcomes in other home health care studies (Brega et al., 2003; Fortinsky & Madigan, 1997). There are several plausible explanations for this finding, including more visits being provided to patients whose conditions do not improve because of the extent of disease or disease progression. There is not a good understanding of how the numbers of visits are decided within home health care agencies as frontline staff are relatively autonomous in deciding numbers of visits. The financial incentive to provide more visits was phased out in the late 1990s and episodic payment (payment based on a specific care interval adjusted for patient characteristics) has been used since. Thus, it is unlikely that there is a financial incentive to the home health care agency to provide additional visits.

Finally, the geographic factors (degree of rurality, number of home health care agencies, skilled nursing facilities and short term hospitals) had little influence in the outcome. There are several plausible explanations for this finding. First, as the patients in this population all had traditional Medicare (not Medicare managed care), the national Medicare payment policy may level some of the differences due to the availability of other kinds of services (skilled nursing facilities and hospitals) in the geographic area. Second, geographic area effects may not be as pertinent for outcomes like functional capacity change as they are for other outcomes like rehospitalization. Rehospitalization is more similar to the outcomes found to be affected by area or regional variation, such as the work done by Fisher and colleagues on hospital costs (Fisher, Bynum & Skinner, 2009). Thus, functional capacity outcomes may drive the use of hospital care (Fortinsky et al., 2006) but may not be as influenced by the availability of other services in the community.

One of the limitations in the current study is that we did not have access to clinically prognostic indicators, specifically results from echocardiograms, B-type natriuretic peptide or N-terminal pro b-type natriuretic peptide (diagnostic markers of severity of HF), NYHA functional class or other factors that have been identified as helpful in determination of functional status. These data elements may be contained within the hospital medical records but are not contained in the hospital claims data that we had access to. Initiatives to improve interoperability and access to electronic health records for practice and research may improve this access in the future. A second limitation, because of the OASIS data requirements, is that we had complete functional status data only on those persons who were discharged from the agency, not on those who died or were transferred. The sensitivity analysis indicates that there were few demographic differences between these two groups while there were substantial differences in mortality where those without functional status data had substantially higher mortality rates and lower functional capacity at admission. Finally, the Barthel Index is another measure of disability for patients with heart failure. For comparability, future research may want to include both the Barthel Index and the OASIS

items. As the OASIS contains nearly identical items, the results would be expected to be similar but empirical validation is needed.

Conclusion

In conclusion, the results of the present study, focused on HF as a specific patient condition, are consistent with other research in home health care. While more research is needed, the results of the present study suggest that HF patients receiving home health care may benefit from physical therapy referrals. In addition, a focus on admission functional capacity score may help agencies target services to those most likely to improve over the course of care with consideration that even those persons with substantial impairment at start of home health care may improve.

Acknowledgments

The authors wish to acknowledge the contributions of Patrick K. Murray, MD, MSc, for his assistance with conceptualization of the paper and Tanya Scharpf, PhD, for her assistance with analysis of the data.

Funding: This work was supported by the National Heart Lung and Blood Institute (grant number R01 HL085725) to Elizabeth Madigan, PI. The NIH had no role in study design, data collection, analysis and interpretation of data, the writing of the manuscript or the decision to submit the manuscript for publication.

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Figure 1.
Andersen model adaptation for the present study

Table 1

Demographic description of population

	% (n)	M (SD)	Median
Patient characteristics (N = 82 080)			
Age		81.0 (9.4)	82.0
Gender			
Female	62 (51 224)		
Male	38 (30 856)		
Ethnicity			
White	83 (68 435)		
African American	13 (10 617)		
Hispanic	2 (1 324)		
All other ethnicities	2 (1 704)		
Provider characteristics by patient (N = 82 080 patients)			
Rural Urban Continuum Code (RUCC):			
Urban	84.2(69 137)		
Suburban	7.5 (6 139)		
Towns	7.3 (5 971)		
Rural	1.0 (833)		
Number of providers/100,000 population:			
Number of Home health care agencies		3.0 (3.0)	2.4
Number of Skilled nursing facilities (SNFs)		5.6 (3.6)	4.7
Number of Short-term general hospitals (STHs)		1.6 (2.0)	1.1
Home health care agency characteristics by patient (N = 82 080)			
Hospital based agency	33 (27 156)		
Non-hospital based agency	67 (54 924)		
Proprietary	33 (27 114)		
Non-profit	61 (50 231)		
Government	6 (4 735)		

Table 2

Descriptive statistics of activities of daily living score

	Mean	Median	Minimum	Maximum	Std. Deviation
ADL Score:					
Admission	1.92	1.67	0.0	8.0	1.47
Discharge	1.17	0.60	0.0	8.0	1.41
Change	-0.74	-0.58	-7.2	7.2	1.11

Table 3

Multivariate model results for ADL change score (N = 82 080)

	Full Model		Final Model	
	Standardized	Unstandardized	S Error	Standardized
Intercept	0.00	0.25***	0.04	0.00
Rural-urban continuum code				0.26***
Urban	0.01	0.04	.02	
Suburban	<0.01	0.03	.02	
Rural	<0.01	<0.01	.04	
No. HHAs	<0.01	<0.01	.002	
No. SNFs	<-0.01	<-0.01	.001	
No. STHs	<-0.01	<-0.01	.003	
Hosp-based	<0.01	-0.01	.008	
Agency profit status				
Non-Profit	-0.03	-0.06***	.02	-0.02
Proprietary	0.01	0.02	.02	0.02
Age	0.07	0.16***	.0075	0.07
Gender	0.02	0.04***	.007	0.02
Race (African American=1)	<0.01	0.02	.01	0.01
Lives alone	-0.04	-0.10***	.0079	-0.04
Primary caregiver	<-0.01	<-0.01	.01	
Medicare+Medicaid	0.02	0.06***	.009	0.03
Admission ADL	-0.55	-0.42***	.0031	-0.55
Oral med mgmt	0.08	0.13***	.0060	0.08
Dyspnea	-0.03	-0.11***	.004	-0.03
Cognitive function	0.07	0.10***	.0060	0.07
Anxiety	-0.02	-0.03***	.005	-0.02
Any depress	<0.01	0.01	.009	
Any high risk	<0.01	0.01	.008	

	Full Model		Final Model	
	Standardized	Unstandardized	Standardized	Unstandardized
Any problem behavior	0.02	0.04***	0.02	0.04***
Life expectancy	<-0.01	<.01		
Primary diagnosis severity	-0.04	-0.06***	-0.04	-0.06***
Overall prognosis	-0.05	-0.16***	-0.05	-0.16***
Rehabilitation prognosis	-0.06	-0.14***	-0.06	-0.14***
Total number comorbidities	-0.02	-0.01**	-0.02	-0.01**
Urinary incontinence	0.06	0.14***	0.06	0.14***
Visit intensity	0.04	0.03***	0.05	0.03***
Any physical therapy	-0.09	-0.20***	-0.09	-0.20***

No. HHAs = number of home health care agencies; No. SNFs = number of skilled nursing facilities; No. STHs = number of short term general hospitals; Admission ADL = admission activity of daily living score

* <.05
 ** <.01
 *** <.001