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Differences in Care Processes between Community-entry versus Post-acute Home Health for Rural Medicare Beneficiaries

KEY FINDINGS

- Home health care processes are significantly different for rural, fee-for-service Medicare beneficiaries who are admitted to home health from the community (community-entry) compared with beneficiaries who are admitted to home health following an inpatient stay (post-acute).
- Compared to post-acute home health episodes, community-entry episodes are 8% less likely to be initiated on the physician-ordered start date or within two days of referral to home health.
- Length of stay is likely to be longer for beneficiaries using community-entry versus post-acute home health; community-entry home health stays are 16% less likely to last only one episode and 35% less likely to last 30 or fewer days compared to post-acute home health stays.
- Compared to post-acute home health episodes, community-entry episodes are 50% less likely to include physical therapy, 40% less likely to include occupational therapy, 22% less likely to include speech language pathology, and 16% less likely to include home health aide visits, but are 25% more likely to include medical social work visits.

BACKGROUND

Fee-for-service Medicare beneficiaries may be admitted to home health following an inpatient stay (post-acute home health) or directly from the community without a preceding inpatient stay (community-entry home health) as long as they satisfy other eligibility criteria[1,2] (e.g., require intermittent skilled nursing or physical therapy, considered to be homebound). Rapid growth in community-entry home health has been highlighted by the Medicare Payment Advisory Commission (MedPAC) as a driver for increased expenditures following implementation of prospective payment for home health agencies in 2000;[3] yet research on community-entry home health remains sparse.

The current prospective payment system for home health agencies does not distinguish between community-entry and post-acute episodes in the calculation of reimbursement even though analysis from MedPAC and the Centers for Medicare & Medicaid Services (CMS) suggests that community-entry episodes require fewer resources on average from home health agencies.[4,5] However, multiple changes to the prospective payment system for home health agencies are

scheduled to be implemented in January 2020 as mandated by the Bipartisan Budget Act of 2018.[6] One significant change is the addition of admission source in the calculation of reimbursement with community-entry episodes slated to receive lower reimbursements than otherwise similar post-acute episodes after the new system is implemented.

Whether rural beneficiaries use fewer home health resources for community-entry versus post-acute episodes, as is seen at the national level,[7] is unclear. If home health resource use by admission source for rural beneficiaries does not track closely with overall national data, which is driven by urban beneficiaries, it is possible that basing payments in part on admission source may decrease access to services for rural beneficiaries admitted to home health from the community. Previous research has demonstrated that rural beneficiaries admitted to home health from the community versus following an inpatient stay are more likely to be older, live alone, require caregiver assistance for supervision or safety, and have lower functional status and higher cognitive impairment.[8] Because some rural beneficiaries experience reduced access to home health overall, as well as services other than nursing,[9-11] it will be important to understand how rural beneficiaries may be affected by the upcoming changes in payment policy. A key first step toward that understanding is examining differences in how care is provided between community-entry and post-acute home health for rural beneficiaries.

The purpose of this study was to compare care processes between community-entry and post-acute home health episodes for rural, fee-for-service Medicare beneficiaries, while accounting for beneficiary characteristics (e.g., sociodemographic, clinical, functional), the communities in which they live (e.g., rurality, region, economic indicators, health resources), and the home health agencies that provide care (e.g., profit status, agency size).

METHODS

This study was a retrospective cohort analysis of rural, fee-for-service Medicare beneficiaries who received home health services from 2011 to 2013. Data sources included Medicare administrative data from 2011 to 2013 including home health claims, the Outcomes and Assessment Information Set (OASIS), and Provider of Services (POS) files, the 2012 Area Health Resource File (AHRF), U.S. Department of Agriculture Economic Research Service (USDA ERS) 2015 county typology file, and published reports on state-level Medicaid expenditures on home- and community-based services (HCBS) from 2011 to 2013.[12] For beneficiaries with more than one home health episode during the study timeframe, we included the initial home health episode in the analysis.

We compared home health care processes by community-entry versus post-acute episodes. Care processes included timely initiation of care, length of stay, and service provision. Timely initiation of care indicated whether an episode started on the physician-ordered start date or within two days of referral to home health care. We used two measures for length of stay: number of episodes and number of days. Number of episodes indicated whether the beneficiary received only one episode of care versus two or more episodes of care. Number of days indicated whether the beneficiary was discharged within 30 days of admission to home health versus 31 days or more. Service provision during the initial episode was measured using dichotomous variables for whether any versus no visits were provided by the following types of providers: physical therapy, occupational therapy, speech language pathology, medical social work, and home health aide. Visits provided by nursing were not included in this analysis because nearly all beneficiaries receive nursing care.

Our independent variable of interest was type of episode: community-entry versus post-acute. We classified the episode as either post-acute or community-entry based on an OASIS item indicating whether any inpatient stay occurred within 14 days prior to home health admission. Episodes that were not preceded by an inpatient stay were considered community-entry rather than post-acute.

We included a wide variety of control variables to account for the characteristics of beneficiaries, the communities in which they live, and the home health agencies that service them. Beneficiary characteristics included age, sex, race, dual-eligibility (Medicare and Medicaid) status, living situation (alone or with others), diagnosis, clinical severity, functional and cognitive status, and caregiving needs for medication management and supervision and safety. Community characteristics included level of rurality of the beneficiary residence (large rural, small rural, or isolated small rural using Rural-Urban Commuting Area Codes); state of beneficiary residence; county-level indicators of persistent poverty, low employment, low education, population loss; state-level spending on Medicaid home- and community-based services; and county-level available health resources as measured by number of acute hospital beds, skilled nursing facility beds, home health agencies, primary care doctors, and rural health clinics per 1,000 beneficiaries. Home health agency characteristics included profit status (for-profit, nonprofit, or governmental), facility type (free-standing versus facility-based), rural volume based on number of visits to rural beneficiaries, agency size based on full-time equivalent clinical staff, contracting status of clinical staff, and rurality of agency (urban, large rural, small rural, isolated small rural).

First we described care processes (timely initiation of care, length of stay, and service provision) overall and by type of episode (community-entry or post-acute). Then we used hierarchical logistic regression models to examine whether type of episode is associated with the three care processes, after controlling for characteristics of beneficiaries, communities, and home health agencies. More details about study methodology are available in the Technical Appendix. The study was approved by the University of Washington Human Subjects Division.

FINDINGS

Rural, fee-for-service Medicare beneficiaries received 858,683 initial home health episodes, of which 29.4% were classified as community-entry and 70.6% as post-acute. Table 1 describes timely initiation of care and length of stay overall and by type of episode. Significantly fewer community-entry episodes had timely initiation of care compared to post-acute episodes, though the percentage of episodes with timely initiation of care was high across both types of episodes. Community-entry

Table 1. Timely Initiation of Care and Length of Stay for Community-entry versus Post-acute Home Health Care,[1] 2011-2013

	All (n=858,683[2])	Community-entry (n=252,138[2])	Post-acute (n=606,545[2])
Timely initiation of care[3]*			
Yes	90.1%	89.1%	90.6%
No	9.9%	10.9%	9.4%
Number of episodes*			
One	90.6%	88.0%	91.6%
Two or more	9.4%	12.0%	8.4%
Number of days*			
30 or less	39.6%	27.6%	44.6%
31 or more	60.4%	72.4%	55.4%

* p<.0001; comparison between community-entry versus post-acute episodes using chi-square tests
1. Episodes were classified based on response to OASIS item M1000 (From which of the following inpatient facilities was the patient discharged during the past 14 days?). Patients who had not been discharged from an inpatient facility (response option 'NA') were classified as community-entry. Patients who had been discharged from an inpatient facility (response options 1, 2, 3, 4, 5, 6, and 7) were classified as post-acute.
2. Note n presented in table represents all qualifying initial home health episodes for rural, fee-for-service beneficiaries. Due to missing data, n=858,513 home health episodes (252,010 community-entry episodes, 606,503 post-acute episodes) for timely initiation of care. Please see technical appendix for additional details on sample.
3. Timely initiation of care indicated whether an episode started on the physician-ordered start date or within two days of referral to home health care.
Sources: Type of episode (community-entry versus post-acute) was drawn from OASIS data and timely initiation of care, number of episodes, and number of days were drawn from home health claims and OASIS data.

episodes were also significantly longer than post-acute episodes, both in terms of number of episodes and number of days.

Table 2 presents service provision overall and by type of episode. Overall, over two-thirds of beneficiaries received at least one physical therapy visit, over one-quarter received at least one occupational therapy visit, approximately one-fifth received at least one home health aide visit, and fewer than one-tenth received at least one medical social work visit or speech language pathology visit. Significantly fewer community-entry episodes included physical therapy, occupational therapy, speech language pathology, and home health aide visits compared with post-acute episodes; however, significantly more community-entry episodes included medical social work visits compared to post-acute episodes.

Table 2. Service Provision in Community-entry versus Post-acute Home Health Care[1], 2011-2013

	All (n=857,552[2])	Community-entry (n=251,726[2])	Post-acute (n=605,826[2])
Physical therapy			
Percent of episodes receiving*:			
Any visits	68.0%	58.1%	72.1%
No visits	32.0%	41.9%	27.9%
Average number of visits per initial episode (SD)*	5.6 (5.8)	5.3 (6.1)	5.8 (5.7)
Occupational therapy			
Percent of episodes receiving*:			
Any visits	26.2%	20.0%	28.7%
No visits	73.8%	80.0%	71.3%
Average number of visits per initial episode (SD)*	1.2 (2.9)	1.1 (2.9)	1.3 (2.9)
Home health aide			
Percent of episodes receiving*:			
Any visits	20.8%	20.1%	21.1%
No visits	79.2%	79.9%	78.9%
Average number of visits per initial episode (SD)*	1.8 (4.8)	2.0 (5.2)	1.7 (4.6)
Medical social work			
Percent of episodes receiving*:			
Any visits	8.8%	10.4%	8.1%
No visits	91.2%	89.6%	91.9%
Average number of visits per initial episode (SD)*	0.1 (0.5)	0.2 (0.6)	0.1 (0.5)
Speech language pathology			
Percent of episodes receiving*:			
Any visits	4.1%	3.9%	4.2%
No visits	95.9%	96.1%	95.8%
Average number of visits per initial episode (SD)	0.2 (1.5)	0.2 (1.5)	0.2 (1.5)

SD = standard deviation
* p<.0001; comparison between community-entry and post-acute episodes using chi-square tests for proportions and t-tests for average number of visits
1. Episodes were classified based on response to OASIS item M1000 (From which of the following inpatient facilities was the patient discharged during the past 14 days?). Patients who had not been discharged from an inpatient facility (response option 'NA') were classified as community-entry. Patients who had been discharged from an inpatient facility (response options 1, 2, 3, 4, 5, 6, and 7) were classified as post-acute.
2. Note 1,503 home health episodes had incomplete data for service provision, resulting in a smaller n for this table than the 858,683 initial qualifying home health episodes that met inclusion and exclusion criteria. Please see technical appendix for additional details on sample.
Sources: Type of episode (community-entry versus post-acute) was drawn from OASIS data and service provision was drawn from home health claims.

Table 3 presents results from the fully-adjusted logistic regression models that controlled for characteristics of beneficiaries, communities, and home health agencies. Results are presented as odds ratios comparing community-entry episodes with post-acute episodes that are otherwise similar in terms of the included control variables; for example, on average a community-entry episode is 50% less likely to include any physical therapy visits compared with a post-acute episode for a similar beneficiary, living in a similar community, and being cared for by a similar home health agency. Results suggest community-entry episodes are longer and less likely to include physical therapy, occupational therapy, speech language

pathology, and home health aide visits in addition to nursing visits, but more likely to include medical social work visits.

Table 3. Adjusted[1] Relationships between Type of Home Health Episode[2] and Timely Initiation of Care, Length of Stay, and Service Provision for Rural Medicare Beneficiaries, 2011-2013

	Adjusted Odds Ratio[1] Comparing Community-entry with Post-acute Episodes[2]	95% Confidence Interval	p-value[3]
Timely initiation of care[4] (yes versus no)	0.92	0.90, 0.94	<.0001
Length of stay			
Number of episodes (1 versus 2+)	0.84	0.83, 0.86	<.0001
Number of days (30 or fewer versus 31+)	0.65	0.64, 0.66	<.0001
Service provision (any versus no visits)			
Physical therapy	0.50	0.37, 0.68	<.0001
Occupational therapy	0.60	0.59, 0.62	<.0001
Speech language pathology	0.78	0.75, 0.81	<.0001
Medical social work	1.25	1.22, 1.28	<.0001
Home health aide	0.84	0.82, 0.85	<.0001

1. Adjusted odds ratios represent the odds of the outcome for community-entry episodes versus the odds of the outcome for post-acute episodes that are otherwise similar with respect to beneficiaries, community, and home health agency characteristics. Specifically, the analysis adjusted for beneficiary characteristics including age, sex, race, dual-eligibility status, living situation, primary diagnosis, clinical severity, functional and cognitive status, and caregiving needs for medication management and supervision and safety; community characteristics including state-level spending on Medicare home-and community-based services, county-level indicators of persistent poverty, low employment, low education, and population loss, and county-level number of acute hospital beds, skilled nursing facility beds, home health agencies, primary care doctors, and rural health clinics per beneficiary; and home health agency characteristics including rurality of agency, profit status, facility type, rural volume, agency size based on full-time equivalent clinical staff, and contracting status of clinical staff.
2. Episodes were classified based on response to OASIS item M1000 (From which of the following inpatient facilities was the patient discharged during the past 14 days?). Patients who had not been discharged from an inpatient facility (response option 'NA') were classified as community-entry. Patients who had been discharged from an inpatient facility (response options 1, 2, 3, 4, 5, 6, and 7) were classified as post-acute.
3. P-value from Wald F test
4. Timely initiation of care indicated whether an episode started on the physician-ordered start date or within two days of referral to home health care.
Sources: Type of episode (community-entry versus post-acute) was drawn from OASIS data. Service provision was drawn from home health claims. Timely initiation of care and length of stay were specified using data form both OASIS and home health claims data. Beneficiary characteristics were drawn from OASIS data. County-level economic indicators were drawn from the U.S. Department of Agriculture Economic Research Service. State-level spending on Medicaid home- and community-based services was drawn from publicly-available summary reports from Truven Health Analytics. County-level health resources were drawn from the Area Health Resource File and standardized by county-level Medicare enrollment. Home health agency characteristics were drawn from the Provider of Services files.

CONCLUSIONS

Results of this study indicate differences in care processes between community-entry and post-acute home health episodes for rural, fee-for-service Medicare beneficiaries, even after controlling for characteristics of beneficiaries, home health agencies, and communities. Community-entry episodes were less likely to be initiated following physician order in a timely manner as compared with post-acute episodes. This difference may reflect prioritization of referrals by home health agencies based on anticipated patient needs, partnerships with discharging hospitals to reduce readmissions by expediting the start of home health services, and/or more assistance with referrals (e.g., verification of eligibility, scheduling of first visit) during the discharge process from inpatient facilities for post-acute episodes. Though care was not initiated as quickly for beneficiaries admitted to home health from the community, their length of home health stay was longer. Longer length of stay for community-entry may indicate home health is addressing more of the chronic care needs for this population.

Despite the longer length of stay for beneficiaries admitted to home health from the community, they were less likely to receive therapy or home health aide visits. Community-entry beneficiaries may have experienced a more gradual decline in function leading to their home health episode compared to their post-acute counterparts who, because of the reason for their inpatient stay or the time spent in the hospital itself, may have experienced more drastic decline. A steeper

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decline may necessitate a greater need for therapy services and assistance from home health aides. Although our analysis accounted for clinical characteristics, including functional status at admission to home health, future research on trajectories of functional status prior to home health admission is needed to understand the potential for unmet need for therapy services in community-entry home health.

Medical social work was the one type of visit that community-entry episodes were more likely to include compared to post-acute episodes. It is possible that beneficiaries admitted to home health from the community have higher need for medical social work services because they did not have the same access to these services during a preceding inpatient stay. Higher need for medical social work services also supports the possibility that community-entry home health is more focused than post-acute home health on chronic care management.

LIMITATIONS

Because this study was limited to rural beneficiaries receiving home health care, we cannot compare urban-rural differences in care processes in community-entry versus post-acute home health episodes. Differences between community-entry and post-acute home health episodes can also not be generalized to Medicare Advantage beneficiaries as we did not have complete data on their utilization of home health in our datasets. Approximately one-fifth of rural Medicare beneficiaries have coverage through Medicare Advantage plans.[13] Finally, based on this analysis, we cannot comment on whether differences in care processes between community-entry and post-acute home health reflect underutilization of certain services within community-entry episodes or over-utilization of certain services within post-acute episodes. Future research tying service provision to quality outcomes for community-entry home health is warranted.

IMPLICATIONS FOR POLICY AND PRACTICE

Results from this study demonstrate decreased use of therapy and home health aide services, but longer lengths of stay for rural Medicare beneficiaries who are admitted to home health from the community versus following an inpatient stay. These findings provide preliminary support for differentiating reimbursement between community-entry and post-acute home health episodes such as is scheduled to go into effect in 2020.[4] However, careful monitoring is needed to ensure rural beneficiaries' access to community-entry home health is not reduced under the new payment model as home health agencies have fewer incentives to admit beneficiaries from the community and/or provide high levels of visits to these beneficiaries. Moreover, an additional change in the new home health prospective payment system will be a switch from the current 60-day payment period to a shorter 30-day payment episode, with lower payments for subsequent 30-day periods following the initial 30-day period.[4] In conjunction with the lower payments for community-entry episodes, the new 30-day payment period may create an additional disincentive for home health agencies to serve beneficiaries admitted from the community.

Future research in this area should also address how the upcoming payment changes fit within the overall context of other recent and upcoming CMS initiatives that may affect home health for rural beneficiaries. These include the Home Health Value-Based Purchasing Demonstration, revisions to the rural add-on payments for home health agencies serving rural beneficiaries, the addition of hospital admission quality measures for all home health episodes versus only post-acute episodes in the Home Health Quality Reporting Program, and participation of home health agencies in Accountable Care Organizations and bundled payment models (e.g., Bundled Payments for Care Improvement Advanced, Comprehensive Care for Joint Replacement). This study is part of a series of studies being conducted by the WWAMI Rural Health Research Center that aims to apply a rural lens to home health-related Medicare policies and programs, in support of the CMS Rural Health Strategy.[14]

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TECHNICAL APPENDIX

This appendix contains detailed technical notes regarding the methods used in this study.

Design and data sources:

This study was a retrospective cohort analysis of rural, fee-for-service Medicare beneficiaries who utilized home health care between 2011 and 2013. Data included Medicare administrative data from 2011 to 2013, specifically home health claims and the Outcomes and Assessment Information Set (OASIS), linked with data from the Area Health Resource File (AHRF) for 2012, the 2015 Edition of County Typology Codes from the U.S. Department of Agriculture Economic Research Service (USDA ERS),[15] and publicly available summary reports on state-level Medicaid expenditures on home and community-based services (HCBS) between 2011 and 2013 from Truven Health Analytics.[12] Home health claims provide beneficiary-level detail on home health episodes. The OASIS is a comprehensive assessment specific to home health that was designed to collect necessary information for care planning by home health agencies and measure outcomes for quality improvement. The OASIS is completed upon admission, discharge, changes in status including transfer to a hospital, and renewal of services for each 60-day episode of care. Items from the OASIS also contribute to case-mix adjustment for Medicare reimbursement. The AHRF provides information on health resources at the county level including hospital beds, skilled nursing facility beds,

home health agencies, rural health clinics, and primary care providers. The ERS data classifies all U.S. counties in terms of economic dependence indicators, including low employment, persistent poverty, low education, and population loss, that are derived from U.S. Census data and the American Community Survey (ACS).

Sample:

We used the following inclusion criteria: 1) Medicare fee-for-service beneficiary, 2) rural-residing based on beneficiary's residential ZIP code classified into any rural category of the ZIP code approximation of the Rural-Urban Commuting Area (RUCA) codes, version 3.10 (https://ruralhealth.und.edu/ruca; additional classification details below),[16] and 3) began home health episode on or after January 1, 2011 and ended on or before December 31, 2013. We excluded beneficiaries who 1) transferred care between home health agencies during the initial home health episode or 2) had an unknown status at the end of the initial home health episode. For beneficiaries who were admitted to home health multiple times during the study period, we used the first initial home health episode during the study period that satisfied inclusion and exclusion criteria.

Dependent variables/outcomes – care processes:

Home health care processes included timely initiation of care, length of stay, and service provision. Timely initiation of care indicated whether an episode started on the physician-ordered start date or within two days of referral to home health care versus after the physician-ordered start or three or more days following referral to home health care. Timely initiation of care uses the same methodology as the National Quality Forum-endorsed, publicly-reported quality measure for home health agencies.[17] We used two measures for length of stay: number of episodes and number of days. Number of episodes indicated whether the beneficiary received any subsequent episodes of care following the initial qualifying home health episode. Number of episodes was dichotomized into one (initial episode only) versus two or more episodes (initial episode plus at least one additional episode). Subsequent episodes represented a continuation of services from the initial qualifying episode and had to start within 60 days of the end of the initial qualifying episode based on similar methodology CMS uses to determine whether episodes are related or considered part of a new spell of illness.[2] Number of days indicates whether the beneficiary was discharged from home health on days 1 through 30 (first half of initial 60-day episode) versus day 31 or later (second half of initial 60-day episode or discharged during a subsequent episode). For service provision during the initial qualifying episode, we created five dichotomous variables for whether any versus no visits were provided by the five allowable provider types under the skilled home health benefit outside of nursing. These provider types included: physical therapy practitioners (physical therapists and physical therapy assistants), occupational therapy practitioners (occupational therapists and occupational therapy assistants), speech language pathologists, medical social workers, and home health aides. We did not study nursing visits since almost all rural beneficiaries included in analysis received nursing care.

Independent variable of interest - community-entry versus post-acute episode:

Episodes were classified based on the response to OASIS item M1000 (From which of the following inpatient facilities was the patient discharged during the past 14 days?). Patients who had not been discharged from an inpatient facility (response option 'NA') were classified as community-entry. Patients who had been discharged from an inpatient facility (response options 1, 2, 3, 4, 5, 6, or 7) were classified as post-acute.

Independent variables used as controls - beneficiary characteristics:

Beneficiary characteristics included: demographics, dual-eligibility status for Medicare and Medicaid, diagnosis, clinical severity, functional and cognitive status upon admission, living situation, and caregiving needs. Demographics included age (<65, 65-74, 75-84, and 85+), sex, and race (white vs. non-white). Dual-eligibility status (yes/no) was determined based on enrollment in Medicaid at any point during the calendar year in which home health services were received from the enrollment file. The ICD-9 code for the primary diagnosis for the home health episode was classified into one of 17 categories based on major diagnostic groups and high frequency conditions (see Table A1). Clinical severity and functional status upon admission

were determined based on the OASIS-derived case-mix measures for prospective payment. Clinical severity, categorized as low, moderate, or high in the case-mix measure, depends on clinical factors such as need for intravenous or parenteral therapy, vision limitations, wounds, pressure ulcers, bowel incontinence, and shortness of breath. Functional impairment, categorized as low, moderate, or high in the case-mix measure, is based on physical assistance required with dressing, bathing, toileting, transfers, and ambulation. Cognitive status was based on an OASIS item on global cognitive status categorized into intact, mild impairment, and moderate to severe impairment. Living situation was dichotomized into lives alone versus lives with others. Caregiving needs were derived from the OASIS and included medication management (none needed, caregiver currently providing assistance, or assistance needed but not currently sufficient) and supervision and safety (no assistance needed, caregiver currently providing assistance, or assistance needed but not currently sufficient).

Table A1. ICD-9 Codes for Diagnosis Groups

Diagnosis Group	Associated ICD-9 Codes
Neoplasms	140.0-239.9, V58.42
Endocrine, nutritional, and metabolic diseases	240.0-279.9
Diseases of the nervous system and sense organs	320.0-389.9, V58.71, V58.72
Diseases of the circulatory system: cardiac conditions	390-429.9
Diseases of the circulatory system: all other conditions	430-459.9, V58.73
Diseases of the respiratory system: asthma, bronchitis, COPD	490-493.92, 496
Diseases of the respiratory system: all other conditions	460-488.89, 494.0-495.9, 500-519.9, V58.74
Diseases of the digestive system	520.0-579.9, V58.75
Diseases of the skin	680.0-709.9, V58.77
Diseases of the musculoskeletal system and connective tissue	710.0-739.9, V58.78
Symptoms, signs, and ill-defined conditions	780.0-799.9
Injury and poisoning	800.0-804.99, 850.0-999.9
Fractures and related supplementary classification	805.0-848.9, V54.0-V54.29, V54.82-V54.9
Supplementary classification: joint replacement	V54.81, V43.60-V43.69
Supplementary classification: rehabilitation	V57.0-V57.9
Supplementary classification: all other	V01-V89 (except V43.60-V43.69, V54.0-V54.29, V54.81-V54.89, V57.0-V57.9, V58.42, V58.71-V58.79)
Other: infection and parasitic diseases, diseases of the blood and blood-forming organs, mental disorders, diseases of the genitourinary system, complications of pregnancy and childbirth, congenital anomalies, and conditions originating in the perinatal period	001.0-139.8, 280.0-289.9, 290.0-319, 580.0-629.9, V58.76, 630-679.14, 740.0-759.9, 760.0-779.9

Independent variables used as controls - community characteristics:

Community characteristics included: rurality of beneficiary residence, state of beneficiary residence, county-level economic indicators, county-level available health resources, and state-level Medicaid spending on HCBS. Rurality of beneficiary residence was determined based on the 2010 RUCA codes, version 3.10 for the beneficiary's ZIP code. We used the ZIP code approximation of the RUCA census tract-based classification scheme, which characterizes the urban/rural status of areas based on U.S. Census Bureau definitions and work commuting information. Rurality was classified as large rural (codes 4.0, 5.0, 6.0), small rural (7.0, 7.2, 8.0, 8.2, 9.0), or isolated small rural (10.0, 10.2, 10.3). State of beneficiary residence included 48 states; New Jersey, Rhode Island, and the District of Columbia were excluded from analysis due to no rural counties or small cell sizes for rural beneficiaries. Available health resources from the AHRF included number of acute care hospital beds, skilled nursing

facility beds, home health agencies, rural health clinics, and primary care physicians within each county in 2012, standardized by county-level Medicare enrollment ages 65 and over and grouped by quartile. County-level economic indicators from the ERS data included dichotomous variables indicating persistent poverty, low employment, low education, and population loss.[15] Persistent poverty indicates that 20% or more residents of a county were poor as measured by the 1980, 1990, and 2000 Census and the ACS 5-year average between 2007 and 2011. Low employment indicates that less than 65% of county residents ages 25 to 64 were employed based on the ACS 5-year average between 2008 and 2012. Low education indicates that 20% or more county residents had neither a high school diploma nor GED based on the ACS 5-year average between 2008 and 2012. Counties designated with population loss had the number of county residents decline both between the 1990 and 2000 Census and between the 2000 and 2010 Census. Two variables derived from publicly-available reports from Truven Health Analytics[12] were used to describe Medicaid spending on HCBS between 2011 and 2013: 1) quartiles of state-level Medicaid expenditures on HCBS, and 2) quartiles of state-level Medicaid expenditures on HCBS as a percentage of spending on all long-term services and supports (LTSS) for older adults and adults with physical disabilities. For this analysis, Federal Fiscal Year data on Medicaid HCBS were treated as Calendar Year data and Medicaid HCBS spending variables were pegged to the year of the beneficiary episode using start date of the episode.

Independent variables used as controls - home health agency characteristics:

Home health agency characteristics were used as control variables in the analysis and included: profit status, facility type, size based on full-time equivalent (FTE) staffing, use of contracting for therapy and medical social work staff, and rural volume. Profit status was categorized as for-profit, non-profit, or governmental. Facility type was categorized as free-standing versus facility-based (i.e., based within a hospital, skilled nursing facility, or other inpatient facility). Variables for home health agency size were calculated based on FTE for each service type and categorized based on variable distributions. Size variables included FTE for registered nurse (<3, 3-5.99, 6-11.99, 12+), licensed practical nurse (<1, 1-1.99, 2-2.99, 3+), home health aide (<1, 1-1.99, 2-2.99, 3+), physical therapist (0, .01-.99, 1-2.99, 3+), occupational therapist (0, .01-.49, .50-.99, 1+), speech language pathologist (0, .01-.25, >.25), and medical social worker (0, .01-.49, .50+). Use of contracting for therapy and medical social work services were variables indicating whether physical therapy, occupational therapy, and medical social work were provided by in-house staff only, through the use of contract staff or a combination of in-house and contract staff, or not provided. Rural volume, calculated from claims data using the number of total annual visits provided by the home health agency without exclusion, was categorized as <500, 500-2,499, 2,500-4,999, 5,000-9,9999, and 10,000+ total annual visits.

Analyses:

Descriptive analysis comparing home health care processes by community-entry versus post-acute episodes used chi-square tests for proportions and t-tests for means. A total of 858,683 initial home health episodes met overall inclusion and exclusion criteria. For the descriptive analyses, 858,513 episodes had complete data for timely initiation of care and 857,552 episodes had complete data for service provision. To assess the relationships between type of episode (community-entry versus post-acute) and care processes (timely initiation of care, length of stay, and service provision), we used three-level hierarchical multiple logistic regression models that controlled for beneficiary, community, and home health agency characteristics described above. We used generalized estimating equation methods in the regression analyses to account for clustering of beneficiaries within agencies and states. Wald F tests were used to determine whether the type of episode (community-entry versus post-acute) was associated with care processes. Since we modeled eight outcomes (i.e., eight separate models for each of the care process measures), we used a Bonferroni correction (α/n) to set the significance for our fully adjusted regression models at .00625 (.05/8). Complete case analysis was used for final models as less than 1% of home health episodes that otherwise met inclusion and exclusion criteria were missing data. For the final models, 856,696 episodes had complete data for the length of stay analysis, 856,154 episodes had complete data for the timely initiation of care analysis, and 855,205 episodes had complete data for the service provision analysis. Analyses were completed using SAS software, Version 9.4 of the SAS System for Windows and SUDAAN software, Version 11.1.