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Association of Function, Symptoms, and Social Support Reported in Standardized Outpatient Clinic Questionnaires With Subsequent Hospital Discharge Disposition and 30-Day Readmissions

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Abstract

Objective: To determine whether patient-reported information, routinely collected in an outpatient setting, is associated with readmission within 30 days of discharge and/or the need for post-acute care after a subsequent hospital admission.

Design: Retrospective cohort study. Six domains of patient-reported information collected in the outpatient setting (psychological distress, respiratory symptoms, musculoskeletal pain, family support, mobility, and activities of daily living [ADLs]) were linked to electronic health record hospitalization data. Mixed effects logistic regression models with random intercepts were used to identify the association between the 6 domains and outcomes.

Setting: Outpatient clinics and hospitals in a Midwestern health system.

Participants: 7671 patients who were hospitalized 11,445 times between May 2004 and May 2014 (N=7671).

Intervention: None.

Main Outcome Measures: 30-day hospital readmission and discharge home vs facility.

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Results: Domains were significantly associated with 30-day readmission and placement in a facility. Specifically, mobility (odds ratio [OR]=1.30; 95% confidence interval [CI], 1.16, 1.46), ADLs (OR=1.27; 95% CI, 1.13, 1.42), respiratory symptoms (OR=1.26; 95% CI, 1.12, 1.41), and psychological distress (OR=1.20; 95% CI, 1.07, 1.35) had the strongest associations with 30-day readmission. The ADL (OR=2.52; 95% CI, 2.26, 2.81), mobility (OR=2.35; 95% CI, 2.10, 2.63), family support (OR=2.28; 95% CI, 1.98, 2.62), and psychological distress (OR=1.38; 95% CI, 1.25, 1.52) domains had the strongest associations with discharge to an institution.

Conclusions: Patient-reported function, symptoms, and social support routinely collected in outpatient clinics are associated with future 30-day readmission and discharge to an institutional setting. Whether these data can be leveraged to guide interventions to address patient needs and improve outcomes requires further research.

Keywords

Hospital readmission; Patient-reported outcome measures; Rehabilitation; Subacute care

Patient-centered outcomes are important indicators of health care quality and are increasingly being linked to health care Reimbursement.[1] Two important outcomes—30-day hospital readmissions and post-acute care utilization, have been the focus of a number of health policies to improve utilization and costs. Consequently, identifying potentially modifiable factors that reduce the risk of readmission and optimize post-acute care utilization is a focus of intense health services research.

Unfortunately, though progress toward identification of patients who are at risk of poor outcomes has been made, less is known about how this risk can be reduced. For example, patient-level social determinants of health including sex, age, income, and insurance coverage are important risk factors for readmissions and need for institutional based care[2,3] but can be difficult to alter because of a variety of social and environmental factors. Though social determinants of health affect health care utilization and cost,[4–6] evidence suggests that additional patient characteristics (eg, functional limitations, symptom burden, and mood) also influence utilization and outcomes,[7–11] which may be more amenable to immediate intervention.

The importance of how functional limitations, symptom severity, and lack of social support shape a patient's trajectory throughout an episode of care is gaining increased attention. For example, symptoms of depression, anxiety, pain, as well as functional limitations are associated with increased rates hospital readmission[12–16] as well as acute/post-acute health care utilization. [17,18] Although these latter domains are considered important and treatable, their incorporation into prediction models and clinical decision making has been slow—in part due to a lack of systematic collection. The massive adoption of electronic health records (EHRs) over the last few decades offers an intriguing path for investigation.

Our overall aim is to assess whether data routinely collected in an outpatient setting are associated with future outcomes after hospitalization. We hypothesize that such information can be used to identify at-risk individuals earlier in the care continuum and that it can serve as an asset in individualizing care and decreasing costs by facilitating earlier identification of

impairments that may benefit from intervention. As the first step toward this end, the goal of the present study was to determine the association between information routinely collected in an outpatient setting (function, symptoms, and family support) with 30-day readmissions and institutionalization after a subsequent hospital discharge.

Methods

Sample

This study included any patient aged 18 years or older who was admitted to 1 of 2 Rochester-based hospitals within the Mayo Clinic health system for congestive heart failure, chronic obstructive pulmonary disease, coronary artery disease including myocardial infarction, and pneumonia over a 10-year period (May 2004-May 2014). These 4 diagnoses were considered in this study because of their high prevalence[19] and high rates of 30-day readmission.[20] Patients were also required to have completed a "current visit information" (CVI) form, in an outpatient setting, that queries patients regarding their function and physical and mental symptoms within 6 months of hospital admission.[21] After identifying a cohort of 12,659 patients, we applied 2 exclusion criteria: (1) residing outside of a 100-km (60-mile) radius of the medical center to ensure residence within the health system's catchment (n=846) and (2) residing in a nursing home (n=368). Our final cohort consisted of 7671 patients who contributed 11,445 hospitalizations during the study period.

Data collection

This investigation utilized de-identified data collected as part of routine clinical care and received an exempt status by the Brown University Institutional Review Board. Two forms of data were collected.

De-identified retrospective data were collected from the CVI. CVI administration occurred every 6 months completely independent of a patient's medical status or visit provider, setting, or type (eg, primary or specialty care) and could occur prior to, or during, a clinical encounter. Our health system used 2 strategies to capture data: (1) the CVI was mailed 3 weeks prior to the appointment with a return envelope or (2) patients who did not return the mailed instrument completed the assessment in the waiting room. In either case the data were scanned into the EHR and available to the provider during a clinic visit. CVI data utilized in this study were collected within 6 months prior to a hospital admission. (Given the 10-year span of the data, some patients contributed multiple admissions during the study period.) The domain scores from the CVI instrument were computed for the patients who completed 70% or more items.[21]

The second set of data consisted of patient demographic and clinical characteristics that were electronically abstracted from the system's Unified Data Platform, which aggregates and stores systemwide EHR and revenue cycle data. These variables included age, sex, residential ZIP code to calculate the distance from the medical center, and race. We used *International Classification of Diseases* diagnosis codes at hospital admission to calculate the Charlson Comorbidity index, in which higher values indicate higher comorbidity burden.

Outcomes: Discharge disposition and 30-day hospital readmission

Outcome data were obtained from the EHR. Discharge disposition was dichotomized into home with/without home care services or institutionalization in a facility such as a skilled nursing facility (SNF), nursing home, or acute inpatient rehabilitation unit. Hospital readmissions were defined as any hospitalization that occurred at one of the Mayo Clinic hospitals in Rochester, Minnesota, within 30 days of a previous hospital discharge.

CVI patient-reported information on function, symptoms, and social support

Our approach to aggregating patient-reported information into domain scores has been described in depth in a previous study, which demonstrated evidence of convergent, discriminant, and known-groups validity.[21] We applied the multidimensional item response theory (MIRT) models to responses on the CVIs, which showed excellent fit statistics. Six domains were identified: psychological distress, respiratory symptoms, musculoskeletal pain, family support ("connectedness"), mobility, and activities of daily living (ADLs). The 33 CVI items included in each domain are listed in supplemental table 1 (available online only at http://www.archives-pmr.org/). In all MIRT calibrated measures, scale scores for each domain are represented by theta estimates, with a mean of 0 and a standard deviation of ±1. For example, a score of 1.25 on the psychological distress domain would be interpreted as being 1.25 standard deviation units higher than the mean scale score, indicating higher symptom burden. To interpret scores on CVI domains, we transformed the MIRT scores on some domains so that higher scores have consistent meaning to indicate worse conditions such as higher symptom burden, more limited family support, and worse functional performance. Rates of missing data across the CVI domains were low, ranging from 0.3 to 3.1% (supplemental table 2, available online only at http://www.archives-pmr.org/). One notable exception was the depression domain, in which 8.0% of scores were missing. Rates of missingness were similar when compared by readmission status and discharge location.

Analysis

Descriptive statistics were used for demographic characteristics of the cohort at the time of each patient's first admission record (n=7671). We then used the full data set (n=11,445) to examine and compare the domain scores, stratified by readmission status/discharge disposition.

To determine the association between each CVI domain and each of the outcomes, we estimated separate mixed effects logistic regression models using maximum likelihood estimation. Given the longitudinal nature of the data with multiple records per patient, we included a random intercept for every patient. First, we estimated separate models to identify the unadjusted odds of each outcome by each domain. We then identified which patient characteristics (age, sex, race, admitting diagnosis category, time interval between completion of the CVI and admission, Charlson Comorbidity Index, whether the patient experienced a short stay at an SNF between CVI completion and hospital admission during the study period) were associated with each outcome. We then fitted final models for each domain, adjusted for patient characteristics and temporal factors (time from CVI completion to hospitalization, year of hospitalization) that were significantly associated with

each outcome. For all models, we report the model intercept, beta estimate, and odds ratio with 95% confidence interval to demonstrate the strength of association.

Finally, we conducted 2 sensitivity analyses to evaluate robustness of the effect sizes. First, we reduced the chance of uncaptured, out-of-system hospitalizations by limiting the distance from home to the hospital to a radius of 32 km (20 miles; n=3700 with 5679 hospitalizations). Second, we evaluated robustness of associations based on timing between CVI completion and hospitalization (1 month or less [n=5136], 1–2 months [n=1448], 3 or more months [n=4861]). All data analyses were performed using SAS v9.4.[a]

Results

Sample and hospitalization characteristics

The study cohort comprised 7671 patients with a median age of 73 years. A total of 11,445 hospitalizations occurred over the study period. Almost 93% of the subjects identified themselves as White and roughly 60% were men. The sample's median Charlson Comorbidity Index score was 2 (table 1). The overall 30-day readmission rate was 8% with an average hospital length of stay of 3.9 days. Less than 3% of hospitalizations were preceded by a stay in a nursing facility and 16.0% resulted in discharge to an institution for post-acute care (table 2).

Domain scores varied across the 30-day hospital readmission and discharge disposition subgroups (table 3). Patients who experienced a 30-day readmission had higher (worse) scores on the psychological distress, respiratory symptoms, musculoskeletal pain, mobility, family connectedness (less family support), and ADL domains relative to those not readmitted. Similar patterns were noted for patients who went to an institution vs home after hospitalization.

Thirty-day readmission

Unadjusted models revealed significant associations between domain scores and 30-day hospital readmissions (table 4). For every standard deviation increase in score, the odds of readmission significantly increased for the following domains: psychological distress (27%), respiratory symptoms (38%), musculoskeletal pain (16%), difficulty with mobility (44%), difficulty with ADLs (40%), and less family support (family connectedness; 30%). Patient age, Charlson Comorbidity Index, an SNF stay between CVI administration and hospitalization, admission diagnosis category, and year of hospitalization were individually associated with readmission. When adjusted for these factors, effect sizes were slightly attenuated yet remained significant, except for family connectedness. The mobility and ADL domains had the largest effect sizes for predicting readmissions, followed closely by respiratory symptoms and psychological distress domains.

Supplier
a. SAS v9.4, SAS Institute.

Discharge disposition

As was true for the readmission regression models, all domains were significantly associated with discharge disposition (table 5). More specifically, for every standard deviation increase in score, odds of discharge to an institution significantly increased: psychological distress (65%), respiratory symptoms (54%), musculoskeletal pain (42%), difficulty with mobility (329%), difficulty with ADLs (373%), and impaired family connectedness (434%). Patient age, sex, Charlson Comorbidity Index, race, SNF admission, admission diagnosis category, time between CVI completion and hospitalization, and year of hospitalization were also individually associated with discharge disposition. Adjusted for these characteristics, effect sizes were again attenuated, yet all of the domain scores remained statistically significant.

Though the direction of effect sizes was similar to those of the readmission regression models, their magnitude was much larger in the discharge disposition models. Higher scores (ie, a more impaired status) on mobility, ADL, and impaired family connectedness domains were associated with the highest odds of discharge to an institution.

Sensitivity analyses

As noted above, we performed a sensitivity analysis by comparing our previous regression model estimates with those living within 32 km of our institution. Findings were largely similar with a few exceptions. In unadjusted and adjusted hospital readmission models (see supplemental table 3A, available online only at http://www.archives-pmr.org/), musculoskeletal pain was no longer a significant predictor of readmission. Family connectedness was no longer significantly associated with readmission when adjusted for relevant patient characteristics. Discharge regression models were also similar in effect size magnitude and direction in sensitivity models (supplemental table 3B, available online only at http://www.archives-pmr.org/). However, in adjusted models, respiratory symptoms were no longer significantly associated with discharge disposition.

We performed additional sensitivity analyses to evaluate robustness of associations when stratified by time between CVI completion and hospitalization. More specifically, the results found in the CVI competed within 1 month of a hospital admission were compared with those completed 1–2 months and >3 months prior to admission.

In adjusted readmission models (supplemental tables 4A–C, available online only at http://www.archives-pmr.org/), associations were similar, with increased effect sizes for respiratory symptoms and pain among patients who completed the CVI within 1 month of hospitalization. Pain was no longer significant for patients who completed the CVI 1–2 months prior to hospitalization, but the strength of associations for psychological distress, respiratory symptoms, mobility, and ADL were increased.

For patients who completed the CVI 3 or months prior to hospitalization, only respiratory symptoms and mobility were significant and similar effect sizes to the full model results. In adjusted discharge models (supplemental tables 5A–C, available online only at http://www.archives-pmr.org/), respiratory symptoms were no longer significant while the magnitude of the associations for psychological distress, family connectedness, mobility, and ADL increased for individuals in both the 1 month or less and 1–2month groups.

Associations in the model for individuals who completed the CVI 3 months or more prior to hospitalization were similar in magnitude to the full model results.

Discussion

This study is, to the best of our knowledge, the first to evaluate associations between routinely collected information on function, symptom burden, and social support in the outpatient setting and outcomes of subsequent hospitalizations. The findings are significant. In summary, we found that information about function, symptoms, and social support routinely collected in an outpatient setting can be associated with increased likelihood of 30-day readmission after a subsequent hospitalization or discharge to an institution. Specifically, higher psychological distress, respiratory symptoms, musculoskeletal pain, impaired mobility and ADL limitations, and poor family support were associated with both an increased odds of 30-day hospital readmission and institutional placement. Importantly, these associations persisted even when adjusted for patient clinical and demographic characteristics and remained robust in our sensitivity analyses.

Health systems have explored data-driven strategies to identify high risk patient populations and high utilizers of health care.[22] These modeling efforts have typically relied on combining administrative claims and EHR data to identify patients with high rates of emergency department visits and hospitalization.[23,24] However, measures of function, symptom burden, and social needs (eg, social support, transportation access) have rarely been considered in these activities. This deficit reflects both a lack of a biopsychosocial approach to understanding health care utilization. Pragmatically, it ignores a wealth of data collected in real-world clinical practice to identify potentially modifiable impairments for intervention.

Our findings accord well with previous reports describing the association of symptom burden and functional status with health care utilization. Psychological symptoms increase health care utilization and are associated with an increased risk of readmission in a variety of patient populations ranging from general medical diagnoses[25] to chronic obstructive pulmonary disease[26] and cancer.[27] Intense and co-occurring symptoms are also associated with increased rates of hospitalization and emergency department utilization among patients with cancer[27,28] and heart failure.[29]

Poorly controlled pain increases the probability of 30-day rehospitalizations and emergency department visits among patients who have been hospitalized with chronic heart failure[30] and other medical conditions.[31] Interestingly, in the current study, the effect of pain, per se, was not only smaller compared to other domains but was also significantly associated with readmission only when including those who lived farther than 32 km away from our medical center. Although suppositional on our part, this finding may reflect decreased access to providers in the more rural and distant portions of our catchment area—with the result that rehospitalization was the only available option. In fact, evidence suggests that rates of 30-day readmission and preventable acute care use are higher among individuals who live in rural vs urban areas.[32–35]

Our findings that mobility and ADL limitations are associated with readmission and post-acute care utilization[17] also align with previous research using administrative claims data and population-based surveys.[12–16] More important, perhaps, they also suggest that these associations can be detected prospectively from data collected as a part of clinical care as much as 6 months prior to a hospital admission. For example, identification of mobility and ADL limitations collected previously in the outpatient setting might be used to trigger referral for rehabilitation services at the time of an admission aimed toward optimizing a patient's strength and function with a goal or proactively improving downstream outcomes.

This study utilized information routinely collected from patients in outpatient care, which may have advantages, including clinician familiarity with data capture and structure. Additionally, the CVI was initially developed as a review of symptoms (ROS), which may facilitate efficient interpretation relative to the learning curve frequently required to interpret and meaningfully use contemporary, multidimensional measures. Moreover, in part, because CVI data supported clinical ROS documentation and were incorporated into patient discussions, data capture approached 100%. Patients' and clinicians' acceptance of patient-reported ROS as integral to clinical care offers an advantage over other patient-reported outcome measures (PROMs) that have, at times, engendered ambivalence.[36]

A more sophisticated PROM-based approach may permit enhanced prediction models that enable us to efficiently identify actionable clinical targets and improve outcomes. Some relevant work has already been done. For example, a recent study confirmed that low physical health domain scores on the Patient-Reported Outcomes Measurement Information System global health questionnaire collected in outpatient clinics were associated with higher rates of hospitalization.[37] These findings, combined with our results, suggest that PROM data may be used across the continuum of care to identify high-risk patients. Yet, further research is needed to prospectively develop and validate prediction models using data collected in forms like the CVI and to compare its clinical utility to contemporary measures, such as the Patient-Reported Outcomes Measurement Information System domains.

The potential for using PROM-driven strategies to identify limitations for targeted, early interventions that avoid preventable health care utilization is enticing, yet proof of concept remains limited. A few approaches have, however, effectively leveraged PROMs to individualize patient care in a manner that reduces utilization. For example, PROM-based monitoring in the outpatient setting is associated with fewer ED visits and longer survival[38] in cancer populations. Similarly, a coupling of PROM-based monitoring with collaborative care has been shown to reduce hospital utilization, lengths of stay, and need for post-acute care.[39] Although these findings are specific to patients with cancer, they highlight the importance of establishing systems for interpreting and acting on PROM and clinical data. Experience has shown that, if they are to be successful, they must fit into established delivery structures and workflows.

Fortunately, recent government mandates have forced health care systems to invest in the infrastructure needed to accomplish this.[40–44] We need to build upon these advances by developing and testing tailored care plans to address burdensome symptoms, functional limitations, and social needs to better serve patient populations with high health care

utilization, such as chronic respiratory and cardiac conditions and multimorbidity. These efforts may prove particularly fruitful when applied to individuals who are identified as high risk for a particular outcome, such as readmission or future institutionalization.

Study limitations

The strength of this study was its large sample size and excellent data capture. There were weaknesses, however. Several limitations constrain this study's external validity, including its racial and ethnic homogeneity, as well as the fact that our data reflect the experience of a single medical center. Additionally, we are unable to identify whether the initial hospital stays in our cohort were classified as a readmission for a prior stay within 30 days. It is reassuring, however, that the significance and magnitude of the associations between the domain scores and 30-day readmission were largely preserved in the sensitivity analyses that limited the sample to those living at the core (<32 km, 20 miles) vs the farther, more rural aspects of our system's catchment area. It also pertinent that our system is in a city of roughly 100,000 people that is surrounded by rural counties that lack any significant hospital resources, with the result that its catchment area is far greater than 100 km utilized in our work. Given this, we believe that the number of patients who may have been admitted within 30 days of a discharge to a facility different from the system investigated in this study is very small. However, even if a significant number were lost to follow-up, the effect would be to mute our findings. Although we adjusted models for time between CVI administration and hospitalization, associations may be stronger for assessments that occurred closer to hospitalization. Finally, although patients in our health system had 2 opportunities to complete the CVI—by mail prior to appointments and in the office prior to the clinic visit—there may be some patients who should have completed the CVI who did not. Given the data collection strategy and its role as an ROS during clinical care, we anticipate that the missing response rates would be low, but we are unable to quantify the exact proportion of missing responses or to characterize the demographics of those who would have been included in the study if they had completed a CVI.

Conclusions and implications

Improved characterization of symptom burden, functional status, and social support prior to hospitalizations can identify patients at risk for 30-day readmission and institutionalization after a hospitalization. Consequently, this approach may allow health care providers to identify and initiate interventions to address symptoms, functional limitations, and social support for at-risk individuals earlier in their care.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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List of abbreviations:

ADLs	activities of daily living
CI	confidence interval
CVI	current visit information
EHR	electronic health record
MIRT	multidimensional item response theory
OR	odds ratio
PROM	patient-reported outcome measure
ROS	review of systems
SNF	skilled nursing facility

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Table 1

Demographic characteristics of the sample (n=7671)

	n	%
Age		
Mean±SD	70.6 (14.1)	
Median (IQR)	73.0 (61.0,82.0)	
Quartiles		
<60 years	1674	21.8
60–69 years	1576	20.5
70–79 years	2057	26.8
80 years or more	2364	30.8
Race		
White	7128	92.9
Other	543	7.1
Sex		
Female	2932	38.2
Male	4739	61.8
Charlson Comorbidity Index		
Mean±SD	2.1 (2.1)	
Median (IQR)	2.0 (1.0, 3.0)	

Table 2

Hospitalization characteristics

Total hospitalizations	
	11,445
SNF stay between CVI completion and admission to hospital	
n (%)	337 (2.9)
Hospitalizations per person	
Mean±SD	1.7 (1.5)
Min	1
Max	20
Time between CVI completion and hospitalization (days)	
Mean±SD	61.7 (58.2)
Median (IQR)	48.0 (3.0, 111.0)
Admission diagnosis category, n (%)	
Pneumonia	2367 (20.7)
Congestive heart failure	2693 (23.5)
Myocardial infarction	1934 (16.9)
Coronary artery disease	3235 (28.3)
Chronic obstructive pulmonary disease	1216 (10.6)
Total readmissions	916
Readmissions per person, n (%)	
Min, max	0, 12
None	6978 (91.0)
1	543 (7.0)
2 or more	150 (2.0)
Length of stay	
Mean±SD	3.9 (4.5)
Min	1
Max	94
Discharge disposition, n (%)	
Home with/without home care	9612 (84.0)
Institution	1833 (16.0)

Table 3

Multidimensional CVI domain scores by outcome

	Readmitted			Not Readmitted		
	n	**Mean±SD**	**Min, Max**	**n**	**Mean±SD**	**Min, Max**
Psychological distress	835	0.23 (0.70)	−0.74, 2.62	9691	0.11 (0.68)	−0.74, 2.72
Respiratory symptoms	910	0.24 (0.72)	−0.80, 1.69	10,495	0.07 (0.69)	−0.80, 1.72
Musculoskeletal pain	910	0.17 (0.73)	−0.82, 2.22	10,495	0.09 (0.72)	−0.81, 2.36
Family connectedness	903	0.15 (0.52)	−0.49, 1.76	10,377	0.07 (0.52)	−0.49, 1.76
Difficulty with mobility	877	0.17 (0.72)	−1.14, 2.00	10,216	−0.03 (0.73)	−1.14, 2.04
Difficulty with ADLs	884	0.21 (0.71)	−0.99, 2.22	10,275	0.02 (0.72)	−0.99, 2.25
	Discharged to Institution			**Discharged Home**		
	n	**Mean±SD**	**Min, Max**	**n**	**Mean±SD**	**Min, Max**
Psychological distress	1673	0.25 (0.65)	−0.74, 2.67	8853	0.10 (0.68)	−0.75, 2.72
Respiratory symptoms	1824	0.19 (0.66)	−0.80, 1.66	9581	0.06 (0.70)	−0.80, 1.72
Musculoskeletal pain	1822	0.20 (0.70)	−0.81, 2.35	9583	0.08 (0.72)	−0.82, 2.36
Family connectedness	1799	0.35 (0.55)	−0.49, 1.76	9481	0.03 (0.50)	−0.49, 1.76
Difficulty with mobility	1749	0.42 (0.68)	−1.14, 2.04	9344	−0.10 (0.72)	−1.14, 2.00
Difficulty with ADLs	1766	0.53 (0.70)	−0.99, 2.25	9393	−0.05 (0.69)	−0.99, 2.22

Table 4

Odds of 30-day hospital readmission by CVI domain score

	n	Intercept	Estimate (β)	ORexp (β)	95% CI
Unadjusted Models					
Psychological distress	10,526	−3.00	0.24	1.27	1.13, 1.42
Respiratory symptoms	11,405	−2.95	0.32	1.38	1.24, 1.53
Musculoskeletal pain	11,405	−2.95	−0.14	1.16	1.04, 1.28
Family connectedness	11,280	−2.92	0.26	1.30	1.12, 1.49
Difficulty with mobility	11,093	−2.89	0.36	1.44	1.30, 1.60
Difficulty with ADLs	11,159	−2.91	0.34	1.40	1.27, 1.55
Adjusted Models *					
Psychological distress	10,526	−4.10	0.18	1.20	1.07, 1.35
Respiratory symptoms	11,405	−4.10	0.24	1.27	1.13, 1.42
Musculoskeletal pain	11,405	−4.05	0.11	1.12	1.01, 1.25
Family connectedness	11,280	−4.03	0.11	1.12	0.96, 1.30
Difficulty with mobility	11,093	−4.01	0.27	1.30	1.16, 1.46
Difficulty with ADLs	11,159	−4.08	0.24	1.27	1.13, 1.42

NOTE.

*Models adjusted for age, Charlson Comorbidity Index, SNF admission between CVI completion and hospitalization, admission diagnosis category, and year of hospitalization.

Table 5

Odds of discharge to an institution vs home by CVI domain score'

	n	Intercept	Estimate (β)	ORexp (β)	95% CI
Unadjusted Models					
Psychological distress	10,526	−2.63	0.50	1.65	1.47, 1.86
Respiratory symptoms	11,405	−2.55	0.43	1.54	1.37, 1.72
Musculoskeletal pain	11,405	−2.54	0.35	1.42	1.27, 1.57
Family connectedness	11,280	−2.75	1.68	5.34	4.47, 6.39
Difficulty with mobility	11,093	−2.63	1.46	4.29	3.74, 4.93
Difficulty with ADLs	11,159	−2.70	1.55	4.73	4.12, 5.43
Adjusted Models *					
Psychological distress	10,526	−3.28	0.33	1.39	1.26, 1.54
Respiratory symptoms	11,405	−3.17	0.17	1.19	1.08, 1.31
Musculoskeletal pain	11,405	−3.10	0.20	1.23	1.12, 1.34
Family connectedness	11,280	−3.10	0.83	2.3	2.00, 2.66
Difficulty with mobility	11,093	−3.22	0.86	2.37	2.12, 2.65
Difficulty with ADLs	11,159	−3.33	0.93	2.53	2.27, 2.83

NOTE.

* Models adjusted for age, sex, Charlson Comorbidity Index, race, SNF admission between CVI administration and hospitalization, admission diagnosis category, time between CVI completion and hospitalization, and year of hospitalization.