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Activities of Daily Living of Home Health Care Patients

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Abstract

Activities of daily living (ADLs) is an important measure of the quality of care provided in home
healthcare (HHC), but few studies describe the ADLs of HHC patients. The objectives of this
study were to (1) describe the types and levels of ADL dependency among patients receiving
home care, (2) identify the risk factors for severe ADL dependency at admission, and (3) identify
the predictors of ADL improvement during a HHC stay. This was a secondary data analysis of a
5% random sample (n=105,654) of the national Outcome and Assessment Information Set
(OASIS-C) for the year 2013. The dependent variables were severe ADL dependency level at
admission and ADL improvement from admission to discharge. About two-thirds (65%) of the
patients (n = 99,991) had severe ADL dependency (dependence in 7 or more ADLs) at admission.
Older age, female gender, and impaired decision-making were associated with severe ADL
dependency on admission. Of the 105,654 patients, 58.1% (n = 89,997) experienced ADL
improvement. ADL improvement was associated with increasing home health care length of stay,
being female, and prior inpatient stay. Clinicians, policy makers and agencies could focus on
modifiable characteristics to achieve the goal of ADL improvement.

Interest in examining the characteristics of patients receiving home health care (HHC) has
increased over the years (Medicare Performance Advisory Commission [MedPAC], 2018),
perhaps because of the rise in use and costs associated with HHC as a site for post-acute care
(PAC) (Jones et al., 2016). The ability to perform activities of daily living (ADLs) is a key
patient characteristic that has drawn attention to the utilization and outcomes of HHC

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(Scharpf & Madigan, 2010). The importance of ADLs is reflected in the passage of the Improving Medicare Post-Acute Care Transformation (IMPACT) Act of 2014 (Centers for Medicare and Medicaid Services [CMS], 2015) which mandates the standardization of functional status measures across all PAC settings. Under the IMPACT Act, functional status is represented by self-care and mobility ADLs (Middleton et al., 2016).

ADLs are basic self-care tasks which include toileting, dressing, bathing or showering, getting in/out of bed or chairs, and walking (Burman et al., 2011). Among older adults, ADL ability is an important component of quality of life and essential to living independently in the community. Low ADLs are strongly associated with poor outcomes such as higher rates of hospitalizations (Kumar et al., 2016), higher cost of medical care (Chuang et al., 2003), increased mortality (Stineman et al., 2012), and increased risk of admission to a nursing home (Holup et al., 2017).

In HHC, ADLs are a required measure of the quality of care provided and are used to determine reimbursement for services, as well as to determine the care needs of patients. More importantly, ADLs form the core of "home bound criterion" that restricts HHC services to those who have substantial difficulty leaving their homes (MedPAC, 2015). Studies have found that home bound status is prevalent among people with low ADL ability (Celeiro et al., 2016).

Information about ADLs is essential to planning the care needs of patients, analyzing rehabilitative utilizations patterns, and informing health policy. The levels of ADLs among HHC patients have not been well characterized. Caffrey et al. (2011) reported 84% of HHC patients have at least one limitation in ADLs. Their study, however, did not indicate which specific ADLs were limited or the levels of dependency. Previous studies have been confined to sub- populations such as heart failure or stroke (Madigan et al., 2012; Scharpf & Madigan, 2010), or have not used a nationally representative data set (Chase et al., 2017).

Therefore, using national data from the mandated assessment tool for HHC called the Outcome and Assessment Information (OASIS) data set, the aims of this study were to (1) describe the types and levels of ADL dependency among patients receiving HHC, (2) identify the risk factors for severe ADL dependency at admission and (3) identify the predictors of ADL improvement during HHC stay.

Methods

Study Design and Data Source

This was a secondary data analysis of a 5% random sample of the national 2013 OASIS data set, which is the patient assessment instrument mandated by CMS since 1999. Medicare certified HHC agencies are required to conduct patient assessments at specific time points during a HHC episode (Scharpf & Madigan, 2010). These OASIS assessments are completed by a registered nurse or physical therapist. A comprehensive assessment is required on admission and discharge from HHC, and ADLs are only assessed at those two-time points. Abridged versions of OASIS data are collected when the patient is transferred to an acute care hospital, resumption of care following a hospital stay, change in medical

status, or death, and every 60 days if HHC services continue (O'Connor &Davitt, 2012). The purposes of OASIS are to: measure patient health status outcomes, monitor the quality of care provided, and certify HHC agencies for reimbursement purposes. The dataset contains patients' socio-demographic status, environment, support systems, health status, functional status and behavioral status data. Multiple versions of OASIS have been validated and implemented since 1999; the OASIS-C that was released in 2010 was used in this study.

Inter-rater reliability studies have reported a Cohen's kappa of 0.60 or higher on most OASIS items, which suggest adequate reliability (Madigan & Fortinsky, 2001). Madigan and colleague (2004) tested inter rater reliability of OASIS items by using HHC staff as raters, and all ADL items had kappa values above 0.70 except the feeding or eating item which had a score of 0.67. Researchers who have compared the OASIS ADL domains to existing instruments have reported the ADL items are sufficiently valid, and correlate highly with the Katz Index of Independence in Activities of Daily of Living (Tullai-McGuiness et al., 2009).

Sample

The sample for these analyses consisted of HHC patients with ADL data at start of care and discharge OASIS in 2013. Individual who completed their HHC episode without a discharge, such as patients who were hospitalized or died were therefore excluded (n=49,147). This resulted in a final sample of 105,654.

Outcomes

The outcome measures in this study were ADL dependency levels at admission and ADL change. ADLs were assessed using the 9 items in the OASIS-C that measure a patient's ability in the following activities: ambulation/locomotion, bathing, dressing upper body, dressing lower body, eating, grooming, toileting/hygiene, toilet transferring and transferring. The individual ADL items have various levels of scoring—for example, ambulation/ locomotion ranges from 0 to 6, while dressing upper body ranges from 0 to 3, and transferring ranges from 0 to 5. Each ADL item is scored on an ordinal scale where lower scores represents independence in the performance of the ADL and the higher score represents dependence.

ADL dependency measure:

To examine the level of dependency in ADLs at HHC admission, each respective raw ADL score was dichotomized into 0 (indicating total independence), or 1, (indicating some level of dependence). Using this method, any individual raw ADL score >0 will be converted as 1. Next, we generated a variable to identify the total number of ADL functions that need assistance (meaning individual ADL scores higher than 0), ranging from 0–9 with 0 indicating independence in all functions and 9 indicating dependence in all ADL functions. From this summed score, a dichotomous ADL dependency level variable was created, categorized as non-severe ADL dependency and severe (assistance needed in 7 or more ADLs).

ADL improvement:

> To assess ADL improvement from admission to discharge from HHC, an ADL change score was created using the corrected Likert approach (Scharpf & Madigan, 2010). Each individual ADL response was divided by the highest value possible for that ADL. This approach converted all the individual ADLs to the same scale, ranging from 0 to 1, with lower scores indicating better ADL ability. Next, the ADL composite score was computed by summing the individually adjusted items. The composite ADL score ranges from 0 to 9 with 9 indicating total dependence, and 0 indicating complete independence. The ADL change score for each patient was calculated by subtracting the summed ADL admission score from the summed ADL discharge score. In the change score, zero indicates that there was no change across all 9 ADLs; a negative score indicates ADL improvement; while positive scores indicate ADL decline. (Madigan et al., 2012). Based on the ADL change score, a dichotomous ADL outcome measure was created. This score was used to measure whether a patient experienced an improvement in the summed score coded as yes or no. A negative ADL change score indicated overall ADL improvement (Madigan et al., 2012), while a score of zero or larger was defined as no change or decline, accordingly patients with no change were collapsed with patients who declined.

Covariates:

> The following variables were covariates: age, race (Black/African American, Hispanic, White, and other minority race/ethnicity), living condition (alone or with others), HHC length of stay (LOS), insurance status (Medicaid, Medicare and dual eligibility), Prior inpatient stay within 14 days of HHC admission (hospital, skilled nursing facility (SNF) or other inpatient unit. The weighted Charlson Comorbidity Index (CCI) was used to identify co-morbidities at HHC admission (Monsen et al., 2012). Impaired decision making based on single OASIS item (M1740).

Statistical Analysis

Aim 1: Types and levels of ADL dependency among patients receiving HHC—
Descriptive statistics were generated for all study variables to describe the type and level of ADL dependency at admission. Differences in the proportion of people who were independent or dependent were also compared using chi square test and t-test as appropriate. To examine differences in the distribution of independent variables by severe or non-severe ADL dependency levels, we also used the Student t-test for continuous variables and chi-squared test for categorical variables. Change in individual ADLs between admission and discharge were assessed using a paired t-test.

Aims 2: Identify the risk factors for severe ADL dependency at admission—
Multivariable logistic regression was used to identify factors associated with severe ADLs dependence at admission. Variables that were associated with the outcome of interest (severe ADLs dependence) according to the literature and in our bivariate analysis were entered to the model, including age, gender, race, insurance, living condition, prior inpatient stay, impaired decision making, and comorbidities.

Aim 3: Identify the predictors of ADL change during HHC stay.—Multivariable logistic regression was also used to identify the predictors of ADL improvement from admission to discharge. In this analysis, to examine if LOS had an impact on ADL improvement, HHC LOS was added to covariates listed above.

Adjusted odds ratios (OR) and 95% confidence intervals are reported for regression analyses in both Aims 2 & 3. Statistical significance was set at P < 0.05. All analyses were conducted using IBM SPSS Statistics Version 24.0.

Results

Aim 1: Types and levels of ADL dependency among patients receiving HHC

Supplemental Digital Content 1 summarizes characteristics of the sample of 154,801 patients; bivariate associations between sample characteristics and ADL dependency level are also shown. The overall sample was predominantly female (64.7%), and the mean age was 77.06 (SD = 11.8) years. About eighty percent (79.8%) of the sample was White, 11.4% were Black, and 6.6% were Hispanic. A majority of the patients (73.4%) lived with others in their household. Most patients had Medicare (96.2%), 0.9% had Medicaid and 2.8% were dually eligible. Of the 68.7% patients who had a prior inpatient stay within 14 days, 43% were from the hospital, followed by 16.3% from a SNF and the remainder had a discharge from a long-term care hospital, intensive rehabilitation facility or psychiatric hospital or unit; 31.4% had no recorded recent inpatient stay. About one in five individuals (19.4%) had impaired decision making. The mean CCI for the overall sample was 0.89 (SD = 1.2).

About 65% of HHC patients (n = 99,991) had severe ADL dependency at admission. Compared to HHC patients who had non-severe ADL dependency, those with severe ADL dependency were older (mean age 77.9 vs. 75.5), more likely to be female (65.5% vs. 63.2), and less likely to be White (78.7% vs. 82%). Patients with severe dependency were more likely to have Medicare (96.5% vs. 95.7%), dual eligibility (2.9% vs. 2.7%), impaired decision making (25.5% vs. 8.4%), were less likely to live alone (21.9% vs. 35.3%), and less likely to be discharged from an acute care hospital (40.7% vs. 47.1%) on admission to HHC services when compared with patients who had non-severe ADL dependency. Patients with severe ADL dependency also had a higher CCI (0.91 vs. 0.86) than the counterparts.

Overall, 88.4% patients had some level of ADL dependency on admission to HHC services; 79% were dependent in grooming, 84% in dressing upper body, 88.4% in dressing lower body, 96.8% in bathing, 67% in toilet transferring, 73% in toileting hygiene, 88.2% in transferring, 94.7% in ambulation/locomotion and 55.5% in feeding or eating, and the most common ADL dependency was bathing (Supplemental Digital Content 2). Most patients improved in ADL dependency from admission to discharge from HHC (mean ADL change score = −1.69, SD = 1.39).

Aim 2: Identify the risk factors for severe ADL dependency

Supplemental Digital Content 3 shows the results of the logistic regression model predicting the risk factors associated with severe ADL dependency at admission. Increasing age (odds ratio [OR] = 1.02, 95 % confidence interval [CI]= 1.01–1.02) and female gender (OR = 1.14,

95% CI = 1.11–1.16) were associated with severe ADL dependency. Compared to White patients, racial/ethnic minorities had higher odds of severe ADL dependency (Black OR = 1.30, 95% CI = 1.25–1.34; Hispanic OR = 1.38, 95% CI = 1.32–1.45 and other minority race: OR = 1.36, 95% CI = 1.26–1.47). The odds of severe ADL dependence decreased by almost 50% for patients who lived alone (OR = 0.51; 95% CI = 0.50–0.53).

Compared to patients receiving Medicare, patients with Medicaid were almost half as likely to develop severe ADL dependency (OR = 0.40 95%, CI = 0.37–0.46). Compared with patients without prior impatient stay, patients with a prior inpatient stay (SNF OR = 1.20; 95% CI = 1.16–1.24 and other inpatient facilities OR = 1.29; 95% CI = 1.23–1.34) were also more likely to have severe ADL dependency

The odds of severe ADL dependency were 3.5 times higher for patients with impaired decision-making (OR = 3.51; 95% CI = 3.39–3.63) at admission to HHC services. We found no statistically significant association between severe ADL dependency and dual eligibility and (OR = 1.06; 95% CI = 0.99–1.14), and prior stay in a hospital and severe ADL dependency (OR = 0.93, 95% CI = 0.91–1.00).

Aim 3: To identify the predictors of ADL improvement.

Of the 105,654 patients with admission and discharge assessments, 58.1% (n = 89,997) experienced ADL improvement, 35.6% (n = 55,057) had ADL decline, and 6.3% (n=9,747) experienced no change from admission to discharge. Patients with ADL improvement were, on average, 77.1 years of age (SD = 11.2), predominantly female (65.7%) and White (82.0%). Most of these patients received payment under Medicare (97.0%). Patients with ADL improvement had less comorbid conditions compared with patients with no change or decline in ADL (mean CCI = 0.77, SD = 1.11 vs mean CCI = 0.93, SD = 1.30). Patients with ADL improvement were also less likely to have impaired decision compared with patients with ADL decline or no change (16.3% vs 22.8%), and had longer HHC episode of care (mean HHC LOS = 31.29, SD =18.07 vs mean HHC LOS = 28.70, SD = 20.75). Compared with patients who had ADL decline or no change, patients with ADL improvement were more likely to have a prior in patient stay (SNF = 17.5% vs 12.7%), acute care hospital (46.3% vs 39.1%) and other inpatient settings (9.5% vs 7.2%) (Supplemental Digital Content 4).

Supplemental Digital Content 5 summarizes the results of the logistic regression assessing the likelihood of experiencing ADL improvement for each independent variable. Several factors were associated with the odds of ADL improvement. Increasing HHC LOS was associated with a greater likelihood of ADL improvement (OR =1.01, 95% CI = 1.01–1.01, p<0.005). Being female (OR = 1.07, 95% CI = 1.03–1.11, p<0.005) increased the likelihood of ADL improvement. Compared to Whites, Blacks had a lower likelihood of ADL improvement, (OR = 0.76, 95% CI = 0.72–0.81, p<0.005). History of prior inpatient stay within 14 days of admission to HHC was also highly associated with ADL improvement. Compared to HHC episodes in which patients did not have a prior inpatient stay, the odds of ADL improvement were about two times higher for patients with a prior inpatient stay: (Hospital: OR = 1.97, 95% CI = 1.89–2.05), (SNF: OR = 2.20, 95% CI = 2.08–2.32) and (Other inpatient settings: OR = 2.06, 95% CI = 1.93–2.21).

Compared to Medicare patients, having Medicaid as their primary payer (OR =0.36, 95%CI = 0.30–0.42), and dual eligibility (OR = 0.79, 95% CI = 0.71–0.87) was associated with lower likelihood of ADL improvement. Increasing CCI (OR= 0.86, 95% CI = 0.84–0.87) and impaired decision-making (OR =0.74, 95%CI = 0.67–0.73) was also associated with a lower likelihood of ADL improvement.

Discussion

Type and Level of ADL Dependency

This description of ADLs of HHC patients showed that most (88.4%) had some level of ADL dependence at admission, which is common in a HHC population where most services are targeted for rehabilitative needs (Jones et al., 2016). We also found that over 60% of the patients have severe ADL dependency at admission, with dependence in seven or more ADLs. Such high prevalence of severe ADLs dependency among HHC patients is unexpected, as most patients with higher ADL level of dependency receive PAC services in alternative settings such as SNFs. (Stein et al., 2015).

Very few studies have characterized the ADLs of HHC patients. Using data collected from the 2000 to 2007 National Home and Hospice Care Survey, consistent with our findings, one study reported that 84% of HHC patients had at least 1 ADL limitation and 14.8% had no ADL limitations (Caffrey et al., 2011). In an effort to provide a comprehensive description of the ADLs of HHC patients, the present study used summary scores and dichotomized individual ADLs to identify the types and levels of ADL dependency among HHC patients.

Using summary scores of ADL, we found patients improved in ADL dependence from admission to discharge from HHC. In terms of individual ADLs, bathing which perhaps requires a larger complexity of ADL ability, was the most common ADL dependency. These findings are consistent with previous HHC studies that have reported bathing as the most common ADL dependency (Scharpf & Madigan, 2010) and improvement in ADLs from admission to discharge (Asiri et al.,2014; Han et al., 2013; Madigan, 2008). This is not surprising because patients whose ADLs decline after admission to HHC are usually transferred to a different level of care to receive appropriate clinical services.

Although the ADLs of HHC patients have been examined in previous studies, patients scores were often condensed to a single summary value (Asiri et al., 2014; Han et al., 2013; Madigan, 2008; Scharpf & Madigan, 2010), simple counts of ADLs (Caffrey et al., 2011), or the sample was limited to specific disease processes (Asiri et al., 2014; Chen et al., 2016; Madigan, 2008). A strength of this analysis is that we examined the types and levels of ADL dependency among HHC patients on admission. A notable limitation is that we were unable to describe the ADLs of HHCs during critical time points such as hospitalization because OASIS data do not provide a measure ADLs during transfer from HHC services.

Risk Factors for Severe ADL Dependency

In our regression analysis, impaired decision making was strongly associated with severe ADL dependency. As expected, older age increased the risk for severe ADL dependency. This finding is consistent with research in other settings (Fauth et al., 2017; Millán-Calenti

et al., 2012). Compared to White patients, we found that racial/ethnic minorities had higher odds of severe ADL dependency. Researchers have previously documented racial /ethnic disparities in ADL ability among the general population of older Americans, with minorities experiencing more severe ADL dependency than Whites (Brenner & Clarke, 2016; Dunlop et al., 2007), and emerging research has documented similar findings among HHC patients (Chase et al.,2017). Mitigating racial/ethnic disparities in ADLs in the community has the potential to reduce excess economic costs allocated to caring for minority patients with severe ADL dependencies (Carrasquillo et al. 2000). As expected, patients with a prior inpatient stay were also more likely to have severe ADL dependencies.

Patients with severe ADL dependency are vulnerable to poor clinical outcomes and account for substantial financial expenditure to the health care system. A recent study of Medicare HHC patients revealed that patients with severe ADL impairment cost three times more than HHC patients without ADL impairment (Greysen et al., 2017).

Predictors of ADL change

Our results show that prior inpatient stay, race/ethnicity, living alone, increasing HHC LOS and being female were associated with ADL improvement, adding to previous HHC studies that reported factors such as cognitive status, age and baseline ADL status at start of care were also associated with ADL change (Asiri et al., 2016; Riggs et al., 2011). In the present study, patients with a history of a prior inpatient stay within 14 days of admission to HHC services had a higher likelihood of ADL improvement. This is unsurprising, because patients discharged from an inpatient setting are likely to have poorer ADLs than their counterparts from the community and would more likely to improve during the HHC episode because they started with worse ADLs. Similar findings have been reported by previous HHC research (Riggs et al., 2011).

Research examining the association between race/ethnicity and ADL ability in HHC patients is scarce. We found racial and ethnic disparities in ADL improvement during a HHC episode of care, with Blacks less likely to achieve ADL improvement compared to Whites. This result aligns with recent research that has documented similar racial differences in ADL outcomes of HHC patients with findings that non-Hispanic Whites experienced greater overall ADL improvement compared with Asian, Hispanic and African American patients (Chase et al., 2017). Our finding provides new information that underscores HHC as an important setting to explore the mechanism of health disparities in ADL ability.

Despite the growing national interest in HHC length of stay (Lee & O'Connor, 2017; MedPAC 2018), very little is known about the association between HHC LOS and patient outcomes. An increased HHC LOS likely indicates greater severity and complexity of the patient's condition. Since we found high level of ADL dependency at admission in our study sample, it is possible that longer HHC LOS allowed these patients to receive more nursing and therapy services, and therefore have better ADL outcomes. One study found that HHC length of stay of at least 22 days or received at least 4 skilled nursing visits had significantly lower odds of hospitalization (O'Connor et al. 2015), indicating a certain level of HHC is needed to avoid adverse outcomes.

CMS has proposed a decrease in HHC episodes from 60 -day episode used in the current payment system to 30-day episodes (MedPAC, 2018). Considering that the average HHC LOS of patients who experienced ADL improvement was 31 days and the significant association between HHC LOS and ADL improvement, it suggests that HHC agencies may keep the episodes open until patients achieve optimal ADL ability. HHC patients may benefit from longer HHC episode beyond the proposed 30-day episode to experience optimal patient outcomes, including ADL improvement.

Compared to patients who had only Medicare insurance, dual eligibility and having Medicaid was associated with lower likelihood of ADL improvement. A possible explanation is that patients receiving Medicare represent a post-acute care population in HHC services and may have had a prior inpatient stay or have been identified with potential to improve in the HHC setting compared to patients from the community. Another possible explanation is that Medicare PAC patients generally receive therapy during a HHC episode and may have had more focused rehabilitation goals since Medicare is intended to cover PAC such as nursing and therapy in a HHC setting. The Medicare HHC benefit generally does not cover HHC services for those who need sustained assistance over time, but people with rehabilitative potential to improve (O'Shaughnessy, 2014). Unsurprisingly, patients who were sicker denoted by higher CCI scores and patients with impaired decision making also were less likely to have ADL improvement.

Strengths & Limitations

Our large, nationally-representative sample is a major strength of this analysis, and its prospective longitudinal design captures ADLs at important time points such as admission and discharge. The availability of detailed information on ADL status at these time points allowed us to carefully characterize ADL trajectories. Another strength is that we included clinically meaningful and policy relevant covariates in the logistic regression model such as HHC LOS, which very few HHC studies have examined.

Despite these strengths, there are study limitations. First, data regarding service utilization during the HHC episode of care were not available for analysis, although previous studies have found associations between patient LOS and provider (PT or RN), and functional status outcomes (Riggs et al., 2011). Future studies may link OASIS data to claims data for nursing and therapy utilization to identify what specific days during LOS a patient is most likely to experience ADL improvement. The present study only used data for one year, which did not allow us to make comparisons between ADL changes of the HHC population over a longer period of time. In addition, we were not able to assess the ADLs of patients who were hospitalized, since the OASIS does not measure ADLs at the time of transfer to hospital.

Furthermore, to identify ADL dependency levels, each ADL was dichotomized and then summed to indicate the total number of dependencies experienced by a HHC patient. This method can obscure information regarding the varying difficulty levels between ADL items. Of note, the lack of consistency in the number of response and categories across OASIS ADL item present a challenge in the use of ADLs for research purposes. Although the Likert method, which was used in this study to assess ADL improvement is widely used in HHC research, the psychometric properties of this approach have not been established.

Importantly, to date, studies of the reliability and validity of the OASIS are based on the OASIS-B and not the revised OASIS-C measures.

Conclusions

For years, changes in ADLs have been a key measure monitored by CMS and also publicly reported on the World Wide Web. This measure provides agency-level information on the percentage of patients who improve in specific ADL items. Findings from this study illustrate there are key patient characteristics associated with ADL improvement, and the HHC clinicians, policy makers and agencies could focus on such characteristics to achieve the goal of ADL improvement.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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