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RESEARCH BRIEF

Characteristics Associated with Home Health Care Referrals at Hospital Discharge: Results from the 2012 National Inpatient Sample

*Christine D. Jones, Heidi L. Wald, Rebecca S. Boxer,
Frederick A. Masoudi, Robert E. Burke, Roberta Capp,
Eric A. Coleman, and Adit A. Ginde*

Objective. To assess patient- and hospital-level factors associated with home health care (HHC) referrals following nonelective U.S. patient hospitalizations in 2012.

Data Source. The 2012 National Inpatient Sample (NIS).

Study Design. Retrospective, cross-sectional multivariable logistic regression modeling to assess patient- and hospital-level variables in patient discharges with versus without HHC referrals.

Data Collection. Analysis included 1,109,905 discharges in patients ≥ 65 years with Medicare.

Principal Findings. About 29.2 percent of discharges were referred to HHC, which were more likely with older age, female sex, urban location, low income, longer length of stay, higher severity of illness scores, diagnoses of heart failure or sepsis, and hospital location in New England (referent: Pacific).

Conclusions. As health policy changes influence postacute HHC, defining specific diagnoses and regional patterns associated with HHC is a first step to optimize postacute HHC services.

Key Words. Home health care, care transitions, regional variation

Between 2001 and 2012, home health care (HHC) referrals at hospital discharge increased by 65 percent, and Medicare spending on HHC services more than doubled (Horwitz et al. 2014; Jones et al. 2015; MedPAC, 2015). Multiple factors may have contributed to increased HHC referral rates over this time, including the following changes in Medicare policies: a change from fee-for-service to a fixed payment rate for HHC services in 2000, public

reporting for excessive hospital readmissions in 2009, and readmissions penalties for hospitals beginning in 2012 (Murtaugh et al. 2003; MedPAC, 2015). In 2012, a majority of HHC referrals at hospital discharge were Medicare beneficiaries (unpublished NIS data). Although it is unclear if HHC referrals are associated with reduced hospital readmissions in practice, many effective transitional care interventions for patients following discharge have included home visits from nurses (Naylor et al. 2004; Coleman et al. 2006; Feltner et al. 2014).

At present, decisions about referrals for postacute care such as HHC at the time of discharge are at the discretion of individual providers without uniform, standardized guidelines, which may promote variability in HHC referrals (Bowles, Foust, and Naylor 2003; Bowles et al. 2008). Prior work in this area has included evaluations of decision support for postacute HHC referrals (Bowles, Naylor, and Foust 2002; Bowles et al. 2008), and outcomes for patients with heart failure (HF) and cancer referred to HHC at discharge (Bowles, McCorkle, and Nuamah 2008; Madigan et al. 2012a,b). Yet much is still unknown about the current state of how decisions are made to refer for HHC and outcomes associated with these referrals. Medicare payment for HHC services changed substantially following the change from fee-for-service to fixed payment in 2000 (Murtaugh et al. 2003; MedPAC, 2015). Defining contemporary patient- and hospital-level factors associated with HHC referrals in Medicare beneficiaries 65 years of age or older in 2012, the year with the highest HHC referral rates since 2001, is a first step to better characterizing the current state of postacute HHC referrals (Jones et al. 2015). Using the 2012 National Inpatient Sample (NIS) database, we sought to identify patient- and hospital-level factors associated with HHC referral (vs. no HHC referral)

Address correspondence to Christine D. Jones, M.D., M.S., Hospital Medicine Section, Division of General Internal Medicine, University of Colorado Denver School of Medicine, Mail Stop F782, 12401 E 17th Avenue, Aurora, CO 80045; e-mail: christine.jones@ucdenver.edu. Heidi L. Wald, M.D., M.P.H., is with the Hospital Medicine Section, Division of General Internal Medicine, Division of Health Care Policy and Research, University of Colorado Denver School of Medicine, Aurora, CO. Rebecca S. Boxer, M.D., M.S., is with the Division of Geriatric Medicine, University of Colorado Denver School of Medicine; VA Eastern Colorado Health Care System, Aurora, CO. Frederick A. Masoudi, M.D., M.S.P.H., is with the Division of Cardiology, University of Colorado Denver School of Medicine, Aurora, CO. Robert E. Burke, M.D., M.P.H., is with the Department of Medicine, VA Eastern Colorado Health Care System, Denver, CO and the Division of General Internal Medicine, University of Colorado Denver School of Medicine, Denver, CO. Roberta Capp, M.D., M.H.S., and Adit A. Ginde, M.D., M.P.H., are with the Department of Emergency Medicine, University of Colorado Denver School of Medicine, Aurora, CO. Eric A. Coleman, M.D., M.P.H., is with the Division of Health Care Policy and Research, University of Colorado Denver School of Medicine, Aurora, CO.

at hospital discharge in Medicare beneficiaries ≥ 65 years old discharged to home.

METHODS

We performed a retrospective analysis of adult hospital discharges in the 2012 NIS, the largest all-payer hospital database in the United States that is publicly available, which is maintained by the Healthcare Cost and Utilization Project (HCUP), Agency for Healthcare Research and Quality. The NIS is an annual, comprehensive, 20 percent stratified sample of discharges from U.S. hospitals, excluding rehabilitation and long-term acute care hospitals, from states representing more than 95 percent of the U.S. population.

We excluded the following for this analysis: age < 65 years ($n = 4,752,686$), non-Medicare insurance ($n = 261,305$), discharges to destinations other than home (e.g., short-term hospital, skilled nursing facility; $n = 829,939$), admissions with primary psychiatric diagnoses ($n = 13,503$), and elective admissions ($n = 329,630$). Psychiatric diagnoses were defined by primary Clinical Classifications Software (CCS) codes for the hospitalization (CCS codes 650-2, 654-9, 662, and 670) based on Medicare methodology for the risk-standardized all-cause readmission measure (Healthcare Cost and Utilization Project [HCUP], 2012a; Horwitz et al. 2014). Elective admissions were excluded due to inherent differences between patients clinically stable enough for an elective hospitalization and patients who are clinically unstable enough to necessitate nonelective hospitalization (de Rooij et al. 2008).

Measures

Among patients discharged home, we evaluated the association between HHC referral at discharge (with vs. without) and patients' sociodemographic, clinical characteristics, and selected hospital characteristics. The NIS variable for disposition defines HHC to include discharges to the following: home health service organizations, home IV providers, hospice-home, and home health service organizations with a planned acute care hospital inpatient readmission (Healthcare Cost and Utilization Project, [HCUP] 2012). Based on prior studies of discharge to postacute care settings in which older age, female sex, length of stay (LOS), number of comorbidities, number of hospital beds, geographic region, and multiple other factors were associated with postacute care referrals, NIS variables were selected for this analysis that were likely to

be clinically meaningful contributors to HHC referrals (Bowles et al. 2009; Allen et al. 2011; Burke et al. 2015; Prvu Bettger et al. 2015). Patient-level discharge variables include age, gender, discharge quarter, race/ethnicity, admission source, patient location, median household income for zip code, primary payer, LOS, illness severity, number of chronic conditions, and primary diagnoses. Hospital-level variables include hospital ownership, teaching status, bed size, census division, and number of discharges per year.

Source of admission was defined in three categories: not a transfer from an outside hospital, transfer from a different acute care hospital, and transfer from another type of health facility (e.g., skilled nursing facility). Patient location was defined in six categories: (1) central (urban) counties of metro areas of >1 million population, (2) fringe counties of metro areas of >1 million population, (3) metro areas with populations of 250,000–999,999, (4) metropolitan areas with populations of 50,000–249,999, (5) micropolitan, and (6) rural.

The All Patient Refined Diagnosis Related Group (APR-DRG) Severity of Illness is based on a classification developed by 3M Health Information systems and incorporates both primary and secondary diagnoses, age, procedures, and other factors in assigning increasing levels of severity (Averill et al. 2003). The APR-DRG severity of illness is classified into five categories: (1) no class specified, (2) minor, (3) moderate, (4) major, and (5) extreme. The top five primary diagnoses with HHC referrals (identified by CCS codes in univariate analyses) were included as variables in the regression model: HF, sepsis, pneumonia, COPD/bronchiectasis, and cardiac dysrhythmias.

Hospital census division was divided into nine categories within the United States: (1) New England, (2) Middle Atlantic, (3) East North Central, (4) West North Central, (5) South Atlantic, (6) East South Central, (7) West South Central, (8) Mountain, and (9) Pacific.

Analysis

Patient- and hospital-level variables were compared by HHC referral status (without vs. with HHC) for descriptive purposes with chi-squared tests for dichotomous variables and student's *t*-tests for continuous variables. We first performed descriptive statistics in unweighted data to obtain the raw number of observations, then repeated descriptive statistics applying HCUP-provided sample weights to obtain nationally representative proportions by HHC referral status (HCUP 2012b). We performed multivariable logistic regression modeling to evaluate the association of patient- and hospital-level factors with the outcome of HHC referral (compared to no HHC referral) at hospital

discharge, including all variables. Through including variables for the top five primary diagnoses for HHC referrals and the APR-DRG severity score in our model, our intent was to adjust for case mix. All logistic regression models accounted for clustering at the hospital level within five hospital-based sampling strata: census division, urban/rural location, teaching status, ownership, and bed size.

We performed post hoc multivariable regression analyses to evaluate HHC referrals within each of the top five primary diagnoses for HHC referrals. We also performed post hoc analyses among the 329,630 elective discharges excluded from the primary analysis. This study was reviewed and determined to be exempt by the Colorado Multiple Institutional Review Board. A two-tailed p -value of $<.05$ was considered statistically significant. All analyses were completed using *Stata 12.1* (College Station, Texas, USA). Results in Table 1 are presented as unweighted numbers with weighted percentages; weighted estimates were used to perform statistical comparisons.

RESULTS

Among 1,109,905 hospital discharges to home in 2012, 29.2 percent ($n = 324,157$) were referred to HHC. Bivariate analyses of patient- and hospital-level characteristics associated with HHC referrals are presented in Table 1. Patient discharges with HHC referrals were on average 2.7 years older, more likely to be female, have a longer LOS, more severe illness by the APR-DRG, one more chronic condition, and a primary diagnosis of HF or sepsis, compared to those without HHC referrals. HHC referrals at discharge were more likely in New England and Middle Atlantic census divisions and were less likely in Mountain and Pacific census divisions.

In multivariable logistic regression analyses, HHC referrals were most likely among patient discharges who were older; female; had homes in urban locations (compared to rural); the lowest household income by zip code; longer LOS; moderate, major, or extreme APR-DRG severity of illness scores (compared to minor); and primary diagnoses of HF or sepsis (Table 2). Medium and large hospitals had higher odds of HHC referrals compared to small hospitals. Hospitals in New England, Middle Atlantic, East North Central, South Atlantic, East South Central, and West South Central all had higher odds of HHC referrals compared to hospitals in the Pacific census division (Table 2, Figure 1).

Table 1: Characteristics of Patient Discharges by HHC Referral Status*

<i>Characteristics</i>	<i>No HHC Referral % (N = 785,748)</i>	<i>HHC Referral % (N = 324,157)</i>
Age at admission		
65–79 years	64.9	49.6
80 and above	35.1	50.4
Age (mean, SD)	76.4 (7.4)	79.1 (7.7)
Female sex	53.8	59.7
Discharge quarter		
January–March	26.2	26.2
April–June	24.9	24.7
July–September	24.1	23.7
October–December	24.8	25.4
Race/ethnicity		
White	77.5	76.8
Black	10.3	11.8
Hispanic	7.2	6.6
Asian or Pacific Islander	2.1	1.8
Other	2.9	3.0
Source of admission		
Not a transfer	94.1	93.4
Transferred in from different acute care hospital	4.4	4.6
Transferred in from another type of health facility	1.5	2.0
Patient’s location by zip code		
Central counties (i.e., urban)	25.7	28.3
Fringe counties	24.2	26.5
Metro areas (250–999,999)	19.4	19.6
Metro areas (50–250,000)	10.2	8.7
Micropolitan	12.1	10.4
Rural	8.5	6.6
Median household income for zip code		
\$1–38,999	29.2	29.3
\$39–47,999	25.6	24.3
\$48–62,999	23.9	23.9
\$63,000 or more	21.4	22.6
Length of stay (mean, SD)	3.5 (3.2)	5.6 (5.0)
All patient refined DRG severity of illness		
No class specified	0.1	0.1
Minor	19.5	8.5
Moderate	49.1	39.4
Major	28.7	44.0
Extreme	2.6	8.0
Number of chronic conditions (mean, SD)	6.2 (3.0)	7.2 (3.1)
Primary diagnosis for hospitalization		
Heart failure	5.7	8.7
Sepsis	3.4	5.9

continued

Table 1: *Continued*

<i>Characteristics</i>	<i>No HHC Referral % (N = 785,748)</i>	<i>HHC Referral % (N = 324,157)</i>
Pneumonia	5.2	5.6
Chronic obstructive pulmonary Disease/bronchiectasis	5.1	4.8
Cardiac dysrhythmias	6.5	3.9
Ownership of hospital		
Government, nonfederal	10.2	9.3
Private, nonprofit	74.5	76.6
Private, investor-owned	15.4	14.1
Location/teaching status		
Rural	13.6	11.5
Urban nonteaching	42.5	41.2
Urban teaching	43.9	47.3
Hospital bed size		
Small	14.5	13.7
Medium	26.4	26.9
Large	59.0	59.4
Hospital census division		
New England	4.0	7.6
Middle Atlantic	14.2	18.4
East North Central	16.7	16.1
West North Central	6.6	5.1
South Atlantic	22.3	21.8
East South Central	7.3	7.1
West South Central	10.2	9.2
Mountain	5.9	4.1
Pacific	12.5	10.7
Number of discharges from hospital/year (mean, SD)	3,974.5 (3,380.3)	4,166.4 (3,411.4)

**p*-value for all comparisons <.05 with exception of number of discharges from hospital/year.
HHC, home health care.

In post hoc multivariable regression analyses among the top five primary diagnoses, we found that the OR for HHC referrals was highest for increased age within cardiac dysrhythmia (Table S1). An interaction term for cardiac dysrhythmia and age was statistically significant (OR: 1.25, 95 percent CI: 1.21–1.29). Associations that were consistent across primary diagnoses included a lower odds of HHC referrals for patients in rural areas (comparison: urban), a higher odds of HHC referral with longer LOS, and increased odds of HHC with higher APR-DRG scores. Other findings of note included the highest odds of HHC referrals at discharge in New England and the second highest odds in the Middle Atlantic census division across all primary

Table 2: Multivariable Logistic Regression Modeling for HHC Referral

<i>Variable</i>	<i>Odds Ratio for HHC Referral</i>	<i>95% CI (%)</i>	<i>p-value</i>
Age/10 years*	1.66	1.65–1.68	<.001
Female	1.28	1.27–1.29	<.001
Discharge quarter			
January–March	-ref-		
April–June	1.01	0.99–1.02	.247
July–September	1.00	0.98–1.02	.935
October–December	1.02	1.01–1.04	.010
Race/ethnicity			
White	-ref-		
Black	1.06	1.02–1.11	.004
Hispanic	0.92	0.87–0.98	.008
Asian or Pacific Islander	0.87	0.80–0.95	.003
Native American and other	1.05	0.96–1.15	.328
Source of admission			
Not a transfer	-ref-		
Transferred in from different acute care hospital	1.01	0.96–1.06	.710
Transferred in from another type of health facility	0.97	0.75–1.26	.822
Patient's location by zip code			
Central counties (i.e., urban)	-ref-		
Fringe counties	0.96	0.91–1.01	.106
Metro areas (250–999,999)	0.89	0.83–0.95	<.001
Metro areas (50–250,000)	0.80	0.75–0.86	<.001
Micropolitan	0.79	0.74–0.84	<.001
Rural	0.76	0.71–0.81	<.001
Median household income for zip code			
\$1–38,999	-ref-		
\$39–47,999	0.93	0.90–0.96	<.001
\$48–62,999	0.91	0.88–0.94	<.001
\$63,000 or more	0.85	0.82–0.89	<.001
Length of stay	1.13	1.13–1.14	<.001
All patient refined DRG severity of illness			
No class specified	2.85	2.31–3.51	<.001
Minor	-ref-		
Moderate	1.44	1.42–1.47	<.001
Major	2.11	2.07–2.16	<.001
Extreme	2.83	2.72–2.94	<.001
Number of chronic conditions	1.06	1.05–1.06	<.001
Primary diagnosis for hospitalization			
Heart failure	1.22	1.19–1.25	<.001
Sepsis	1.23	1.20–1.27	<.001
Pneumonia	0.97	0.95–0.99	.002
COPD/bronchiectasis	1.00	0.98–1.03	.891
Cardiac dysrhythmias	0.67	0.65–0.68	<.001

continued

Table 2: *Continued*

<i>Variable</i>	<i>Odds Ratio for HHC Referral</i>	<i>95% CI (%)</i>	<i>p-value</i>
Ownership of hospital			
Government, nonfederal	-ref-		
Private, nonprofit	1.00	0.92–1.08	.951
Private, investor-owned	1.01	0.92–1.11	.826
Location/teaching status			
Rural	-ref-		
Urban nonteaching	0.96	0.89–1.04	.339
Urban teaching	0.98	0.90–1.08	.734
Hospital bed size			
Small	-ref-		
Medium	1.09	1.02–1.17	.010
Large	1.10	1.03–1.18	.007
Hospital census division			
New England	2.61	2.29–2.99	<.001
Middle Atlantic	1.57	1.43–1.73	<.001
East North Central	1.19	1.10–1.30	<.001
West North Central	1.11	0.99–1.26	.086
South Atlantic	1.24	1.15–1.35	<.001
East South Central	1.27	1.13–1.43	<.001
West South Central	1.16	1.06–1.28	.001
Mountain	0.94	0.84–1.05	.262
Pacific	-ref-		
Number of discharges/1,000 from hospital per year	1.00	0.99–1.01	.604

*Age/10 years—provides odds for every 10-year increase in age.

COPD, chronic obstructive pulmonary disease; HHC, home health care.

diagnoses (comparison: Pacific). In addition, the Mountain and Pacific divisions consistently had the lowest odds of HHC referrals across all primary diagnoses.

We completed post hoc analyses of 329,630 elective hospitalizations. Patients discharged from elective versus nonelective admissions with HHC were on average 4 years younger, more frequently had minor or moderate illness severity by the APR-DRG score (72.3 percent vs. 47.9 percent), and more frequently had a primary diagnosis of osteoarthritis (29.8 percent vs. 0.6 percent) or rehabilitation care (16.0 percent vs. 2.1 percent; Table S2). In multivariable regression analysis, the highest odds of HHC referrals were in the New England and Middle Atlantic census divisions, respectively (Table S3).

Figure 1: Map of Adjusted Odds of Home Health Care Referral by Census Division

DISCUSSION

In this descriptive study of HHC referrals at hospital discharge in the United States, 29.2 percent of all discharges to home were referred to HHC. We found substantial geographic variation by census division, and hospitals in New England and Middle Atlantic census divisions consistently had the highest odds of HHC referral. Our results had similarities to prior studies by Bowles and colleagues, in which adults referred to postacute care at discharge were older, had a longer LOS, rated their health as fair or poor more frequently, had worse functional status, and more comorbidities, compared to those not referred to HHC (Bowles, Naylor, and Foust 2002; Bowles et al. 2009).

Our analysis adds a national perspective on HHC referrals at discharge, and a description of HHC referral odds based on primary diagnosis. We found that the odds of a HHC referral at discharge were higher for patients with HF and sepsis, but they were markedly lower for patients with cardiac dysrhythmia as a primary diagnosis. The inclusion of home hospice as a HHC discharge in the NIS dataset may have contributed to the increased odds of HHC referral with a primary diagnosis of HF, as HF has consistently been a

top five diagnosis among Medicare patients referred to hospice (Medicare Hospice Data, 2013). The lower odds of a HHC referral with cardiac dysrhythmia may be related to the high prevalence of this diagnosis (5.7 percent of all discharges, and the most prevalent diagnosis among those not referred to HHC), without debility requiring HHC services.

We also identified geographic variability in which hospitals in New England and Middle Atlantic divisions had the highest odds for HHC referrals, and hospitals in the Mountain and Pacific divisions consistently had the lowest odds for HHC referrals. Additional unmeasured factors likely contribute to geographic variability in HHC referrals, including differences in (1) unaccounted-for patient- or population-level characteristics, such as patient preferences (Baker, Bundorf, and Kessler 2014), (2) HHC referral practices by providers, (3) access to and payer coverage for HHC by location, (4) perceived effectiveness/cost-effectiveness of postacute HHC, and (5) inpatient rehabilitation facility and skilled nursing facility availability.

Regional variation in HHC utilization was identified in prior analyses of Medicare data from the 1990s (Kenney and Dubay 1992; Welch, Wennberg, and Welch 1996). In one study, HHC use for Medicare beneficiaries was associated with fewer nursing home beds, increased hospital discharge rates, higher payments for HHC, and increased HHC agencies per enrollee; of interest, New England beneficiaries were 40 percent more likely to use HHC services compared to other beneficiaries (Kenney and Dubay 1992). Such substantial geographic variation in HHC services in the 1990s was felt to suggest “a lack of consensus about their [HHC services] appropriate use,” which also appears to be the case over 20 years later (Welch, Wennberg, and Welch 1996). Prior analyses have also noted increased skilled nursing facility referral rates in the Northeast, despite the highest nursing home capacity per 1,000 people ≥ 65 being located in the Midwest (Allen et al. 2011; Dunlay et al. 2015; Harris-Kojetin et al. 2016). A prior analysis of geographic difference in Medicare spending suggests that differences in health status may contribute to observed differences to some extent, yet much of the observed difference by geographic area is, as yet, unexplained (Zuckerman et al. 2010).

Recent and forthcoming Medicare initiatives are likely to result in changes to postacute referral patterns. One such initiative is the mandatory Comprehensive Care for Joint Replacement (CJR) bundled payment demonstration (Medicare Program 2015). This is a 5-year mandatory demonstration that starts in 2016 in 67 metropolitan areas nationwide. Hospitals in these areas will be required to participate in this program, which will include bearing financial risk for a 90-day episode of care, including the procedure,

inpatient care, provider costs, and postacute care. Another important Medicare initiative that affects postacute care is the IMPACT Act, in which postacute care organizations including HHC are required to collect and report standardized patient assessment data (IMPACT Act of 2014 & Cross Setting Measures, 2015). This act is intended to allow information exchange between providers and direct comparisons of the quality of care across settings through publically reported outcomes. Both of these initiatives are likely to affect postacute care referral practices, but it remains to be seen if variability in HHC referral rates will be reduced as a result.

At present, HHC referral decisions at discharge are not standardized or structured, and it is unclear what information is used by clinicians to make HHC referral decisions. Variability identified by region, diagnosis, and other characteristics could lead to further studies to define and ultimately intervene on modifiable drivers of HHC referrals. The use of clinical assessment tools that incorporate relevant clinical and nonclinical information (e.g., caregiver status) could support standardized, efficient, and evidence-based postacute HHC referrals with the potential to improve patient outcomes (Bowles et al. 2015).

The strengths of this study include a large, nationally representative sample that includes robust, diverse patient- and hospital-level characteristics. In addition, this analysis was performed with recent 2012 discharge data. Of note, the validity of discharge disposition data is dependent on the administrative data provided by each hospital participating in the NIS. Additional limitations of this analysis include unmeasured confounding, including the inability to determine the frequency and type of HHC services that were provided following discharge (e.g., physical therapy), prior hospitalizations, patient functional or cognitive status, caregiver status, home environment, and information about provider decision making for postacute care destination. In addition, APR-DRG and LOS are not available early in a hospitalization, so they have limited applicability in decision making about HHC referrals during a hospitalization. Finally, additional variables that could influence HHC referrals, such as hospital integration with HHC, hospital quality ratings, and HHC quality ratings are not available in the NIS.

CONCLUSION

In conclusion, we found substantial regional variation of HHC referrals by diagnosis and census division. It is unclear how unmeasured characteristics at

the patient, population, agency, or provider levels might contribute to regional variation in HHC referrals. In a health care environment that is increasingly moving toward shared accountability across settings, identifying variation in HHC use is a first step to developing more standardized, evidence-based HHC referrals that optimize the potential of postacute HHC services to improve patient outcomes.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.

Table S1. Odds of HHC Referral by Primary Diagnoses: Heart Failure, Sepsis, Pneumonia, COPD/Bronchiectasis, and Cardiac Dysrhythmia.

Table S2. Characteristics of Elective Patient Discharges by Home Health Care (HHC) Referral Status.

Table S3. Multivariable Logistic Regression Modeling for Home Health Care (HHC) Referral in Elective Patient Discharges.