

Thirty-Day Hospital Readmission Among Homeless Individuals With Medicaid in Massachusetts

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Background: National efforts are underway to reduce hospital readmissions. Few studies have used administrative data to provide a global view of readmission among people experiencing homelessness, who often utilize multiple hospital systems.

Objective: To examine the 30-day hospital readmission rate and factors associated with readmission following discharge among homeless Medicaid members in Massachusetts.

Methods: We analyzed medical record and Medicaid administrative data for 1269 hospitalizations between 2013 and 2014 for 458 unique patients attributed to Boston Health Care for the Homeless Program. Generalized Estimating Equations were used to investigate factors associated with readmission.

Results: Of all hospitalizations, 27% resulted in readmission, more than double the average national Medicaid readmission rate. Leaving against medical advice was associated with increased readmission, while having a Health Care for the Homeless primary care practitioner was associated with reduced readmission. Among the most frequently admitted individuals, being discharged to medical respite care was associated with reduced readmission.

Conclusions: To break the readmission cycle, health care providers serving homeless individuals could focus on assuring access to medical respite care and extending outreach efforts that increase primary care engagement. This may be especially important for accountable care systems, as safety net providers increasingly assume financial risk for patients' total cost and quality of care.

Key Words: homelessness, readmissions, medical respite

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For many of the half a million people in the United States who are estimated to be homeless each night,¹ chronic and acute medical conditions, mental illness, and substance use disorders accompany the harsh circumstances of being poor without stable housing.^{2–6} When faced with the prospect of engaging in routine preventive care and the long-term management of chronic disease, people who are homeless face significant competing demands of meeting basic survival needs, such as food, shelter, and safety.⁷ Coupled with known gaps in access to care,⁷ this can result in costly, disproportionate, and often preventable emergency and inpatient service utilization.^{5,6,8–11}

Repeated hospitalizations can take a significant physical and psychological toll on individuals who are already socioeconomically disadvantaged and living with medical or mental disability. In particular, repeated hospitalizations for the same diagnoses can be a poignant reminder of the challenges of hospital discharge planning and the limited availability of appropriate recuperative settings for individuals experiencing homelessness. Medical respite care is one such structured care setting that provides interim medical and case management services for homeless individuals well enough for hospital discharge but too sick for shelter or street.¹² Patients at Boston Health Care for the Homeless Program (BHCHP) were subjects of one of the first and few published studies specifically focused on readmissions among homeless individuals.¹³ That study, which examined admissions to a single Boston hospital, found a 90-day readmission rate of 21% and highlighted that discharge to medical respite care was associated with significantly reduced risk of readmission when compared with those discharged to their “own care,” including streets or shelters. Buchanan and colleagues also found that medical respite care significantly reduced future hospital utilization among homeless patients, in the 12 months following an initial hospital stay, when compared with a similar group of homeless patients referred, but not admitted, to medical respite care.¹⁴ Other studies have indicated more generally that patients without stable housing are more likely than their housed counterparts to experience hospital readmission.^{15,16} Doran and colleagues found a startling 30-day readmission rate of 51% among homeless patients in New York City, and found that discharge to the streets or shelter was

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associated with higher risk of readmission.¹⁷ However, that study was limited to a single hospital over a 4-month period. Saab et al¹⁸ identified a 22% readmission rate among a community-based sample of homeless individuals in Toronto.

The present study sought to expand upon and update these previous findings by matching administrative data to BHCHP electronic health record data to explore a wider range of factors potentially associated with readmission; by extending the duration of study to 2 years; by exploring readmission at all billed hospitals, rather than a single site of care, which was especially important given that individuals who are homeless often use multiple hospital systems; and by including an analysis of the highest utilizing individuals. This high utilizer analysis was significant because interventions for this subset of patients have become a critical feature of BHCHP's clinical practice in recent years, as the organization has embarked upon new efforts to provide accountable care and drive down total medical expenditures for the highest utilizing homeless patients. Seeking innovative ways to reduce hospital readmission rates among our most vulnerable patients, our specific aims were to identify the 30-day hospital readmission rate and the factors associated with readmission in the 30 days following discharge among homeless Medicaid members in Massachusetts who used BHCHP services.

METHODS

Study Setting

The integrated care model at BHCHP is grounded in the provision of integrated primary and behavioral health care within community settings where people are trying to meet basic survival needs, including shelters and soup kitchens.¹⁹ BHCHP has therefore evolved a decentralized practice tailored to the population it serves, with points of access in nearly 60 sites, including an extensive network of clinics within most adult and family homeless shelters in Boston. In addition, BHCHP operates the oldest and largest medical respite program in the United States, with 124 beds across 2 clinical sites.

Study Sample

We retrospectively merged and analyzed BHCHP medical record and Massachusetts Medicaid administrative data for the 1269 hospital admissions occurring in the 2-year period between 2013 and 2014 for 458 patients attributed to BHCHP for primary care by the Medicaid Primary Care Clinician plan, a managed care plan administered by MassHealth. This represented all inpatient admissions to acute care hospitals during this period for patients attributed to BHCHP through this Medicaid plan, excluding those for which the primary reason for admission was either a substance use disorder or mental illness. Because of patient confidentiality protections instituted by Medicaid, the dataset excluded any claims for inpatient admissions that may have had a primary diagnosis related to substance use disorder; however, claims with secondary or other diagnoses related to substance use disorder were included. Furthermore, substance use disorder could still be evaluated for the majority of patients, given most had had a visit at BHCHP and had

available clinical data on substance use in the BHCHP Electronic Medical Record. Records were merged using exact matches of the Medicaid insurance identification number, which was located on both the Medicaid claims and in the BHCHP medical record. While all of these patients were officially attributed to BHCHP for insurance enrollment purposes, not all had established care through an initial or ongoing primary care visit with a BHCHP doctor, nurse practitioner or physician's assistant; thus not all individuals in this sample had yet been assigned and visited with a BHCHP primary care practitioner (PCP); PCP assignment occurred once they were seen for care.

Measures

The primary outcome of interest was all-cause 30-day hospital readmission, which was measured in accordance with the key Healthcare Cost and Utilization Project (HCUP) re-admission measure and methods outlined by the Agency for Healthcare Research and Quality.²⁰ All index admissions occurring at acute inpatient hospitals between January 1, 2013 and December 31, 2014 were identified. Index admissions that resulted in death prior to discharge were excluded. Only admissions for adults (age 18 and above) were included. An inpatient hospitalization could refer to both an index admission and a readmission. Readmissions were identified during the 30-day postdischarge period for each hospitalization. Rehabilitation, specialty hospitals, and psychiatric hospitals were excluded from the analysis. Readmission rate was used to determine the percentage of hospital admissions that had at least one readmission within 30 days of discharge. Transfers identified by one inpatient stay that ended on the same day as a second inpatient stay were counted as a single admission. Transfers made to specialty hospitals were thus included as a single admission if the initial inpatient stay, prior to transfer, was at an acute inpatient hospital.

In alignment with the behavioral model of health care use for vulnerable populations,²¹ we sought to identify and examine a range of predictors that could potentially *predispose* an individual to hospital readmission, *enable* their readmission, or cause them to *need* readmission. Predisposing factors—understood to impact a patient's baseline tendency to use health services—included age, sex, race, ethnicity, preferred language, and housing status at the time of index admission. Enabling factors—which are thought to present specific barriers or facilitators to seeking care—included having established care with a BHCHP PCP; index admission timing (month, season, day of week, weekend vs. weekday); hospital; or having a BHCHP visit within 30 days of index discharge. Need factors included admitting diagnosis category; number of chronic medical conditions; presence of alcohol use disorder, substance use disorder, and/or mental illness; number of prescribed medications at time of index discharge; prescription of warfarin or insulin at time of index discharge; emergency department visit within 30 days of index discharge; length of index hospital stay; and index stay discharge location [eg, leaving against medical advice (AMA), discharged to home, discharged to medical respite].

Patients were categorized as having 0, 1, 2, or 3 or more chronic medical conditions, a measure which was

informed by prior readmission studies among homeless individuals^{5,10,11,18,22} and by the National Survey of Homeless Assistance Providers and Clients.²³ Using claims data, we noted whether patients had diabetes, anemia, high blood pressure, heart disease or stroke, cancer, respiratory disease (including chronic obstructive pulmonary disease or asthma), liver problems (including hepatitis), or arthritis or other joint problems. Conditions were classified in claims data based on International Classification of Diseases, Ninth Revision, Clinical Modifications (ICD-9-CM) codes, which we further grouped into diagnostic categories using Clinical Classification Software produced by the Agency for Healthcare Research and Quality. Alcohol use disorder, substance use disorder, and/or mental illness at the time of index admission were assessed using the BHCHP Electronic Medical Record.

Statistical Analysis

The 30-day hospital readmission rate was calculated as the proportion of index admissions which resulted in a readmission to an acute care hospital within 30 days of discharge.

To identify potential predictors of readmission, we used Generalized Estimating Equations to examine the associations between the dichotomous outcome of 30-day readmission and each of the predisposing, enabling, and need factors while accounting for clustering in the data resulting from a single patient contributing multiple admissions. We then constructed multivariable Generalized Estimating Equations models that controlled for age, sex, race, and the presence of 3 or more chronic medical conditions in addition to other variables with significant associations in univariate analyses. When analyzing the effect of being discharged to medical respite care, we further adjusted for propensity of being discharged to medical respite versus other settings, such as self care (home, street, or shelter), home with the support of a home health organization, a skilled nursing facility, or other setting.¹³ We used logistic regression to develop these propensity scores, which represented the probability that a hospitalization would result in discharge to medical respite care, given all other observed covariates. Hospitalizations were then stratified into quintiles based on grouped propensity scores, and the logistic regression was rerun to include adjustment for propensity score quintiles. All analyses were then repeated for the hospitalizations involving the highest utilizers—the top 10% of patients, when ranked by their total number of admissions in this 2-year period—to inform targeted interventions for those patients.

All analyses were performed using SAS statistical software, version 9.4 (SAS Institute, Cary, NC). This study was exempted by the Boston University Medical Center Institutional Review Board.

RESULTS

From January 1, 2013 through December 31, 2014, 458 unique patients accounted for 1269 hospitalizations, of which 348 (27.4%) resulted in a readmission to another acute care hospital within 30 days. The average hospital length of stay was 6 days, and 40% of readmissions occurred within the first week following discharge. Approximately 40% of all readmissions were for the same admitting diagnostic category as

the index admission. Hospitalization characteristics are shown in Table 1.

In unadjusted analyses, those discharged to medical respite had a lower absolute readmission rate (22.9%) than those not discharged to respite (28.3%), but this difference was not statistically significant. In multivariable analyses controlling for age, sex, race, and the presence of 3 or more chronic medical conditions (Table 2), patients who left AMA were significantly more likely to be readmitted within 30 days as compared with those who did not [adjusted odds ratios (AOR): 1.94, 95% confidence interval (CI): 1.20–3.14], while patients who had an assigned PCP at BHCHP were significantly less likely to be readmitted (AOR: 0.46, 95% CI: 0.30–0.70). Neither discharge to medical respite nor most recent housing status were significantly associated with 30-day readmission among all patients in adjusted analyses. Patients discharged to medical respite care had significantly higher rates of alcohol use disorder (53.5%) relative to patients discharged to other settings (37.6%) ($P < 0.0001$), and were more likely to be currently homeless (70% vs. 54%, $P < 0.0001$).

When ranked by number of admissions in this 2-year period, the top 10% of patients accounted for 37% of all admissions (46 patients, 475 admissions), and the maximum number of hospitalizations for a single member was 13 during this period. Among these high utilizers, those who were discharged to medical respite care were significantly less likely to be readmitted to the hospital as patients who were discharged to other settings in both unadjusted analyses (Fig. 1) and analyses controlling for age, sex, race, and the presence of 3 or more chronic medical conditions (AOR: 0.49, 95% CI: 0.28–0.87; Table 2). Further adjustment for propensity of being discharged to medical respite did not alter this finding (AOR: 0.51, 95% CI: 0.28–0.93). Among the top 10% high utilizers discharged to medical respite, the average length of stay in medical respite was longer for those without a hospital readmission when compared with those who were readmitted (22 vs. 8 d, respectively).

DISCUSSION

The 30-day readmission rate for this sample of homeless and unstably housed Medicaid patients in Massachusetts was 27.4%. This exceeded the 90-day readmission rate of 21.2% for a similar population discharged from a single Boston hospital between 1998 and 2001,¹³ but was lower than the 50.8% 30-day readmission rate for homeless patients at a single northeastern hospital where there was not a local medical respite program.¹⁷ That the readmission rate in this study was nearly twice that of the published readmission rate for Medicaid patients in 2014²⁴ speaks to the specific and unique challenges faced by people experiencing homelessness as they transition from acute care hospitals back to community settings.

In alignment with prior research on this topic, the average hospital length of stay for this population was 6 days, and 40% of readmissions occurred within the first week following discharge, often for the same or similar diagnosis as the index stay.^{6,17} This finding underscores the chaotic world

TABLE 1. Characteristics of Inpatient Hospitalizations Among BHCHP Patients With Medicaid: Boston, MA, 2013–2014

Characteristics	Total (N = 1269), Mean ± SD or n (%)	Readmission Within 30 d	
		Yes (N = 348), Mean ± SD or n (%)	No (N = 921), Mean ± SD or n (%)
Age (y)	49.1 ± 9.0	49.3 ± 8.1	49.0 ± 9.3
Sex			
Male	906 (71)	256 (74)	650 (70)
Female	337 (27)	83 (24)	254 (28)
Unknown	26 (2)	9 (2)	17 (2)
Race/ethnicity			
Non-Hispanic white	571 (45)	153 (44)	418 (45)
Non-Hispanic African American	387 (30)	107 (31)	280 (30)
Hispanic	233 (18)	68 (20)	165 (18)
Other or Unknown	78 (6)	20 (6)	58 (6)
Housing status			
Housed	248 (20)	67 (19)	181 (20)
Shelter	393 (31)	102 (29)	291 (32)
Street	207 (16)	66 (19)	141 (15)
Other or Unknown	421 (33)	113 (32)	308 (33)
Behavioral health disorders			
Any mental illness	942 (74)	255 (73)	687 (75)
Any SUDs	844 (67)	241 (69)	603 (65)
Co-occurring mental illness and SUDs	729 (57)	203 (58)	526 (57)
Chronic medical conditions*			
0–2 chronic conditions	937 (74)	242 (70)	695 (75)
3+ chronic conditions	332 (26)	106 (30)	226 (25)
Has BHCHP primary care practitioner†			
Yes	1010 (80)	253 (73)	757 (82)
No	259 (20)	95 (27)	164 (18)
Has BHCHP visit within 30 d			
Yes	836 (66)	244 (70)	592 (64)
No	433 (34)	104 (30)	329 (36)
Has ED visit within 30 d			
Yes	583 (46)	190 (55)	393 (43)
No	686 (54)	158 (45)	528 (57)
Discharge location			
Self-care (home, street, or shelter)	583 (46)	108 (31)	475 (52)
Home, under care of Home Health Organization	75 (6)	26 (7)	49 (5)
Medical respite	205 (16)	47 (14)	158 (17)
Skilled nursing facility	69 (5)	13 (4)	56 (6)
Left against medical advice†	177 (14)	80 (23)	97 (11)
Other	160 (13)	74 (21)	86 (9)
Days to readmission	—	11.9 ± 8.7	—

*Chronic medical conditions include diabetes, anemia, high blood pressure, heart disease, stroke, cancer, respiratory disease (including chronic obstructive pulmonary disease or asthma), liver problems (including hepatitis), or arthritis or other joint problems.

†Significantly associated with 30-day readmission ($P \leq 0.05$).

BHCHP indicates Boston Health Care for the Homeless Program; ED, emergency department; SUD, substance use disorders.

to which many people experiencing homelessness return following hospitalization. Of all patients in this study, 14% left the hospital AMA, likely an underestimate given that inpatient teams often underreport AMA discharges. AMA discharges are often the result of untreated withdrawal or difficult interactions rooted in stigma. Clinicians caring for patients experiencing homelessness should be aware of their risk of AMA discharge and take appropriate steps to lower this risk early in the hospitalization. In addition, patients who left the hospital AMA were nearly twice as likely to be readmitted within 30 days, highlighting the increased morbidity and mortality associated with this outcome that has been shown in prior studies.^{17,18,25}

Having an assigned PCP at BHCHP lowered the risk of readmission within 30 days by more than half. This is in

contrast with prior research suggesting that having any PCP may be a predictor of increased readmission among people experiencing homelessness.¹⁸ This result suggests that the uniquely tailored care model of Health Care for the Homeless (HCH) programs, with their emphasis on trauma informed, team-based care, might play an important role in mitigating costly cycles of acute care use. Further study is needed to understand how, why, and under what circumstances HCH programs may impact postdischarge utilization.

Among all utilizers, the association between discharge to medical respite and readmission was found to be clinically significant (22.9% for those discharged to respite, vs. 28.3% for those discharged to other settings) but not statistically significant. Given that the data included only 47 hospitalizations resulting in both discharge to medical respite and

TABLE 2. Factors Associated With 30-Day Readmission Among BHCHP Patients With Medicaid: Boston, MA, 2013–2014

Factors Associated With Readmission*	Adjusted Odds Ratio† (95% CI)
Among all utilizers	
Has BHCHP primary care practitioner	0.46 (0.30–0.70)
Left against medical advice	1.94 (1.20–3.14)
Among top 10% of hospital utilizers	
Discharged to medical respite	0.51 (0.28–0.93)*
Left against medical advice	1.74 (1.21–2.51)

*For all factors in this table, $P < 0.05$.

†Adjusted, multivariate analyses controlled for age, sex, race, and the presence of 3 or more chronic medical conditions.

‡Includes additional adjustment for propensity score.

BHCHP indicates Boston Health Care for the Homeless Program; CI, confidence interval.

readmission, it may be that this small cell size, together with known clustering of individuals in the data, diminished the statistical significance of the association between medical respite and readmission among all utilizers. Further research is warranted, particularly in light of the additional and alternative finding from the present study that discharge to medical respite did lead to significantly reduced readmission among the highest hospital utilizers, when compared with those high utilizers discharged to non-respite settings. This result lends support to previous studies which have indicated that discharge to medical respite may decrease risk of readmission,¹³ particularly among those individuals who are the highest utilizers of hospital systems, while discharge to shelter or the streets may increase risk of readmission for such populations.¹⁷ Medical respite programs are designed to ensure a safe and stable discharge location for homeless persons leaving hospital and are models of care uniquely positioned to help break the cycling of patients who frequent hospitals and emergency departments. As states continue to expand Medicaid, they should look to partner with HCH community health centers and medical respite programs in caring for the

most complex patients, while continuing to evaluate the impact of respite on readmission.

Limitations

The present study has several limitations. First, findings may not be generalizable to all homeless populations, as our definition of homelessness included all patients attributed to BHCHP for insurance purposes—which itself occurs primarily on the basis of patient selection and historical utilization, not necessarily on current homelessness. Furthermore, while not all studied patients engaged in primary care, focusing our study on BHCHP-attributed patients likely omits data on homeless patients who were less engaged in primary preventive care. Massachusetts has expanded its Medicaid program to more homeless patients than most other states, so the baseline level of primary care engagement and overall health care utilization may be different in the study population than in other settings.

A second limitation is that we were not able to include admissions for which the primary diagnosis was related to substance use disorder. For these patients, transitions out of inpatient settings are often chaotic and it is likely that if this data had been included, the rate of readmission would have been higher for the studied group.

Finally, we conducted only a limited analysis of potentially preventable readmissions (ie, those with a diagnosis at readmission that was related to the diagnosis upon index admission), and, in alignment with the national HCUP readmission measure, we did not distinguish between planned and unplanned readmissions. Because the data set contained a high rate of missing procedure codes, we were not able to include inpatient procedures as a covariate in our model.

CONCLUSIONS

This sample of currently or formerly homeless patients experienced more than double the average adult Medicaid readmission rate after discharge from an acute care hospital. Repeated hospitalizations are costly on many levels, affecting both the financial health of our system of care and the physical and psychological health of our most vulnerable patients. An analysis of risk factors contributing to readmission suggests that health care providers serving homeless individuals will need to focus on increasing primary care team empanelment and facilitating access to medical respite care, especially for those most frequently admitted. Such efforts should accompany ongoing advocacy for supportive housing and other opportunities to address the social determinants of health.

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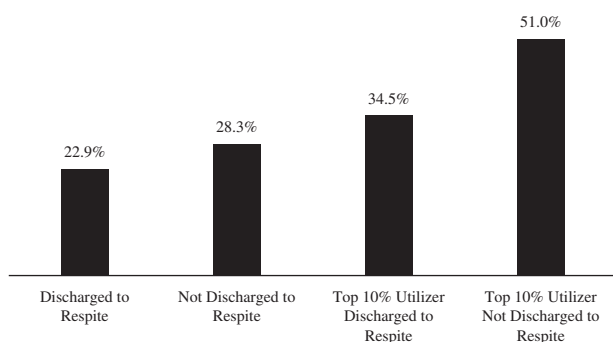


FIGURE 1. 30-day hospital readmission rate among Boston Health Care for the Homeless patients discharged to medical respite versus other settings: Boston, MA: 2013–2014. The readmission rate is shown by both discharge setting (medical respite vs. nonrespite) and utilization group (all utilizers vs. those who are among the top 10% most frequent hospital utilizers).

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