

Value-Based Care Through Postacute Home Health Under CMS PACT Regulations

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Under the CMS postacute care transfer (PACT) policy, hospitals receive reduced payment for shorter-than-average stays if the discharge is considered a postacute transfer, defined as discharge to a skilled nursing facility, a long-term acute care hospital, a distinct hospital unit (eg, a long-term care or rehabilitation unit), or hospice, or discharge with orders for home health services to be provided by a home health agency and to begin within 3 days of discharge. Annual applicable diagnosis-related groups (DRGs) are determined by recent CMS inpatient payment experience.^{1,2} The policy rationale is that hospitals should not be paid at the usual DRG rate for shorter stays when the total episode includes postacute care.

This study explored the PACT policy's implications for improving the value of care for an entire episode (admission to 90 days post discharge) for patients discharged to home health instead of to home without home health services. Home health entails care delivery in the home to help prevent recurrence and complications following an acute event and is one of the fastest-growing areas of US health care expenditures.³

Evidence concerning the value of postacute home health is sparse, derived from old data, and representative of narrowly defined patient populations.³⁻⁶ PACT policy DRGs, in contrast, include both surgical and medical DRGs across a spectrum of severity and complexity. Moreover, previously published comparisons of home health with no postacute care do not address unmeasured confounding, a relevant consideration because the decision to discharge with home health can be influenced by unobservable patient needs.

The objectives of this study were to assess (1) whether discharge to home health following a PACT policy-eligible inpatient stay, compared with discharge to home, is associated with better outcomes or lower expenditures and (2) whether the impact of home health differs among subpopulations defined by type of inpatient stay and exposure to care management. To improve analytic validity through control of unmeasured confounding, an instrumental variable (IV) approach was taken.

ABSTRACT

OBJECTIVES: To assess in a Medicare Advantage population (1) whether discharge to home health, compared with discharge to home, following an inpatient stay subject to CMS postacute care transfer (PACT) regulations, is associated with better outcomes or lower expenditures and (2) whether the impact differs among subpopulations.

STUDY DESIGN: Claims-based retrospective cohort study.

METHODS: Instrumental variable (IV) analysis, with prior hospital-level probability of discharge to home health as the IV, to control for unobservable as well as observable confounders.

RESULTS: Compared with 15,071 patients discharged to home, 4160 patients discharged to and receiving timely home health services were 60% less likely to be readmitted within 30 days and 37% less likely at 90 days. Total expenditures from time of admission to 90 days post discharge were 11% lower in the home health group. The association of discharge to home health with reduced readmission and reduced costs varied by subpopulations defined by surgical vs medical diagnosis-related group and receipt of intensive care management following discharge.

CONCLUSIONS: The PACT policy may be promoting greater value by reducing readmissions while lowering total expenditures for patients who do not require intensive postacute care. Findings were in contrast to those of previous studies, in which discharge to home health has been associated with higher rates of readmission. Earlier studies did not control for unmeasurable confounders, involved narrowly defined populations, and used older data.

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TAKEAWAY POINTS

The CMS postacute care transfer policy reduces hospital reimbursement for shorter-than-average stays for certain diagnosis-related groups if patients enter postacute care.

- ▶ Among policy-eligible patients discharged to home health or home, home health was associated with a 60% reduction in 30-day readmissions and a 37% reduction at 90 days; a statistically significant relationship persisted in the surgical subpopulation.
- ▶ Total expenditures (admission through 90 days post discharge) were 11% lower with home health.
- ▶ Results should encourage clinical entities to consider home health for patients with relatively short hospital stays who do not require intensive postacute care, particularly patients with surgical admissions.

METHODS

Study Population and Data Sources

An Advarra institutional review board granted a waiver of informed consent for this retrospective cohort study. Participants were in a Humana Medicare Advantage prescription drug plan and had a hospital discharge during 2018 for 1 of 280 PACT policy DRGs (eAppendix Tables 1 and 2 [eAppendix available at [ajmc.com](https://www.ajmc.com)]). Humana's 2018 Medicare Advantage population exceeded 2.8 million, almost all with a Part D plan.⁷ Inclusion also required a rounded-down length of stay (LOS) less than the CMS-reported geometric mean for the assigned DRG and a discharge code for home health or home. Each patient's first eligible discharge was the index event. These exclusion criteria were applied relative to the index date: age less than 19 or greater than 89 years, lack of continuous enrollment for the previous 12 months, end-stage renal disease or hospice care during the previous 12 months or in the following 90 days, and attribution to a primary care physician who delegated claims adjudication to a third party (an option under certain forms of value-based payment). The remaining cohort was divided into preliminary groups of home health and home based on discharge code. Individuals discharged to home health who did not receive home health services within 3 days and individuals discharged to home but receiving home health services within 3 days were then excluded from the final groups, making the 2 treatment groups equivalent for everything except the discharge code and home health services initiation within the time window dictated by CMS PACT policy rules. The 3-day requirement avoids classifying on the basis of home health unlikely to be related to the discharge.

Study data were derived from claims, CMS (mortality), enrollment files, program participation records, and primary care contracts. Humana at Home is a care management service for Medicare Advantage participants with complex medical and functional needs that might be addressed through regular contact with nurse case managers. Special Needs Plans (SNPs) are CMS-approved coordinated care plans for Medicare Advantage participants who are institutionalized, are dually eligible for Medicaid and Medicare, or have a severe or disabling condition. Two Humana at Home programs provide intensive care management: the Transitions Program for certain patients newly discharged from the hospital

and the Long-Term In-Home (LTIH) Program for patients with chronic needs. Participants in Humana at Home may or may not be enrolled in SNPs. Neither Humana at Home programs nor SNPs entail delivery of care in the home.

Measures

The primary outcome measure was all-cause readmission within 30 days of discharge. Additionally, all-cause readmission at 60 and 90 days; emergency department (ED) visits within 30, 60, and 90 days (excluding those

associated with admission); all-cause mortality at 30, 60, and 90 days; and costs at 90 days, with and without inclusion of admission costs, were measured. Costs included total allowed amounts for all medical and pharmacy claims. The following baseline characteristics were measured as of index date: age, sex, race, geographic region and population density of residence, low-income indicators, and surgical vs medical DRG.⁸ Baseline variables for inpatient admissions, ED visits, and the Charlson Comorbidity Index (Deyo version; see eAppendix) were created, using data from the 12 months preceding the index admission. In addition to these baseline variables, the following care management variables were covariates in adjusted analyses: (1) Humana at Home Transitions Program participation anytime during 90 days post discharge, (2) Humana at Home LTIH Program participation anytime during 90 days post discharge, and (3) eligibility for a CMS SNP on the index date.

To permit IV analysis, 3 versions of a variable representing the hospital preference for discharge to home health were constructed. See the eAppendix for more detail.

Analysis

Conventional analyses. Descriptive statistics were used to compare baseline characteristics and postdischarge care management between the home health and home groups and to test the unadjusted association between treatment group and each outcome. The adjusted association between treatment group and outcomes was assessed through Cox proportional hazards models for risk of readmission, ED visits, and mortality and through a generalized linear model (log link, gamma distribution) for costs. Model covariates are described in the preceding section. Patients without continuous enrollment for 90 days following the index date were excluded from the cost analysis.

IV analysis. IV analysis was used to improve the validity of findings by accounting for potential sources of unmeasured confounding, also taking into account measured confounders. Important unmeasurable confounding was suspected because of potential differences between the home health and home groups in patient selection factors that would have influenced both discharge orders and outcomes. For example, a patient living alone might be more likely to be discharged to home health. Living alone could increase the risk of falls, nonadherence to medications, failure to

attend follow-up physician visits, and deficiencies in self-care, in turn increasing the risk of poor outcomes and greater expenditures. Other confounding could occur because of clinical factors absent from claims data. By definition, an IV only indirectly influences outcomes through its direct association with the treatment. Unmeasurable confounders are assumed to be randomly distributed across different levels of the IV. The IV considered in the present study was hospital-level prior preference for (ie, prior probability of) discharge to home health among all patients discharged during the look-back period. The value of the IV was to be substituted for treatment group in the same models used in the conventional analysis. Although conclusions were to be based on the results of IV analysis, results from conventional analysis are reported to show how control for unmeasured confounding altered results. See the eAppendix for additional detail.

Subgroup analyses. Stratified analyses demonstrated the differential impact of home health in subpopulation pairs defined by surgical vs medical DRGs, participation vs no participation in one or the other of the 2 Humana at Home programs, and eligibility vs no eligibility for a SNP.

RESULTS

Inclusion and exclusion criteria yielded a cohort of 19,231 patients: 4160 in the home health group and 15,071 in the home group (see eAppendix Figure 1). Table 1 summarizes unadjusted group differences. Some differences were not only statistically significant but also large enough to be meaningful. Patients in the home health group were more likely to be female and to live in an urban area, were less likely to qualify for a low-income program, had lower levels of preadmission comorbidity and general health care utilization, were much more likely to have had an index admission for a surgical rather than a medical DRG, and were less likely to receive postdischarge Humana at Home services or be in an SNP. The index admissions had occurred in 8419 hospitals.

Testing for the association of the IV with discharge to home health resulted in defining the IV as the probability of discharge to home health in the 6 months prior to the date of a study patient's index discharge. See the eAppendix for testing details.

Results for patient outcomes favored the home health group (Table 2). With adjustment only for measured confounders (conventional analysis), patients in the home health group had more than a 25% smaller risk of readmission at 30 days. With additional adjustment for unmeasured confounders (IV analysis), the relative risk reduction was more than 50%. The observed benefit of home health became somewhat attenuated over time, but a significant reduction in risk of 90-day readmission remained after adjustment for both measured and unmeasured confounders. No statistically significant association between home health discharge and ED visits or all-cause mortality was observed.

The benefit of home health discharge varied somewhat by subpopulation (Figure). Reduction in 30-day readmission among

TABLE 1. Characteristics of Study Participants Receiving Home Health vs Discharged to Home

Variable ^a	Home health (n = 4160)	Home (n = 15,071)	P ^b
Age in years, mean (SD)	71.7 (7)	70.8 (9)	<.001
Female sex, n (%)	2433 (58.5)	7462 (49.5)	<.001
10 CMS regions	Differences in distribution were small although statistically significant		<.001
Population density, n (%)			
Urban	2614 (62.8)	8805 (58.4)	<.001
Suburban	1101 (26.5)	4383 (29.1)	
Rural	445 (10.7)	1883 (12.5)	
Race, n (%)			
White	3574 (85.9)	12,927 (85.8)	.04
Non-White	540 (13.0)	1981 (13.2)	
Unknown	46 (1.1)	163 (1.1)	
LIS and/or Medicare-Medicaid dual eligibility, n (%)	708 (17.0)	3471 (23.0)	<.001
Deyo CCI score, mean (SD)	1.9 (2)	2.7 (3)	<.001
≥ 1 prior inpatient admission, n (%)	1017 (24.4)	4554 (30.2)	<.001
≥ 1 prior ED visit, n (%)	1704 (41.0)	10,508 (69.7)	<.0001
Surgical (as opposed to medical) diagnosis-related group	3553 (85.4)	7421 (49.2)	<.001
Mean length of stay, days	1.04	1.07	<.001
Mean number of home health visits, 90 days post discharge ^c	13.45	6.28	<.001
HAA LTIH Program, anytime during 90 days post discharge, n (%)	255 (6.1)	1061 (7.0)	.04
HAA Transitions Program, n (%)	256 (6.2)	1141 (7.6)	.002
SNP eligibility, n (%)	161 (3.9)	806 (5.3)	<.001

CCI, Charlson Comorbidity Index; ED, emergency department; HAA, Humana at Home; LIS, low-income subsidy (assistance from CMS with Part D prescription drug costs); LTIH, Long-Term In-Home; SNP, Special Needs Plan.

^aMeasurements were made on the date of index discharge or over a time period relative to that date, except for inpatient admissions, ED visits, and the CCI score, which were based on the 12-month period prior to hospital admission.

^bDifferences were evaluated by χ^2 tests (categorical variables) and 2-tailed Student *t* tests (means of continuous variables).

^cOnly home health visits occurring within 3 days of discharge made patients discharged to home (without home health services) ineligible for the study. An unknown number of home health visits in both groups could have been unrelated to the index admission.

those receiving home health was greater in the surgical (vs medical) DRG subpopulation and was statistically significant only in the surgical DRG subpopulation. Reduced risk of 30-day readmission was observed for recipients of home health regardless of receipt of intensive Humana at Home services during 90-day follow-up but was not statistically significant among patients receiving Humana at Home services. A similar pattern was observed when the analysis was stratified by SNP and no SNP. The reduction in readmissions in the home health group remained greater at 60 and 90 days for patients with surgical DRGs, no Humana at Home, or no SNP

TABLE 2. Patient Outcomes, Discharge to Home Health vs Discharged to Home

Outcome measure	Unadjusted, n (%)		P ^a	Adjusted, HR (95% CI)	
	Home health (n=4160)	Home (n=15,071)		Conventional analysis	IV analysis
≥ 1 all-cause readmission					
30 days	199 (4.8)	1130 (7.5)	<.001	0.73 (0.63-0.85)	0.40 (0.25-0.65)
60 days	314 (7.5)	1697 (11.3)	<.001	0.77 (0.69-0.87)	0.55 (0.37-0.82)
90 days	374 (9.0)	2111 (14.0)	<.001	0.74 (0.66-0.82)	0.63 (0.45-0.90)
≥ 1 ED visit					
30 days	533 (12.8)	2503 (16.6)	<.001	0.98 (0.91-1.10)	0.79 (0.57-1.08)
60 days	735 (17.7)	3461 (23.0)	<.001	1.01 (0.93-1.09)	0.83 (0.63-1.09)
90 days	860 (20.7)	4171 (27.7)	<.001	0.97 (0.90-1.05)	0.85 (0.66-1.09)
All-cause mortality					
30 days	10 (0.2)	89 (0.6)	<.001	0.49 (0.26-0.96)	0.35 (0.06-2.11)
60 days	35 (0.8)	208 (1.4)	<.001	0.79 (0.55-1.13)	0.66 (0.21-2.06)
90 days	58 (1.4)	307 (2.0)	<.001	0.89 (0.67-1.18)	0.69 (0.27-1.75)

ED, emergency department; IV, instrumental variable.
^aDifferences were evaluated by χ^2 tests.

DISCUSSION

In an IV analysis, discharge to and timely receipt of home health services was associated with reduced readmission rates and total episode expenditures in a national patient population defined by the CMS PACT policy. The 30-day risk of readmission was 60% lower for patients discharged to home health compared with patients discharged to home. Readmission remained lower in the home health group up to 90 days. Home health was additionally associated with an 11% reduction in total 90-day allowable costs, taking into account both the reduced hospital payment and the added cost of home health services for patients in this group. Because IV analysis was originally conceived as a theoretical simulation of randomized controlled trials, it is reasonable to infer that these associations represent causal relationships.^{9,10} The added robustness of results, compared with results controlled only for measured confounders, demonstrates the potential utility of the IV approach.

Although the cost savings demonstrated by this study are from a payer perspective, they have implications for clinicians and health care systems, particularly those under value-based payment arrangements involving downside financial risk. Clinical entities can apply these findings to those situations in which intensive postacute care is not needed. Study findings suggest that for a wide range of DRGs, home health would improve outcomes and result in shared savings even after accounting for home health costs.

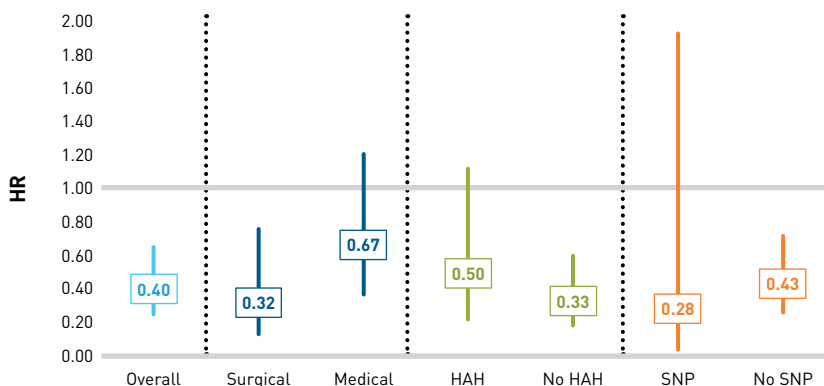
The present study is, to the authors' knowledge, the only published investigation of the impact of the PACT policy. It also adds to the body of evidence concerning home health services through its methods and the patient population studied. Previous studies have

found higher readmission rates among patients discharged to home health as opposed to home.³⁻⁶ By contrast, the present study found readmission rates to be lower for recipients of home health, perhaps because of control through IV analysis for unobservable differences. Nevertheless, the present study also demonstrated a significant though smaller reduction in readmission through conventional multivariable analysis. The present study's unique classification requirement of receipt or nonreceipt of home health services in the first 3 days post discharge may have improved the likelihood of detecting home health benefits. Another difference from previous

eligibility than for patients in the alternate subpopulations, but differences grew smaller over time (eAppendix Figures 2 and 3).

Total adjusted episode costs, including admission and 90-day postdischarge care, were comparable between the home health and home groups in conventional adjusted analysis but were significantly lower in the home health group in IV analysis. When hospital admission expenditures were disregarded, no overall cost savings were detected. The actual cost savings, according to unadjusted analysis, was \$239 per patient. See Table 3 and the graphic display in eAppendix Figure 4.

FIGURE. Adjusted HRs for 30-Day Readmission, Home Health vs Home, Overall and by Subpopulation^a



HAH, Humana at Home; IV, instrumental variable; SNP, Special Needs Plan.

^aThe figure represents the results of IV analysis in which hospital-level preference for home health discharge (the IV) was substituted for treatment (discharge to home health vs discharge to home without home health). Vertical lines behind HR estimates represent CIs. The CIs that cross the horizontal line corresponding to an HR of 1.00 denote statistically significant results.

publications was a more broadly defined patient population who had been hospitalized for a wide range of procedures and conditions. Because of the shorter-than-average LOS that defines PACT-eligible discharges, these patients differ clinically from other patients with the same DRG in ways that may affect the risk of readmission independent of discharge orders. The PACT policy population in the present study did in fact have a relatively low overall rate of 30-day all-cause readmission: 7% compared with 17% to 30% in previously published studies making the same comparison.^{3,4,6} Although patients may be discharged to home health rather than home because of an elevated risk of readmission, home health services may not completely eliminate the risk difference, depending on the nature of the admission.

But for the population defined by the PACT policy, whose primary common denominator is shorter lengths of stay, home health may in fact improve outcomes. Because previous studies used data sets from 2005 to 2011, it is also possible that the present study, using data from 2018, reflects improvements in home health quality.¹¹

Stratified analysis showed that in all subpopulations, patients experienced fewer readmissions if they received home health, but statistical significance varied and differences diminished over time. Stratification by surgical vs medical DRG revealed a significant reduction in 30-day readmissions, the primary outcome, comparing home health with home discharge, in the surgical subpopulation, but the reduction was nonsignificant in the medical subpopulation. Surgical procedures often create new needs, such as wound care or occupational therapy. By contrast, care needs after medical hospitalizations may not differ from preadmission needs because the condition has been stabilized. It is noteworthy that 85% of patients in the home health group had had a surgical stay, compared with only 50% of the home group. It is also possible that medical patients have more complex needs, which would be consistent with the greater levels of preadmission comorbidity and utilization observed in the home group, and that these needs are less easily resolved with home health services. The direction of results in other stratified analyses suggested that home health may have benefited patients regardless of whether they received intensive care management in the form of a Humana at Home program or through a SNP. However, the observed benefits of home health were larger and statistically significant in the subpopulations without these additional forms of oversight. Conclusions about the differential impact of home health among subpopulations must be made with caution because the CIs of subpopulation estimates overlapped.

The CMS PACT policy was designed to distribute payments across the providers where care is received. This study's findings suggest that, additionally, policy incentives may be promoting greater value

by reducing readmissions while reducing total episode costs. Study results should encourage physicians to consider home health for a broad range of admissions, especially for surgical admissions, that might otherwise result in discharge to home.

Limitations

A key study limitation is that although the IV was designed to control for unmeasured patient-level confounding, it may not capture all hospital-level confounders, such as variations in care quality, adequacy of discharge planning, hospital culture, and geographical practice patterns. The available data did not allow creation of hospital-level variables to control for these factors. This source of confounding may be mitigated by adjustment in all models for patient-level geographic location, population density, income, and race. These patient-level factors are likely to be associated with the quality of care delivered in each study patient's index hospital. For example, it can be assumed that high-income earners are more likely to be admitted to hospitals delivering higher-quality care and that urban residents have access to hospitals with more resources. Still, hospital-level confounding remains an important limitation. A remaining potential source of confounding is differences across hospitals in the distribution of the 280 PACT-eligible DRGs.

Control for the effect of the LTIH Program was imperfect because there was no differentiation between initiation of these services before and after the outcome measurement time point. Additional limitations inherent in administrative databases, such as missing data, incorrect coding, and the unavailability of such information as planned readmission at the time of discharge, also apply.

Results may not generalize to true real-world practice in which receipt or lack of home health services immediately after discharge can be inconsistent with the actual discharge orders. In the present study, approximately 27% of otherwise study-eligible patients with a home health discharge received no home health services within 3 days and were thus excluded. Results may not generalize

TABLE 3. Total 90-Day Costs,^a Discharge to Home Health vs Discharge to Home

Population	Unadjusted, mean (SD)			Adjusted, cost ratio (95% CI)	
	Home health	Home	P ^b	Conventional analysis	IV analysis
Overall	\$5463 (\$4159)	\$5702 (\$6431)	.02	1.02 (1.00-1.06)	0.89 (0.81-0.98)
Surgical DRG	\$5218 (\$3464)	\$5911 (\$5189)	<.001	0.93 (0.90-0.96)	0.83 (0.75-0.92)
Medical DRG	\$6898 (\$6779)	\$5499 (\$7434)	<.001	1.07 (0.99-1.14)	0.86 (0.72-1.02)
Intensive HAH	\$8303 (\$6786)	\$8678 (\$7928)	.38	0.93 (0.86-1.02)	0.71 (0.53-0.95)
No intensive HAH	\$5155 (\$3635)	\$5316 (\$6105)	.12	1.05 (1.02-1.08)	0.95 (0.86-1.05)
SNP eligibility	\$7310 (\$6690)	\$6087 (\$6572)	.03	1.30 (1.14-1.48)	1.37 (0.86-2.19)
No SNP eligibility	\$5388 (\$4007)	\$5680 (\$6422)	<.006	1.01 (0.99-1.04)	0.89 (0.80-0.97)

DRG, diagnosis-related group; HAH, Humana at Home; IV, instrumental variable; SNP, Special Needs Plan.

^aTotal costs included all allowable expenditures beginning with the cost of the index hospital admission and ending at 90 days post discharge. HAH participation could occur at any time during the 90-day postdischarge period; SNP eligibility was assessed on the index discharge date.

^bDifferences were evaluated by 2-tailed Student *t* tests.

to traditional Medicare, other Medicare Advantage populations, or future PACT policy DRG lists.

CONCLUSIONS

In an IV analysis, discharge to home health was associated with improved patient outcomes (fewer readmissions) and reduced expenditures in a national patient population defined by the CMS PACT policy. Results should encourage physicians and health care systems to consider home health for patients whose hospital stays, particularly surgical stays, have been relatively short and who do not require intensive postacute care to ensure that early discharge does not jeopardize patients' chances of avoiding a readmission. Further research is needed to more precisely define the diagnoses, procedures, hospital stay parameters, and patient characteristics that can be used to identify patients likely to benefit from home health services. ■

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Authorship Information: Concept and design (PR, TR, BSt, MF, CD, YL, BSa, KW, AS, DA); acquisition of data (PR, MF); analysis and interpretation of data (PR, TR, BSt, MF, CD, YL, BSa, KW, AS, DA); drafting of the manuscript (PR, TR, MF); critical revision of the manuscript for important intellectual content (PR, BSt, YL, BSa, KW, AS, DA); statistical analysis (PR); administrative, technical, or logistic support (PR, TR, MF); and supervision (TR, BSt, CD).

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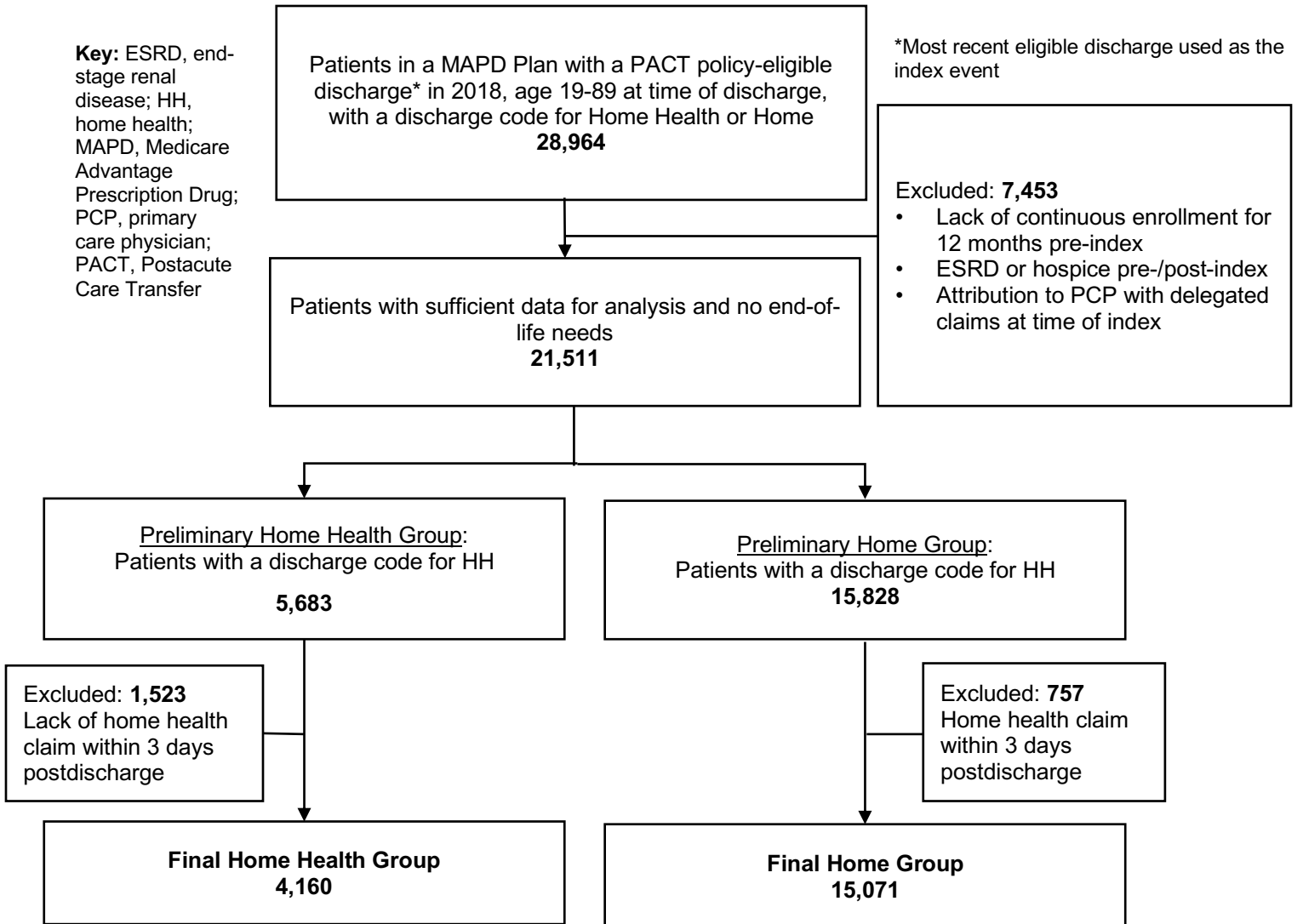
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eAppendix Figure 1. Study Participant Flow Diagram



Charlson Comorbidity Index

The Deyo-Charlson Comorbidity Index (DCI) is based on 17 categories of comorbidities, the presence of which yield a score that reflects the cumulative increased likelihood of one-year mortality. The evolution of the Deyo-Charlson methodology since its origin has permitted researchers to utilize the score as an assessment of overall patient health risk, typically performed at baseline in a given study. It uses ICD-9-CM and ICD-10 diagnosis and procedure codes to identify the presence of each category, which are weighted on a scale of 1 to 6. The composite score can range from 0 to 33.¹

Instrumental Variable (IV Testing)

Candidate Variables

To permit IV analysis, three different variations of a variable representing the hospital preference for discharge to home health were constructed. For each hospital, these variables were created: 1) a binary variable representing whether the last PACT policy-eligible patient was discharged with orders for home health, 2) a continuous variable representing the probability that PACT policy-eligible patients discharged in the 6 months prior to the study patient's index date were discharged with orders for home health, and 3) a continuous variable representing the probability that PACT policy-eligible patients discharged in the 12 months prior to the study patient's index date were discharged with orders for home health.

Analytic Plan and Rationale

IV analysis was used to improve the validity of findings by accounting for potential sources of unmeasured confounding, while also taking into account measured confounders. Important unmeasurable confounding was suspected because of potential differences between the Home Health and Home Groups in patient selection factors that would have influenced both discharge orders and outcomes. For example, a patient who lived alone might be more likely to be discharged to home health than a patient with the same DRG who lived with a spouse or an adult child because of greater risk of falls, poorer adherence to medications, less likely compliance with follow-up physician visit recommendations, poor nutrition and other deficiencies in self-care. These risks could in turn increase the risk of readmission, ED visits, death and expenditures. Other potential unmeasurable confounding could occur because of differences in clinical factors not captured by the available data. An IV is a variable that is directly associated with the treatment of interest (in this case, being discharged to home health), but only indirectly influences outcomes (in this case, readmissions, mortality and costs) through its association with the treatment. Substituting an IV for actual treatment when randomized treatment assignment is not possible is intended to take advantage of a presumed unintentional, natural randomization of patients to different values of the IV, the result being that the distribution of unobserved confounders is similar across levels of the IV.^{2,3} In IV analysis, the IV replaces the treatment variable in regression models and covariates for measured confounders are retained. The IV considered in the present study was hospital-level prior preference for discharge to home health, where "preference for" was understood to be prior probability of. Since unobserved patient characteristics like living alone would not likely be related to where patients had been hospitalized, it was assumed that patients' admission to

hospitals with different levels of preference for home health discharge could be treated as though these were randomized assignments.

IV analysis followed the two-stage predictor substitution (2SPS) approach.⁴ In the first step of stage 1, the three previously described variations of the designated IV were tested for their adjusted association with treatment by constructing logistic regression models to predict whether a PACT policy-eligible patient was discharged to home health, with the IV and all the previously defined covariates (e.g., age, sex, clinical risk, care management) in the model. The odds ratios and confidence intervals for the coefficient of the IV were used to confirm an association between the IV and discharge to home health. IV analysis was to be abandoned if there was no statistically significant association. In the second step of stage 1, linear regression was used to predict discharge to home health as a function of the IV and the covariates, using the strongest version of the IV. The predicted value from this linear regression model was used as the instrument for stage 2.

In stage 2, the stage 1 value of the chosen version of the IV was to be substituted for treatment group (Home Health versus Home) in the same models used to predict outcomes in the conventional analysis. Although conclusions were to be based on the results of IV analysis, results from conventional multivariable regression models are reported to show how results would have been different without the control for unmeasured confounding.

Results of Testing

Step 1 of stage 1, testing for the association of the IV with the treatment of interest (discharge to home health), resulted in defining the IV as the probability of discharge to home health in the 6 months prior to the date of a study patient's index discharge. The first proposed variation of the IV, which was the probability of the last patient being discharged to home health, did not have a statistically significant association with treatment. When the IV was defined in terms of the probability of home health discharge in the prior 6 or 12 months, the association with treatment was significant in both cases and the point estimates were nearly identical in magnitude. The probability of discharge to home health in the prior 6 months was chosen as the IV because it represented a more recent measure of the hospital's preference for home health discharge. The adjusted odds of a study patient being discharged to home health was about 8% greater for every 1 percentage point increase in the probability of home health discharge among patients with PACT policy DRGs who were discharged in the previous 6 months (odds ratio, 1.076; 95% CI, 1.072-1.079). In the second step of stage 1, the instrument was generated in a regression modeling the current discharge to home health using the probability of discharge to home health in the prior 6 months and relevant covariates. This regression model yielded a parameter estimate of 0.0084 (t-Value, 58.7; $p < .0001$) for the IV. As described in the previous section, predicted values from this regression model were used in stage 2 of models examining the outcomes of interest.

eAppendix Table 1. Surgical Diagnosis-Related Groups for Which Postacute Transfer Policy Rules Applied in 2018

MS-DRG¹	TYPE	MS-DRG Title	Weights²
003	SURG	ECMO OR TRACH W MV >96 HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	17.6245
004	SURG	TRACH W MV >96 HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	11.0663
216	SURG	CARDIAC VALVE & OTH MAJ CARDIOTHORACIC PROC W CARD CATH W MCC	9.4996
266	SURG	ENDOVASCULAR CARDIAC VALVE REPLACEMENT W MCC	7.7525
219	SURG	CARDIAC VALVE & OTH MAJ CARDIOTHORACIC PROC W/O CARD CATH W MCC	7.6075
233	SURG	CORONARY BYPASS W CARDIAC CATH W MCC	7.3436
217	SURG	CARDIAC VALVE & OTH MAJ CARDIOTHORACIC PROC W CARD CATH W CC	6.2829
267	SURG	ENDOVASCULAR CARDIAC VALVE REPLACEMENT W/O MCC	6.1066
459	SURG	SPINAL FUSION EXCEPT CERVICAL W MCC	6.0381
235	SURG	CORONARY BYPASS W/O CARDIAC CATH W MCC	5.7786
218	SURG	CARDIAC VALVE & OTH MAJ CARDIOTHORACIC PROC W CARD CATH W/O CC/MCC	5.684
028	SURG	SPINAL PROCEDURES W MCC	5.5586
653	SURG	MAJOR BLADDER PROCEDURES W MCC	5.53
023	SURG	CRANIOTOMY W MAJOR DEVICE IMPLANT OR ACUTE CNS PDX W MCC OR CHEMOTHERAPY IMPLANT OR EPILEPSY W NEUROSTIMULATOR	5.4949
405	SURG	PANCREAS, LIVER & SHUNT PROCEDURES W MCC	5.2874
220	SURG	CARDIAC VALVE & OTH MAJ CARDIOTHORACIC PROC W/O CARD CATH W CC	5.1403
853	SURG	INFECTIOUS & PARASITIC DISEASES W O.R. PROCEDURE W MCC	5.1279
234	SURG	CORONARY BYPASS W CARDIAC CATH W/O MCC	5.0566
466	SURG	REVISION OF HIP OR KNEE REPLACEMENT W MCC	5.043
463	SURG	WND DEBRID & SKN GRFT EXC HAND, FOR MUSCULO-CONN TISS DIS W MCC	5.0171
163	SURG	MAJOR CHEST PROCEDURES W MCC	4.9422
329	SURG	MAJOR SMALL & LARGE BOWEL PROCEDURES W MCC	4.9133
239	SURG	AMPUTATION FOR CIRC SYS DISORDERS EXC UPPER LIMB & TOE W MCC	4.6456
221	SURG	CARDIAC VALVE & OTH MAJ CARDIOTHORACIC PROC W/O CARD CATH W/O CC/MCC	4.5838
326	SURG	STOMACH, ESOPHAGEAL & DUODENAL PROC W MCC	4.5478
856	SURG	POSTOPERATIVE OR POST-TRAUMATIC INFECTIONS W O.R. PROC W MCC	4.4513
981	SURG	EXTENSIVE O.R. PROCEDURE UNRELATED TO PRINCIPAL DIAGNOSIS W MCC	4.3098
025	SURG	CRANIOTOMY & ENDOVASCULAR INTRACRANIAL PROCEDURES W MCC	4.3064
907	SURG	OTHER O.R. PROCEDURES FOR INJURIES W MCC	4.1721
335	SURG	PERITONEAL ADHESIOLYSIS W MCC	4.0938

MS-DRG¹	TYPE	MS-DRG Title	Weights²
031	SURG	VENTRICULAR SHUNT PROCEDURES W MCC	4.0742
573	SURG	SKIN GRAFT FOR SKIN ULCER OR CELLULITIS W MCC	4.0635
616	SURG	AMPUTAT OF LOWER LIMB FOR ENDOCRINE,NUTRIT,& METABOL DIS W MCC	4.043
460	SURG	SPINAL FUSION EXCEPT CERVICAL W/O MCC	4.0149
956	SURG	LIMB REATTACHMENT, HIP & FEMUR PROC FOR MULTIPLE SIGNIFICANT TRAUMA	3.9066
236	SURG	CORONARY BYPASS W/O CARDIAC CATH W/O MCC	3.8838
474	SURG	AMPUTATION FOR MUSCULOSKELETAL SYS & CONN TISSUE DIS W MCC	3.863
024	SURG	CRANIO W MAJOR DEV IMPL/ACUTE COMPLEX CNS PDX W/O MCC	3.8314
332	SURG	RECTAL RESECTION W MCC	3.8214
040	SURG	PERIPH/CRANIAL NERVE & OTHER NERV SYST PROC W MCC	3.8078
356	SURG	OTHER DIGESTIVE SYSTEM O.R. PROCEDURES W MCC	3.8061
242	SURG	PERMANENT CARDIAC PACEMAKER IMPLANT W MCC	3.7055
622	SURG	SKIN GRAFTS & WOUND DEBRID FOR ENDOC, NUTRIT & METAB DIS W MCC	3.6115
273	SURG	PERCUTANEOUS INTRACARDIAC PROCEDURES W MCC	3.5791
628	SURG	OTHER ENDOCRINE, NUTRIT & METAB O.R. PROC W MCC	3.5763
166	SURG	OTHER RESP SYSTEM O.R. PROCEDURES W MCC	3.547
414	SURG	CHOLECYSTECTOMY EXCEPT BY LAPAROSCOPE W/O C.D.E. W MCC	3.5468
467	SURG	REVISION OF HIP OR KNEE REPLACEMENT W CC	3.4778
659	SURG	KIDNEY & URETER PROCEDURES FOR NON-NEOPLASM W MCC	3.4129
492	SURG	LOWER EXTREM & HUMER PROC EXCEPT HIP,FOOT,FEMUR W MCC	3.3008
029	SURG	SPINAL PROCEDURES W CC OR SPINAL NEUROSTIMULATORS	3.2737
987	SURG	NON-EXTENSIVE O.R. PROC UNRELATED TO PRINCIPAL DIAGNOSIS W MCC	3.2362
477	SURG	BIOPSIES OF MUSCULOSKELETAL SYSTEM & CONNECTIVE TISSUE W MCC	3.2332
264	SURG	OTHER CIRCULATORY SYSTEM O.R. PROCEDURES	3.2177
469	SURG	MAJOR HIP AND KNEE JOINT REPLACEMENT OR REATTACHMENT OF LOWER EXTREMITY W MCC OR TOTAL ANKLE REPLACEMENT	3.201
480	SURG	HIP & FEMUR PROCEDURES EXCEPT MAJOR JOINT W MCC	3.0199
495	SURG	LOCAL EXCISION & REMOVAL INT FIX DEVICES EXC HIP & FEMUR W MCC	3.0121
026	SURG	CRANIOTOMY & ENDOVASCULAR INTRACRANIAL PROCEDURES W CC	2.9971
574	SURG	SKIN GRAFT FOR SKIN ULCER OR CELLULITIS W CC	2.9594
500	SURG	SOFT TISSUE PROCEDURES W MCC	2.9592
515	SURG	OTHER MUSCULOSKELET SYS & CONN TISS O.R. PROC W MCC	2.9195
518	SURG	BACK & NECK PROC EXC SPINAL FUSION W MCC OR DISC DEVICE/NEUROSTIM	2.893
464	SURG	WND DEBRID & SKN GRFT EXC HAND, FOR MUSCULO-CONN TISS DIS W CC	2.8438
468	SURG	REVISION OF HIP OR KNEE REPLACEMENT W/O CC/MCC	2.817

MS-DRG¹	TYPE	MS-DRG Title	Weights²
406	SURG	PANCREAS, LIVER & SHUNT PROCEDURES W CC	2.7958
654	SURG	MAJOR BLADDER PROCEDURES W CC	2.7726
274	SURG	PERCUTANEOUS INTRACARDIAC PROCEDURES W/O MCC	2.7684
240	SURG	AMPUTATION FOR CIRC SYS DISORDERS EXC UPPER LIMB & TOE W CC	2.6669
579	SURG	OTHER SKIN, SUBCUT TISS & BREAST PROC W MCC	2.6606
243	SURG	PERMANENT CARDIAC PACEMAKER IMPLANT W CC	2.6088
570	SURG	SKIN DEBRIDEMENT W MCC	2.5948
164	SURG	MAJOR CHEST PROCEDURES W CC	2.5776
255	SURG	UPPER LIMB & TOE AMPUTATION FOR CIRC SYSTEM DISORDERS W MCC	2.5153
510	SURG	SHOULDER, ELBOW OR FOREARM PROC, EXC MAJOR JOINT PROC W MCC	2.4879
982	SURG	EXTENSIVE O.R. PROCEDURE UNRELATED TO PRINCIPAL DIAGNOSIS W CC	2.4839
330	SURG	MAJOR SMALL & LARGE BOWEL PROCEDURES W CC	2.4689
854	SURG	INFECTIOUS & PARASITIC DISEASES W O.R. PROCEDURE W CC	2.3912
027	SURG	CRANIOTOMY & ENDOVASCULAR INTRACRANIAL PROCEDURES W/O CC/MCC	2.3665
336	SURG	PERITONEAL ADHESIOLYSIS W CC	2.3397
041	SURG	PERIPH/CRANIAL NERVE & OTHER NERV SYST PROC W CC OR PERIPH NEUROSTIM	2.3311
629	SURG	OTHER ENDOCRINE, NUTRIT & METAB O.R. PROC W CC	2.3157
478	SURG	BIOPSIES OF MUSCULOSKELETAL SYSTEM & CONNECTIVE TISSUE W CC	2.2386
493	SURG	LOWER EXTREM & HUMER PROC EXCEPT HIP, FOOT, FEMUR W CC	2.2036
475	SURG	AMPUTATION FOR MUSCULOSKELETAL SYS & CONN TISSUE DIS W CC	2.1526
244	SURG	PERMANENT CARDIAC PACEMAKER IMPLANT W/O CC/MCC	2.1395
030	SURG	SPINAL PROCEDURES W/O CC/MCC	2.1333
032	SURG	VENTRICULAR SHUNT PROCEDURES W CC	2.1276
327	SURG	STOMACH, ESOPHAGEAL & DUODENAL PROC W CC	2.1162
357	SURG	OTHER DIGESTIVE SYSTEM O.R. PROCEDURES W CC	2.1
617	SURG	AMPUTAT OF LOWER LIMB FOR ENDOCRINE, NUTRIT, & METABOL DIS W CC	2.098
470	SURG	MAJOR HIP AND KNEE JOINT REPLACEMENT OR REATTACHMENT OF LOWER EXTREMITY W/O MCC	2.0543
481	SURG	HIP & FEMUR PROCEDURES EXCEPT MAJOR JOINT W CC	2.0501
655	SURG	MAJOR BLADDER PROCEDURES W/O CC/MCC	2.0496
908	SURG	OTHER O.R. PROCEDURES FOR INJURIES W CC	2.0254
415	SURG	CHOLECYSTECTOMY EXCEPT BY LAPAROSCOPE W/O C.D.E. W CC	2.021
407	SURG	PANCREAS, LIVER & SHUNT PROCEDURES W/O CC/MCC	2.0185
488	SURG	KNEE PROCEDURES W/O PDX OF INFECTION W CC/MCC	1.9965
333	SURG	RECTAL RESECTION W CC	1.9925
857	SURG	POSTOPERATIVE OR POST-TRAUMATIC INFECTIONS W O.R. PROC W CC	1.9881

MS-DRG¹	TYPE	MS-DRG Title	Weights²
496	SURG	LOCAL EXCISION & REMOVAL INT FIX DEVICES EXC HIP & FEMUR W CC	1.9746
042	SURG	PERIPH/CRANIAL NERVE & OTHER NERV SYST PROC W/O CC/MCC	1.9105
623	SURG	SKIN GRAFTS & WOUND DEBRID FOR ENDOC, NUTRIT & METAB DIS W CC	1.897
516	SURG	OTHER MUSCULOSKELET SYS & CONN TISS O.R. PROC W CC	1.882
465	SURG	WND DEBRID & SKN GRFT EXC HAND, FOR MUSCULO-CONN TISS DIS W/O CC/MCC	1.8815
165	SURG	MAJOR CHEST PROCEDURES W/O CC/MCC	1.8507
167	SURG	OTHER RESP SYSTEM O.R. PROCEDURES W CC	1.8497
519	SURG	BACK & NECK PROC EXC SPINAL FUSION W CC	1.8038
660	SURG	KIDNEY & URETER PROCEDURES FOR NON-NEOPLASM W CC	1.7929
511	SURG	SHOULDER,ELBOW OR FOREARM PROC,EXC MAJOR JOINT PROC W CC	1.786
479	SURG	BIOPSIES OF MUSCULOSKELETAL SYSTEM & CONNECTIVE TISSUE W/O CC/MCC	1.7667
494	SURG	LOWER EXTREM & HUMER PROC EXCEPT HIP,FOOT,FEMUR W/O CC/MCC	1.7562
256	SURG	UPPER LIMB & TOE AMPUTATION FOR CIRC SYSTEM DISORDERS W CC	1.7431
575	SURG	SKIN GRAFT FOR SKIN ULCER OR CELLULITIS W/O CC/MCC	1.7419
988	SURG	NON-EXTENSIVE O.R. PROC UNRELATED TO PRINCIPAL DIAGNOSIS W CC	1.7104
033	SURG	VENTRICULAR SHUNT PROCEDURES W/O CC/MCC	1.6992
501	SURG	SOFT TISSUE PROCEDURES W CC	1.6893
331	SURG	MAJOR SMALL & LARGE BOWEL PROCEDURES W/O CC/MCC	1.6758
482	SURG	HIP & FEMUR PROCEDURES EXCEPT MAJOR JOINT W/O CC/MCC	1.6692
983	SURG	EXTENSIVE O.R. PROCEDURE UNRELATED TO PRINCIPAL DIAGNOSIS W/O CC/MCC	1.6456
571	SURG	SKIN DEBRIDEMENT W CC	1.6287
337	SURG	PERITONEAL ADHESIOLYSIS W/O CC/MCC	1.6182
630	SURG	OTHER ENDOCRINE, NUTRIT & METAB O.R. PROC W/O CC/MCC	1.5969
580	SURG	OTHER SKIN, SUBCUT TISS & BREAST PROC W CC	1.5558
328	SURG	STOMACH, ESOPHAGEAL & DUODENAL PROC W/O CC/MCC	1.5044
512	SURG	SHOULDER,ELBOW OR FOREARM PROC,EXC MAJOR JOINT PROC W/O CC/MCC	1.496
241	SURG	AMPUTATION FOR CIRC SYS DISORDERS EXC UPPER LIMB & TOE W/O CC/MCC	1.4774
661	SURG	KIDNEY & URETER PROCEDURES FOR NON-NEOPLASM W/O CC/MCC	1.454
855	SURG	INFECTIOUS & PARASITIC DISEASES W O.R. PROCEDURE W/O CC/MCC	1.44
517	SURG	OTHER MUSCULOSKELET SYS & CONN TISS O.R. PROC W/O CC/MCC	1.4361
358	SURG	OTHER DIGESTIVE SYSTEM O.R. PROCEDURES W/O CC/MCC	1.4085
909	SURG	OTHER O.R. PROCEDURES FOR INJURIES W/O CC/MCC	1.4069
416	SURG	CHOLECYSTECTOMY EXCEPT BY LAPAROSCOPE W/O C.D.E. W/O CC/MCC	1.4023

MS-DRG ¹	TYPE	MS-DRG Title	Weights ²
497	SURG	LOCAL EXCISION & REMOVAL INT FIX DEVICES EXC HIP & FEMUR W/O CC/MCC	1.3874
858	SURG	POSTOPERATIVE OR POST-TRAUMATIC INFECTIONS W O.R. PROC W/O CC/MCC	1.3488
334	SURG	RECTAL RESECTION W/O CC/MCC	1.2969
520	SURG	BACK & NECK PROC EXC SPINAL FUSION W/O CC/MCC	1.2966
168	SURG	OTHER RESP SYSTEM O.R. PROCEDURES W/O CC/MCC	1.2904
489	SURG	KNEE PROCEDURES W/O PDX OF INFECTION W/O CC/MCC	1.2876
502	SURG	SOFT TISSUE PROCEDURES W/O CC/MCC	1.2637
581	SURG	OTHER SKIN, SUBCUT TISS & BREAST PROC W/O CC/MCC	1.224
624	SURG	SKIN GRAFTS & WOUND DEBRID FOR ENDOC, NUTRIT & METAB DIS W/O CC/MCC	1.1891
618	SURG	AMPUTAT OF LOWER LIMB FOR ENDOCRINE,NUTRIT,& METABOL DIS W/O CC/MCC	1.1785
572	SURG	SKIN DEBRIDEMENT W/O CC/MCC	1.1756
476	SURG	AMPUTATION FOR MUSCULOSKELETAL SYS & CONN TISSUE DIS W/O CC/MCC	1.1681
257	SURG	UPPER LIMB & TOE AMPUTATION FOR CIRC SYSTEM DISORDERS W/O CC/MCC	1.1259
989	SURG	NON-EXTENSIVE O.R. PROC UNRELATED TO PRINCIPAL DIAGNOSIS W/O CC/MCC	1.1056

Source: [FY 2018 IPPS Final Rule Homepage](#) (FY 2018 Final Rule, Correction Notice, and Notice Tables; Table 5)

¹Medicare Severity-Diagnosis Related Groups

²Relative weights are based on the average resources required and determine hospital reimbursement for that DRG.

eAppendix Table 2. Medical Diagnosis-Related Groups for Which Postacute Transfer Policy Rules Applied in 2018

MS-DRG^a	TYPE	MS-DRG Title	Weights^b
870	MED	SEPTICEMIA OR SEVERE SEPSIS W MV >96 HOURS	6.0896
207	MED	RESPIRATORY SYSTEM DIAGNOSIS W VENTILATOR SUPPORT >96 HOURS	5.4845
840	MED	LYMPHOMA & NON-ACUTE LEUKEMIA W MCC	3.0793
288	MED	ACUTE & SUBACUTE ENDOCARDITIS W MCC	2.7081
545	MED	CONNECTIVE TISSUE DISORDERS W MCC	2.3634
867	MED	OTHER INFECTIOUS & PARASITIC DISEASES DIAGNOSES W MCC	2.1174
085	MED	TRAUMATIC STUPOR & COMA, COMA <1 HR W MCC	2.0478
374	MED	DIGESTIVE MALIGNANCY W MCC	2.0014
314	MED	OTHER CIRCULATORY SYSTEM DIAGNOSES W MCC	1.9582
056	MED	DEGENERATIVE NERVOUS SYSTEM DISORDERS W MCC	1.9135
380	MED	COMPLICATED PEPTIC ULCER W MCC	1.8968
539	MED	OSTEOMYELITIS W MCC	1.8848
177	MED	RESPIRATORY INFECTIONS & INFLAMMATIONS W MCC	1.8507
862	MED	POSTOPERATIVE & POST-TRAUMATIC INFECTIONS W MCC	1.8327
871	MED	SEPTICEMIA OR SEVERE SEPSIS W/O MV >96 HOURS W MCC	1.8229
441	MED	DISORDERS OF LIVER EXCEPT MALIG,CIRR,ALC HEPA W MCC	1.8159
542	MED	PATHOLOGICAL FRACTURES & MUSCULOSKELET & CONN TISS MALIG W MCC	1.8104
064	MED	INTRACRANIAL HEMORRHAGE OR CEREBRAL INFARCTION W MCC	1.7685
371	MED	MAJOR GASTROINTESTINAL DISORDERS & PERITONEAL INFECTIONS W MCC	1.7244
377	MED	G.I. HEMORRHAGE W MCC	1.714
289	MED	ACUTE & SUBACUTE ENDOCARDITIS W CC	1.6946
559	MED	AFTERCARE, MUSCULOSKELETAL SYSTEM & CONNECTIVE TISSUE W MCC	1.6813
280	MED	ACUTE MYOCARDIAL INFARCTION, DISCHARGED ALIVE W MCC	1.6577
070	MED	NONSPECIFIC CEREBROVASCULAR DISORDERS W MCC	1.6486
100	MED	SEIZURES W MCC	1.6478
896	MED	ALCOHOL/DRUG ABUSE OR DEPENDENCE W/O REHABILITATION THERAPY W MCC	1.6357
841	MED	LYMPHOMA & NON-ACUTE LEUKEMIA W CC	1.6206
196	MED	INTERSTITIAL LUNG DISEASE W MCC	1.5964
643	MED	ENDOCRINE DISORDERS W MCC	1.5914
698	MED	OTHER KIDNEY & URINARY TRACT DIAGNOSES W MCC	1.5879
551	MED	MEDICAL BACK PROBLEMS W MCC	1.5533
091	MED	OTHER DISORDERS OF NERVOUS SYSTEM W MCC	1.54
186	MED	PLEURAL EFFUSION W MCC	1.5246

MS-DRG^a	TYPE	MS-DRG Title	Weights^b
388	MED	G.I. OBSTRUCTION W MCC	1.5239
205	MED	OTHER RESPIRATORY SYSTEM DIAGNOSES W MCC	1.493
682	MED	RENAL FAILURE W MCC	1.4843
592	MED	SKIN ULCERS W MCC	1.4818
291	MED	HEART FAILURE & SHOCK W MCC	1.4759
175	MED	PULMONARY EMBOLISM W MCC	1.4678
602	MED	CELLULITIS W MCC	1.4464
557	MED	TENDONITIS, MYOSITIS & BURSITIS W MCC	1.4432
533	MED	FRACTURES OF FEMUR W MCC	1.438
299	MED	PERIPHERAL VASCULAR DISORDERS W MCC	1.4112
917	MED	POISONING & TOXIC EFFECTS OF DRUGS W MCC	1.402
562	MED	FX, SPRN, STRN & DISL EXCEPT FEMUR, HIP, PELVIS & THIGH W MCC	1.3819
193	MED	SIMPLE PNEUMONIA & PLEURISY W MCC	1.3731
637	MED	DIABETES W MCC	1.3347
054	MED	NERVOUS SYSTEM NEOPLASMS W MCC	1.315
178	MED	RESPIRATORY INFECTIONS & INFLAMMATIONS W CC	1.2952
540	MED	OSTEOMYELITIS W CC	1.2914
535	MED	FRACTURES OF HIP & PELVIS W MCC	1.2568
945	MED	REHABILITATION W CC/MCC	1.2539
375	MED	DIGESTIVE MALIGNANCY W CC	1.2347
884	MED	ORGANIC DISTURBANCES & INTELLECTUAL DISABILITY	1.2342
086	MED	TRAUMATIC STUPOR & COMA, COMA <1 HR W CC	1.1823
947	MED	SIGNS & SYMPTOMS W MCC	1.1739
640	MED	MISC DISORDERS OF NUTRITION, METABOLISM, FLUIDS/ELECTROLYTES W MCC	1.1724
190	MED	CHRONIC OBSTRUCTIVE PULMONARY DISEASE W MCC	1.1526
057	MED	DEGENERATIVE NERVOUS SYSTEM DISORDERS W/O MCC	1.1351
946	MED	REHABILITATION W/O CC/MCC	1.1299
546	MED	CONNECTIVE TISSUE DISORDERS W CC	1.1268
842	MED	LYMPHOMA & NON-ACUTE LEUKEMIA W/O CC/MCC	1.1243
290	MED	ACUTE & SUBACUTE ENDOCARDITIS W/O CC/MCC	1.0906
543	MED	PATHOLOGICAL FRACTURES & MUSCULOSKELET & CONN TISS MALIG W CC	1.0798
689	MED	KIDNEY & URINARY TRACT INFECTIONS W MCC	1.0793
381	MED	COMPLICATED PEPTIC ULCER W CC	1.0781
560	MED	AFTERCARE, MUSCULOSKELETAL SYSTEM & CONNECTIVE TISSUE W CC	1.0772
868	MED	OTHER INFECTIOUS & PARASITIC DISEASES DIAGNOSES W CC	1.0596
372	MED	MAJOR GASTROINTESTINAL DISORDERS & PERITONEAL INFECTIONS W CC	1.059
187	MED	PLEURAL EFFUSION W CC	1.0568

MS-DRG ^a	TYPE	MS-DRG Title	Weights ^b
872	MED	SEPTICEMIA OR SEVERE SEPSIS W/O MV >96 HOURS W/O MCC	1.0546
699	MED	OTHER KIDNEY & URINARY TRACT DIAGNOSES W CC	1.0465
593	MED	SKIN ULCERS W CC	1.0459
197	MED	INTERSTITIAL LUNG DISEASE W CC	1.0449
065	MED	INTRACRANIAL HEMORRHAGE OR CEREBRAL INFARCTION W CC OR TPA IN 24 HRS	1.0311
300	MED	PERIPHERAL VASCULAR DISORDERS W CC	1.0184
863	MED	POSTOPERATIVE & POST-TRAUMATIC INFECTIONS W/O MCC	1.0072
644	MED	ENDOCRINE DISORDERS W CC	1.0023
055	MED	NERVOUS SYSTEM NEOPLASMS W/O MCC	0.9995
071	MED	NONSPECIFIC CEREBROVASCULAR DISORDERS W CC	0.9896
281	MED	ACUTE MYOCARDIAL INFARCTION, DISCHARGED ALIVE W CC	0.9848
378	MED	G.I. HEMORRHAGE W CC	0.9703
315	MED	OTHER CIRCULATORY SYSTEM DIAGNOSES W CC	0.9658
292	MED	HEART FAILURE & SHOCK W CC	0.9588
541	MED	OSTEOMYELITIS W/O CC/MCC	0.9451
376	MED	DIGESTIVE MALIGNANCY W/O CC/MCC	0.9401
442	MED	DISORDERS OF LIVER EXCEPT MALIG,CIRR,ALC HEPA W CC	0.9394
092	MED	OTHER DISORDERS OF NERVOUS SYSTEM W CC	0.9368
194	MED	SIMPLE PNEUMONIA & PLEURISY W CC	0.9332
179	MED	RESPIRATORY INFECTIONS & INFLAMMATIONS W/O CC/MCC	0.93
683	MED	RENAL FAILURE W CC	0.9292
191	MED	CHRONIC OBSTRUCTIVE PULMONARY DISEASE W CC	0.9176
176	MED	PULMONARY EMBOLISM W/O MCC	0.8952
552	MED	MEDICAL BACK PROBLEMS W/O MCC	0.8938
558	MED	TENDONITIS, MYOSITIS & BURSITIS W/O MCC	0.8566
389	MED	G.I. OBSTRUCTION W CC	0.8536
206	MED	OTHER RESPIRATORY SYSTEM DIAGNOSES W/O MCC	0.8518
638	MED	DIABETES W CC	0.8512
603	MED	CELLULITIS W/O MCC	0.8503
087	MED	TRAUMATIC STUPOR & COMA, COMA <1 HR W/O CC/MCC	0.832
101	MED	SEIZURES W/O MCC	0.8286
563	MED	FX, SPRN, STRN & DISL EXCEPT FEMUR, HIP, PELVIS & THIGH W/O MCC	0.8235
547	MED	CONNECTIVE TISSUE DISORDERS W/O CC/MCC	0.8152
382	MED	COMPLICATED PEPTIC ULCER W/O CC/MCC	0.8032
188	MED	PLEURAL EFFUSION W/O CC/MCC	0.7992
690	MED	KIDNEY & URINARY TRACT INFECTIONS W/O MCC	0.7945
897	MED	ALCOHOL/DRUG ABUSE OR DEPENDENCE W/O REHABILITATION THERAPY W/O MCC	0.7896

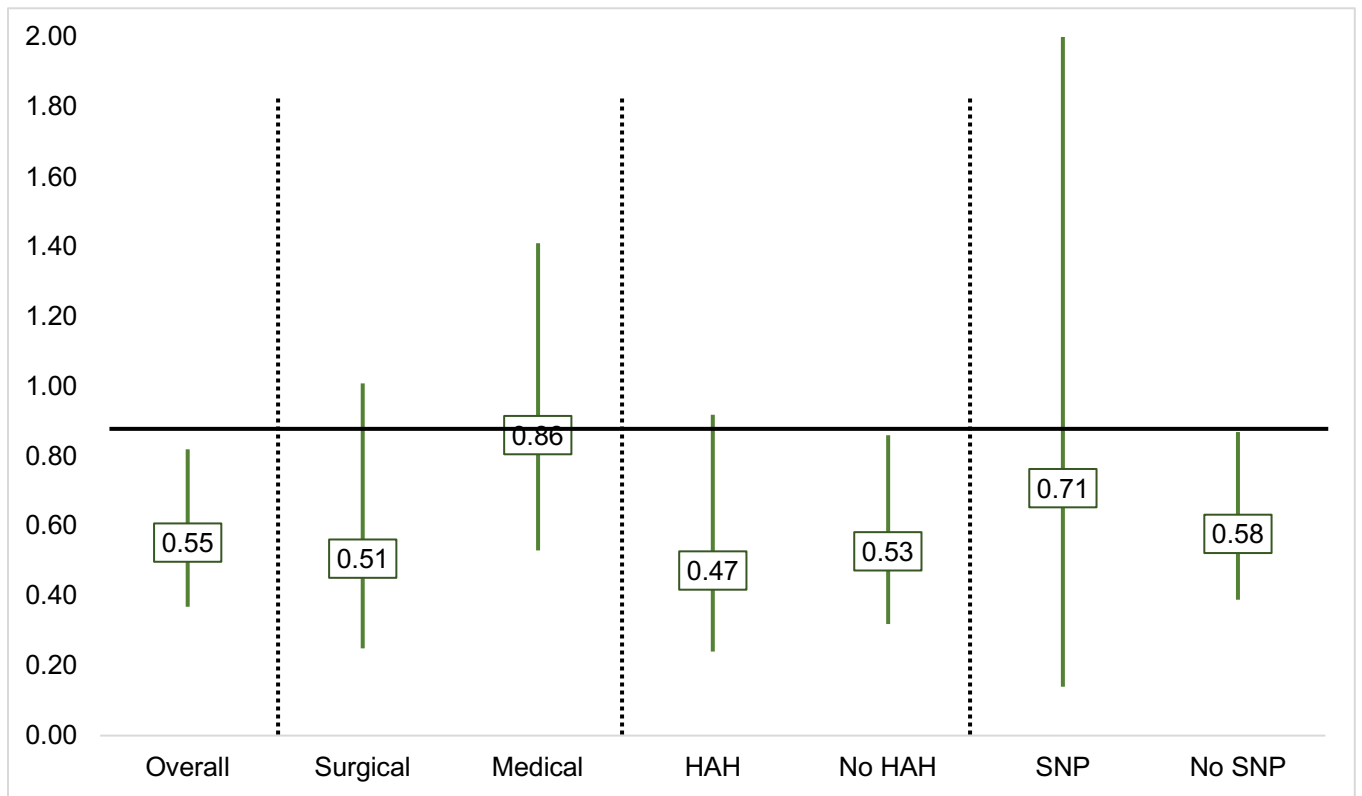
MS-DRG ^a	TYPE	MS-DRG Title	Weights ^b
869	MED	OTHER INFECTIOUS & PARASITIC DISEASES DIAGNOSES W/O CC/MCC	0.7886
198	MED	INTERSTITIAL LUNG DISEASE W/O CC/MCC	0.7824
700	MED	OTHER KIDNEY & URINARY TRACT DIAGNOSES W/O CC/MCC	0.7765
544	MED	PATHOLOGICAL FRACTURES & MUSCULOSKELET & CONN TISS MALIG W/O CC/MCC	0.7758
948	MED	SIGNS & SYMPTOMS W/O MCC	0.7726
373	MED	MAJOR GASTROINTESTINAL DISORDERS & PERITONEAL INFECTIONS W/O CC/MCC	0.7622
561	MED	AFTERCARE, MUSCULOSKELETAL SYSTEM & CONNECTIVE TISSUE W/O CC/MCC	0.7611
534	MED	FRACTURES OF FEMUR W/O MCC	0.7609
072	MED	NONSPECIFIC CEREBROVASCULAR DISORDERS W/O CC/MCC	0.7602
282	MED	ACUTE MYOCARDIAL INFARCTION, DISCHARGED ALIVE W/O CC/MCC	0.7586
594	MED	SKIN ULCERS W/O CC/MCC	0.7584
536	MED	FRACTURES OF HIP & PELVIS W/O MCC	0.7545
918	MED	POISONING & TOXIC EFFECTS OF DRUGS W/O MCC	0.7502
066	MED	INTRACRANIAL HEMORRHAGE OR CEREBRAL INFARCTION W/O CC/MCC	0.7466
641	MED	MISC DISORDERS OF NUTRITION,METABOLISM,FLUIDS/ELECTROLYTES W/O MCC	0.7461
316	MED	OTHER CIRCULATORY SYSTEM DIAGNOSES W/O CC/MCC	0.7401
645	MED	ENDOCRINE DISORDERS W/O CC/MCC	0.7388
093	MED	OTHER DISORDERS OF NERVOUS SYSTEM W/O CC/MCC	0.729
192	MED	CHRONIC OBSTRUCTIVE PULMONARY DISEASE W/O CC/MCC	0.7265
301	MED	PERIPHERAL VASCULAR DISORDERS W/O CC/MCC	0.7251
195	MED	SIMPLE PNEUMONIA & PLEURISY W/O CC/MCC	0.7099
443	MED	DISORDERS OF LIVER EXCEPT MALIG,CIRR,ALC HEPA W/O CC/MCC	0.6787
293	MED	HEART FAILURE & SHOCK W/O CC/MCC	0.6736
379	MED	G.I. HEMORRHAGE W/O CC/MCC	0.6446
684	MED	RENAL FAILURE W/O CC/MCC	0.6284
639	MED	DIABETES W/O CC/MCC	0.6257
390	MED	G.I. OBSTRUCTION W/O CC/MCC	0.5966

Source: [FY 2018 IPPS Final Rule Homepage](#) (FY 2018 Final Rule, Correction Notice, and Notice Tables; Table 5)

^aMedicare Severity-Diagnosis Related Groups

^bRelative weights are based on the average resources required and determine hospital reimbursement for that DRG.

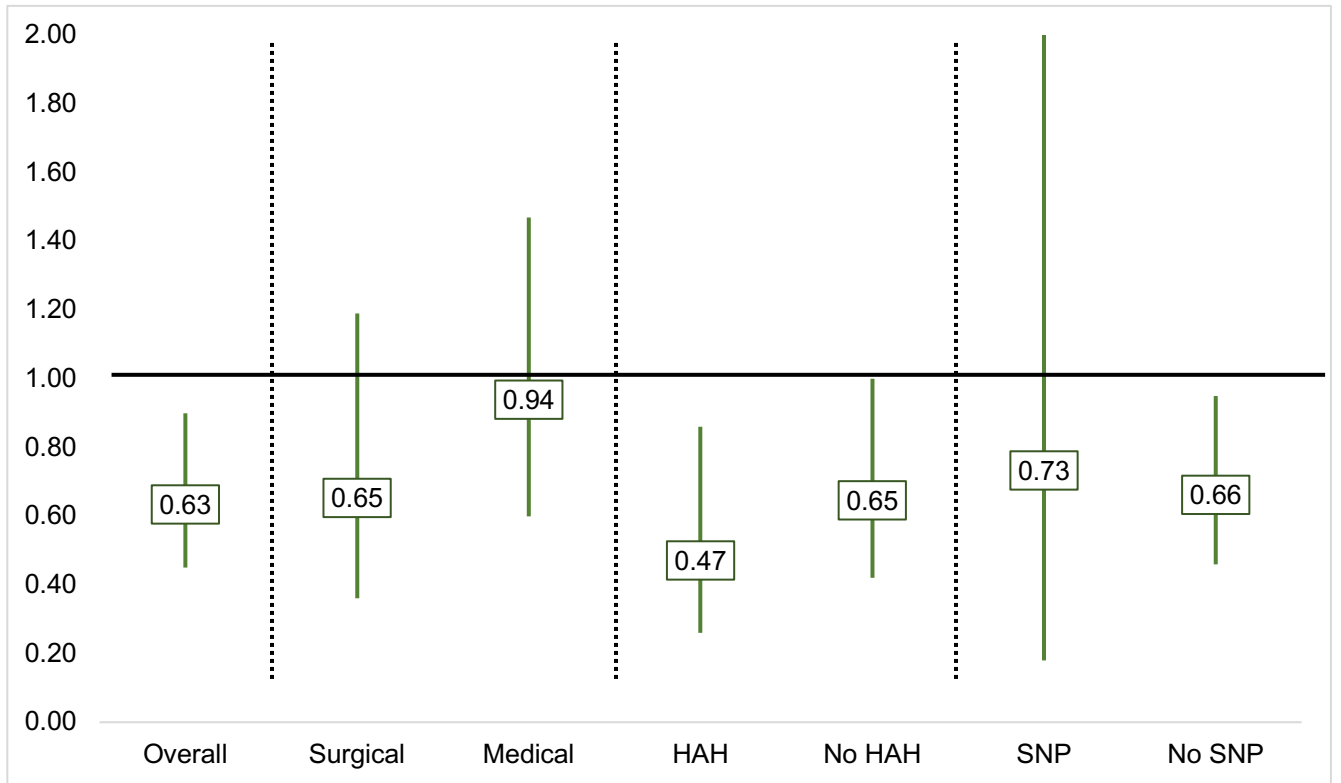
eAppendix Figure 2. Adjusted Hazard Ratios for 60-Day Readmission, Home Health vs Home, Overall and by Subpopulation



Key: HAH, Humana at Home; SNP, Special Needs Plan

Vertical lines behind HR estimates represent confidence intervals. Confidence intervals that cross the horizontal line corresponding to an HR of 1.00 denote statistically significant results.

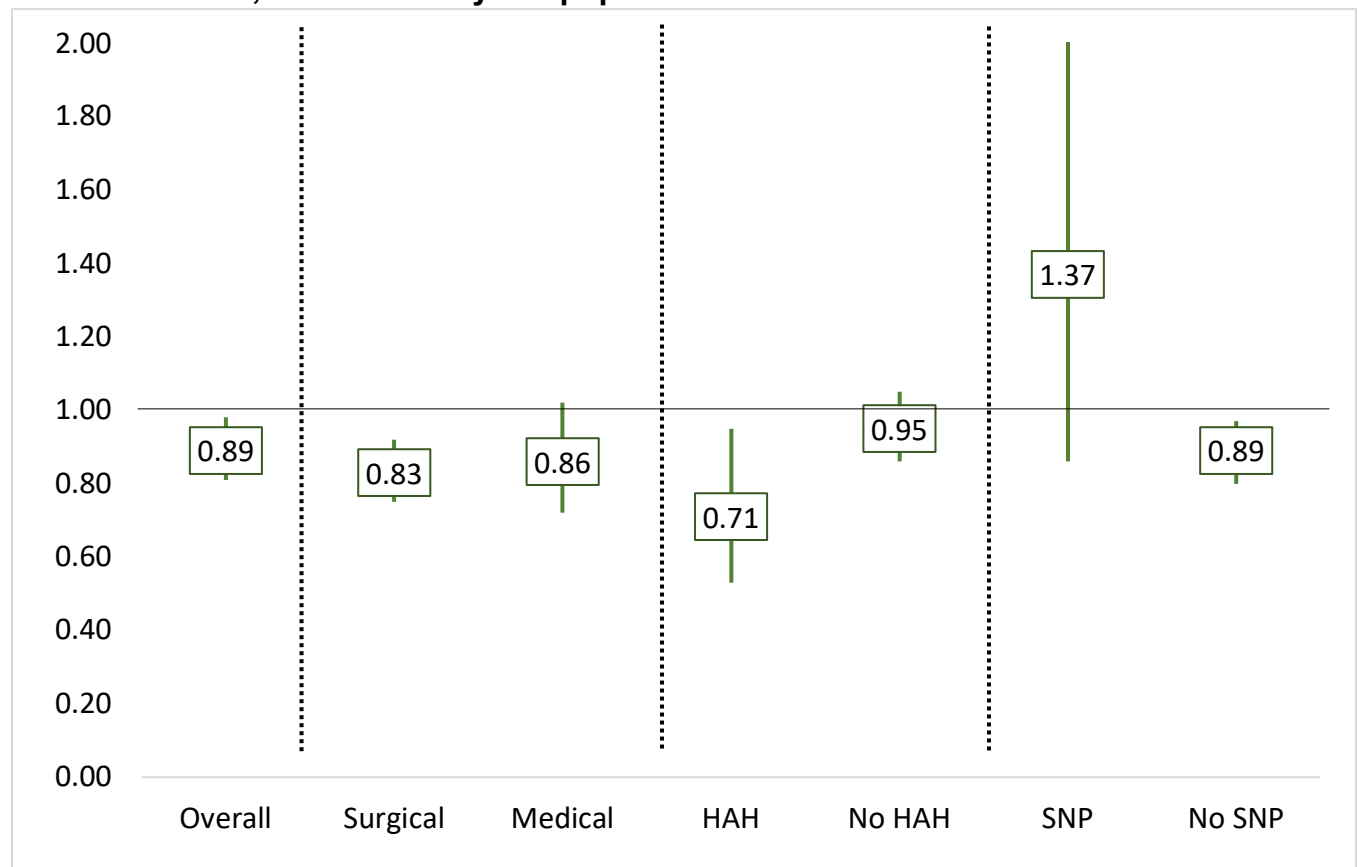
eAppendix Figure 3. Adjusted Hazard Ratios for 90-Day Readmission, Home Health vs Home, Overall and by Subpopulation



Key: HAH, Humana at Home; SNP, Special Needs Plan

Vertical lines behind HR estimates represent confidence intervals. Confidence intervals that cross the horizontal line corresponding to an HR of 1.00 denote statistically significant results.

eAppendix Figure 4. Adjusted Cost Ratios for Total 90-day Expenditures, Home Health vs Home, Overall and by Subpopulation



Key: HAH, Humana at Home; SNP, Special Needs Plan

²⁻⁴Vertical lines behind HR estimates represent confidence intervals. Confidence intervals that cross the horizontal line corresponding to an HR of 1.00 denote statistically significant results.

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