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Perceived vs. Actual Risks of 30-Day Readmission in Patients with Cardiovascular Disease

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Abstract

Background: Cardiovascular disease (CVD) is the leading cause of hospitalization in the United States and patients with CVD are at a high risk of readmission after discharge. We examined whether patients' perceived risk of readmission at discharge was associated with actual 30-day readmissions in patients hospitalized with CVD.

Methods: We recruited 730 patients from the Duke Heart Center who were admitted for treatment of CVD between January 1, 2015 and August 31, 2017. A standardized survey was linked with electronic health records to ascertain patients' perceived risk of readmission, and other sociodemographic, psychosocial, behavioral, and clinical data prior to discharge. All-cause readmission within 30 days after discharge was examined.

Results: Nearly 1-in-3 patients perceived a high risk of readmission at index admission and those who perceived a high risk had significantly more readmissions within 30 days than patients who perceived low risks of readmission (23.6% vs. 15.8%, p=0.016). Among those who perceived a high risk of readmission, non-white patients (odds ratio [OR], 2.07; 95% confidence interval [CI], 1.28–3.36), those with poor self-rated health (OR, 2.30; 95% CI, 1.38–3.85), difficulty accessing care (OR, 2.72; 95% CI, 1.24–6.00), and prior hospitalizations in the past year (OR, 2.13; 95% CI, 1.21–3.74) were more likely to be readmitted. Among those who perceived a low risk of

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Disclosures

None.

readmission, patients who were widowed (OR, 2.69; 95% CI, 1.60–4.51) and reported difficulty accessing care (OR, 1.89; 95% CI, 1.07–3.33) were more likely to be readmitted.

Conclusions: Patients who perceived a high risk of readmission had a higher rate of 30-day readmission than patients who perceived a low risk. These findings have important implications for identifying CVD patients at a high risk of 30-day readmission and targeting the factors associated with perceived and actual risks of readmission.

INTRODUCTION

Cardiovascular disease (CVD) remains the leading cause of hospitalization in the United States and patients with CVD have an especially high risk of readmission after discharge.[1] For more than a decade, clinicians, payers, and policy makers have targeted 30-day readmissions to lower healthcare costs and improve the quality of care for patients with CVD.[2, 3] Despite these efforts, strategies to effectively identify patients at high risk of readmission have remained a challenge.[3–6] To date, however, few approaches have considered patient-reported factors when assessing risks for 30-day readmission.[7, 8]

Studies have demonstrated the importance of patient-reported characteristics, perceptions, and outcomes for improving clinical practice and the provision of care.[7–10] A patient's perception of risk is an important factor that reflects the understanding and interpretation of one's personal health, available resources, and wider socio-environmental contexts, which standard clinical measures are unable to capture.[11] Indeed, studies suggest that a patient's perceived risk of developing a disease or experiencing an adverse event is significantly related to their adherence to medical treatments and preventive behaviors.[11–13] To our knowledge, no study has directly assessed whether a patient's perception of their readmission risk at discharge is associated with actual 30-day readmission. Understanding patients' perceptions of their risk of 30-day readmission and the factors associated with these perceptions may identify high-risk patients and promote targeted care-management strategies that prevent actual 30-day readmissions.

This study linked patient-reported data with electronic health records (EHR) to investigate the correlates and consequences of the perceived risk of readmission at the time of discharge in patients with CVD. Our overall objectives were threefold: first, to identify the sociodemographic, psychosocial, behavioral, and clinical factors associated with the perceived risk of readmission in patients hospitalized with CVD; second, to examine how patients' perceived risk of readmission is associated with actual 30-day readmissions; and third, to evaluate the factors associated with 30-day readmissions in patients with different perceptions of readmission risk.

METHODS

Because of the sensitive nature of the data collected for this study, qualified researchers trained in human subject confidentiality protocols may send requests to access the data that support the findings of this study to the corresponding author.

Sample

Patients who were admitted for treatment of cardiovascular-related conditions between January 1, 2015 and August 31, 2017 were recruited from the Duke Heart Center at Duke University Health System. A total of 6,860 patients 18 years or older were admitted during the study period and were eligible to participate in the study. Eligible patients were randomly selected, consented, and administered a standardized survey questionnaire to collect their demographic background, socioeconomic status, psychosocial and behavioral factors, as well as patient-reported outcomes. Additional data were extracted from patients' EHR using Duke Enterprise Data Unified Content Explorer (DEDUCE), a data extraction system that identifies patient cohorts and provides access to clinical data stored in the organizational data warehouse.[14] Detailed information on subject selection, recruitment, and survey administration have been published elsewhere.[15] Prior research has also demonstrated that the demographic and clinical profiles of study participants and all eligible patients at the Duke Heart Center were similar.[15] A total of 860 patients were approached for inclusion and 67 refused to participate in this study (Figure 1). Among the 762 recruited patients, 32 did not answer the perceived risk of readmission question. The final analytical sample included 730 patients who were interviewed and followed after discharge. The study was approved by the Institutional Review Board at Duke University.

Measures

Perceived Risk of Readmission.—At the time of their index hospitalization, patients were asked how likely they thought that they would return to the hospital for an unplanned or emergency visit within the next 30 days. Possible responses included the following four categories: (1) very likely, (2) somewhat likely, (3) somewhat unlikely, and (4) not very likely. Based on the distribution of responses, and the Kaplan-Meier plots of 30-day readmissions by the responses (Supplemental Figure I), responses were dichotomized to indicate participants who perceived a high risk of readmission (categories 1 and 2) and those who perceived a low risk of readmission (categories 3 and 4).

30-Day Hospital Readmission.—Consistent with prior studies, all-cause 30-day readmissions (yes/no) were identified based on the number of days after discharge from the index admission to a subsequent hospitalization using patients' EHRs.[4, 6] Twenty-five patients died within 30 days of their discharge and five of these patients were readmitted. Another 23 patients died within 60 days of their index hospitalization. Our previous research suggests that the 30-day readmission rate in the current study was comparable to the readmission rates reported by other hospitals in North Carolina and the estimates in national reports.[16] The 30-day mortality rate in this study was also similar to the mortality rate reported in prior research (3.4% in this study vs. 2.7%−5.3% in other studies).[17, 18] A composite outcome of 30-day readmission or 30-day mortality was used for sensitivity analyses.[19]

Covariates.—Patients' sociodemographic background, psychosocial factors, health behaviors, health-related characteristics, and healthcare utilization were collected from the surveys and EHR. Supplementary Table I presents the detailed measures for each covariate. Sociodemographic background included age, gender, race, education level, employment

status, and marital status. Psychosocial factors included several previously-validated measures of social support,[20, 21] life stressors,[22] depressive symptoms,[23, 24] self-efficacy,[25, 26] and health literacy.[15, 27–29] Behavioral factors included smoking history (current/past smoker or not), alcohol consumption (current drinker or not), and medication adherence.[22] Health-related characteristics included poor self-rated health, a continuous measure of body mass index, any limitations in activities of daily living ([ADL], yes/no),[30] and major cardiovascular related conditions that consist of hypertension, diabetes, stroke, acute myocardial infarction, atrial fibrillation, and heart failure. Measures for healthcare access and utilization included the patients' reported difficulty accessing routine care,[16, 31] length of hospital stay (in days), and having prior admissions in the past year (yes/no).

Statistical analyses

Statistical analyses were conducted in the following steps. First, we examined the differences in patients' sociodemographic, psychosocial, behavioral, and health-related characteristics by their perceived risk of readmission using chi-square and Wilcoxon rank-sum tests (as appropriate). Next, we used Kaplan-Meier curves to demonstrate how patients' perceived risk of readmission was associated with actual 30-day readmissions after discharge. We then conducted univariate and multivariate analyses to assess the association between perceived and actual risks of 30-day readmission accounting for all study covariates. Additionally, we used Karlson-Holm-Breen (KHB) methods to explore the extent to which these covariates contributed to the association between perceived risk of readmission and actual 30-day readmission (i.e., percentage confounding/mediating in the nested nonlinear probability models).[32] In the next step, we performed bivariate and multivariate analyses using logistic regression models to identify patient characteristics that were associated with 30-day readmission (1) in patients who perceived a low risk of readmission and (2) in patients who perceived a high risk of readmission. In the final multivariate logistic regression models, backward stepwise-selection methods were used to identify the key factors significantly associated (p value <.05) with 30-day readmission in patients with different perceptions of readmission risk. Preliminary analyses showed that forward stepwise-selection methods yielded the same results on the key factors selection. Information on patient's county of residence were extracted from the EHR and were included in all models to account for clustering and to generate robust standard errors. Tests of model discrimination and calibration were also assessed in the final models.

Preliminary analyses were also conducted to assess whether additional factors (e.g., health insurance, hyperlipidemia, chronic obstructive pulmonary disease, number of comorbidities, etc.) played a role in the associations. However, the results indicated no significant associations and were subsequently dropped in the final analyses. Sensitivity analyses also assessed alternative coding strategies for all categorical variables (e.g., different cut-points, and reference groups) and continuous variables (e.g., logged, polynomial, and grouped-ordinal scales).

The percentage of missing data among covariates ranged from 0 to 3%, with 82% of patients having complete information across all study variables. Results from Little's MCAR test suggested that data were not missing completely at random (Chi-square = 1035.85, p

< .001).[33] To preserve the number of patients included in our study and to reduce the bias in estimation, we used multiple imputation methods to impute data for the missing covariates of interests.[33, 34] We also performed sensitivity analyses using non-imputed data and found similar results. All analyses were performed using Stata 16.0 (StataCorp LP, College Station, TX). *P* values < 0.05 were considered statistically significant.

RESULTS

Table 1 presents the patients' characteristics by perceived risk of 30-day readmission. Overall, the median age was 66 (interquartile range [IQR]: 57–75), 38.2% were female, and 34.9% were non-white. Approximately 36% of the patients had an index admission for heart failure (Supplementary Table II), followed by atrial fibrillation (20.1%), angina (15.8%), and shortness of breath (15.2%). Before discharge, nearly one-third of the patients (n=229) perceived that they were at high risk of readmission (Supplementary Figure II). Patients who perceived they were at a high risk of readmission had lower levels of education, were less likely to be working, had lower levels of social support, more life stressors, and more depressive symptoms than patients who perceived a low risk. Patients with high perceived risk were also less likely to consume alcohol, were more likely to report poor self-rated health and ADL limitations, have longer hospital stays, and have a prior hospital admission in the past year. Results from the fully-adjusted model suggested that being female (OR=0.69 [95% CI 0.52–0.93]), having more life stressors (OR=1.22 [95% CI 1.11–1.34]), reported poor self-rated health (OR=1.89 [95% CI 1.13–3.16]), having any ADL limitations (OR=2.03 [95% CI 1.38–2.99]), and having at least one prior hospital admission in the past year (OR=1.40 [95% CI 1.03–1.90]) were significantly associated with perceiving a high risk of readmission (Supplementary Table III).

The overall 30-day readmission rate was 18.2%. Supplementary Figure III presents the Kaplan-Meier plots demonstrating significant differences in 30-day readmission rate by patients who perceived a high vs. a low risk of readmission (23.6% vs. 15.8%, respectively; $p = .016$). Table 3 presents the univariate and multivariate analyses of the association between perceived and actual risks of 30-day readmission. Results from the unadjusted model suggested that patients who perceived high risk were 66% more likely to be readmitted (OR=1.66 [95% CI 1.10–2.51]). This association was attenuated after adjusting for all study covariates (OR=1.31 [95% CI 0.87–1.96]). Similar results were found in an analysis using the composite 30-day outcome (Supplementary Table IV). Additional analyses using KHB methods suggested that a combination of all study covariates contributed to 49.3% of the association between perceived and actual risks of readmission. In particular, poor self-reported health (23.6%) and prior admissions in the past year (9.4%) were the two factors contributing most to the association.

Among patients who perceived they were at a high risk of readmission prior to discharge, findings from both unadjusted and adjusted models suggest that patients who were non-white (OR=2.07 [95% CI 1.28–3.36]) and those with poor self-rated health (OR=2.30 [95% CI 1.38–3.85]), difficulty accessing care (OR=2.72 [95% CI 1.24–6.00]), and prior admissions in the past year (OR=2.13 [95% CI 1.21–3.74]) were significantly more likely to be readmitted within 30 days (Table 3). Among patients who perceived they were at a low

risk of readmission, widowhood (OR=2.69 [95% CI 1.60–4.51]) and difficulty accessing care (OR=1.89 [95% CI 1.07–3.33]) were key factors significantly associated with 30-day readmission (Table 4).

An assessment of c-statistics for the two final models suggested better model discrimination in patients with a high perceived risk of readmission (c-statistic = 0.72, 95% CI, 0.65–0.79) than in patients with a low perceived risk of readmission (c-statistic = 0.66, 95% CI, 0.59–0.72). Non-significant results from Hosmer-Lemeshow goodness-of-fit tests also indicated good calibration in both models.

DISCUSSION

This study is the first to investigate how patient-perceived risk of readmission is associated with actual 30-day readmissions in patients with CVD. We found that approximately one-third of hospitalized patients perceived they had a high risk of readmission within 30 days after discharge. Furthermore, we found that patients who perceived they were at high risk of readmission were more likely to be readmitted compared with those who perceived a low risk. We also identified several key factors associated with risk of 30-day readmission in patients who perceived a high risk of readmission and among those who perceived a low risk of readmission. Similar to prior studies,[35, 36] these models had moderate discrimination and good calibration performance.

In this study, we found that perceived risk of readmission was associated with actual 30-day readmission; and that this association was explained most by health-related factors. Specifically, self-reported health status had the largest impact on the association between perceived and actual 30-day readmission. These findings were similar to a prior study showing that poor self-rated health was associated with an increased risk of 30-day readmission in patients with acute MI.[17] Our supplementary analyses further revealed that patients' self-rated health was related to the perception of their risk of readmission. Together, this suggests that a patient's self-awareness of their health status may not only impact how they perceive their risks of readmission, but also is an independent predictor of actual 30-day readmission. Furthermore, the association between perceived and actual risks of readmission was no longer statistically significant after adjusting for all study covariates, suggesting some degree of disconcordance between a patient's perceived and actual risks of readmission. Therefore, to better understand this (dis)concordance, we directly examined factors associated with actual 30-day readmissions in patients who perceived a high risk of readmission and in those who perceived a low risk of readmission.

Among patients who perceived they were at a high risk of readmission, we found that non-white patients were significantly more likely to be readmitted within 30 days than their white counterparts. This finding is consistent with prior studies that have also shown higher rates of 30-day readmission in non-white patients hospitalized with CVD-related conditions.[37–39] In addition, we found that adjusting for patients' socioeconomic backgrounds and clinical characteristics did not account for racial differences in 30-day readmission. Non-white patients may be less likely to receive (or procure) the necessary support and/or care-management services to mitigate their risk of readmission. Accordingly, the American

College of Cardiology (ACC) and the American Heart Association (AHA) have highlighted the need for research to identify pathways that mediate racial disparities in cardiovascular care.[40, 41] Furthermore, greater efforts are needed to address potential racial disparities in CVD care, particularly among non-white patients who may be aware of their high risk of readmission and yet are readmitted within the next 30 days.

In patients who perceived they were at a high risk of readmission, we also found that those with poor self-rated health and those with prior admissions in the past year were more likely to be readmitted within 30 days after discharge. As we discussed in previous section, it can be argued that the high perceived risk in these patients may be attributable to a self-awareness of their health status and their past experiences of hospitalization; which in turn, accurately reflect their actual risk of 30-day readmission. If this is the case, providers need to consider screening patients for poor self-reported health, prior admissions, and perceptions of their risk of readmission to identify patients who may benefit from additional care-management programs to reduce their likelihood of being readmitted within 30 days after discharge.

In patients with a low perceived risk of readmission, we found that the risk of 30-day readmission were 2.7 times greater in widowed patients than in those who were currently married. These findings are sizeable and overall consistent with prior studies that have shown the associations between widowhood and other adverse cardiovascular events and mortality.[42–44] Prior research has shown that HF patients who received support from their family were less likely to be readmitted than those who lacked support.[19] Therefore, we speculate that patients who were widowed may be more socially isolated from the resources and support that may help them manage and monitor their disease symptoms. Therefore, these patients may not be aware of their risk of readmission but nevertheless face a high risk of being readmitted within 30 days. Although our exploratory analyses accounted for several psychosocial factors—including social support, depressive symptoms, and life stressors—possibly other and/or more detailed measures are needed to better explain the association between widowhood and the risks of readmission. Therefore, we encourage studies to further explore the potential factor(s) contributing to how the loss of a spouse can increase the risk of readmission in cardiovascular patients.

Two other notable findings warrant discussion. First, this study suggests that patients who report difficulty accessing their routine medical care have a significantly higher rate of 30-day readmission than those without difficulty accessing care. This association was observed in both the high and low-perceived risk groups and is consistent with evidence from our prior research.[16] These findings contribute to the growing evidence that addressing barriers to routine medical care may be an effective approach to reducing 30-day readmissions in CVD patients.[7, 9, 31] A second notable finding was that the difference in readmission rates between the high and low-perceived risk groups largely emerged 14 days after discharge (Supplementary Figure 3). This general pattern is consistent with recent evidence in support of current guidelines that recommend outpatient follow-up within 7–14 days to reduce 30-day readmissions.[45, 46] Given that more than one-third of patients still do not receive timely outpatient follow-up,[47, 48] our results further underscore the need to identify barriers that

limit access to care and more widely recognize the importance of patient-reported evidence to develop more effective interventions to reduce 30-day readmissions.

Unlike prior research, results from this study show that insurance status and comorbidities were not significant predictors of 30-day readmission.[17, 35, 36] The reasons are potentially twofold. First, most patients (96%) in our study were insured and there were no overall differences in insurance status or comorbidities by perceived risks of readmission. Second, the heterogeneity among our study patients may partially explain the non-significant finding of comorbidities. Because we recruited patients who were admitted for treatment of any cardiovascular-related conditions, the number and type of comorbidities may not be a good indicator of the patient's severity of disease. Additional research is needed to further assess the relationship between perceived and actual risks of 30-day readmission in patients with specific cardiovascular conditions (e.g. acute myocardial infarction, heart failure, and atrial fibrillation, etc.). Relatedly, given that all study covariates accounted for only about 50% of the relationship between perceived and actual risks of 30-day readmission, we recognize that there are other unmeasured factors—patient-reported factors in particular—contributing to the association. Indeed, prior studies have found that factors such as frailty, anxiety, and cognitive impairment were also strong predictors of rehospitalizations in heart failure patients.[19, 49] Additional research is needed to further assess whether and how patient-reported factors may influence perceived and actual risks of 30-day readmission. These findings may shed light on specific areas for improvement to promote high quality care as the U.S. healthcare system transitions from fee-for-service to value-based care.

Limitations

Our study has several limitations. First, this study was an observational study so that no causality can be assessed. We also recognize that the study only included CVD patients who were admitted at Duke Heart Center, which limits the generalizability of our findings. Relatedly, because we were only able to identify hospitalizations within the Duke University Healthcare System, we may not have captured readmissions that occurred outside of this health system. Nevertheless, as previously noted, the rates of 30-day readmission in the current study were comparable to the readmission rates reported by other hospitals in North Carolina. We also acknowledge that other factors—such as medications prescribed at discharge—may be related to 30-day readmissions but were not available in the current data sources. Lastly, we acknowledge the heterogeneity among patients with regard to their primary diagnosis for index admissions.

Conclusion

Nearly one-third of CVD patients perceived that they were at a high risk of readmission in this study. Patients who perceived a high risk of readmission had a significantly higher rate of 30-day readmission than those who perceived a low risk of readmission. These findings provide strong evidence for the clinical utility of assessing patients' perceived risk of readmission prior to discharge to better identify those who may be readmitted within 30 days. Our study also identifies important non-clinical factors that are associated with 30-day readmission in patients with different perceptions of their risk. These findings have

important implications for targeting CVD patients at high risk of 30-day readmission and for developing interventions that are responsive to patient-reported needs and perceptions.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Non-standard Abbreviations and Acronyms

ADL	Activities of daily living
CES-D	Center for Epidemiologic Studies Depression
CI	Confidence Interval
CVD	Cardiovascular disease
DEDUCE	Duke Enterprise Data Unified Content Explorer
EHR	Electronic health records
HF	Heart failure
H.S.	High school
IQR	Interquartile range
KHB	Karlson-Holm-Breen
MI	Myocardial infarction
OR	Odds ratio

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What is Known

- Patients with cardiovascular disease (CVD) have a high risk of readmission after discharge.
- Patients' perception of risk is associated with their adherence to medical treatments and preventive behaviors.

What the Study Adds

- Patients who perceived high risks of readmission were more likely to be readmitted within 30 days than those who perceived low risks of readmission, suggesting its clinical utility to identify CVD patients at a high risk of readmission.
- Future studies are need to identify strategies to target the factors associated with perceived and actual risks of readmission.

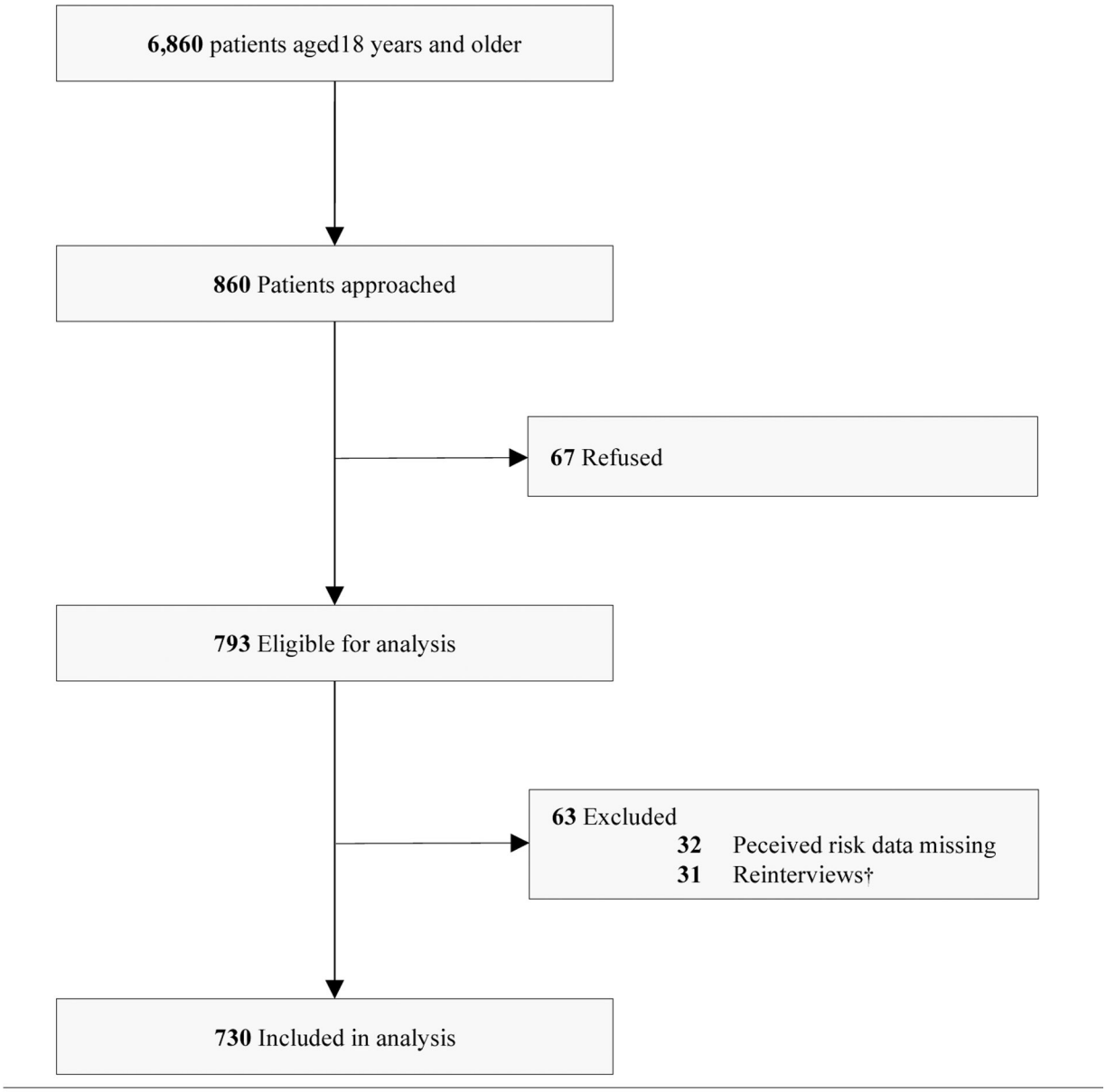

Figure 1.
Study Participants from the Duke Heart Center

Table 1.

Characteristics of Study Participants by Perceived Risk of 30-Day Readmission (N = 730)

	Overall (N = 730)	Low Perceived Risk (N = 501)	High Perceived Risk (N = 229)	*P* value	Missing N (%)
Sociodemographic Characteristics					
Age, median (IQR)	66 (18)	66 (18)	66 (20)	0.354	10 (1.37)
Female	278 (38.19)	194 (38.88)	84 (36.68)	0.571	2 (0.27)
Non-white	255 (34.93)	173 (34.53)	82 (35.81)	0.737	
H.S. or less education	104 (14.31)	61 (12.22)	43 (18.86)	0.018	3 (0.41)
Not currently working	575 (79.09)	381 (76.35)	194 (85.09)	0.007	3 (0.41)
Insurance status					
Currently insured	662 (91.44)	457 (91.77)	205 (90.71)	0.809	6 (0.82)
Medicaid only	36 (4.97)	23 (4.62)	13 (5.75)		
Uninsured	26h (3.59)	18 (3.61)	8 (3.54)		
Psychosocial Factors					
Marital status					
Currently married	396 (54.55)	270 (54.22)	126 (55.26)		
Never married	95 (13.09)	65 (13.05)	30 (13.16)	0.975	4 (0.55)
Divorced	141 (19.42)	99 (19.88)	42 (18.42)		
Widowed	94 (12.95)	64 (12.85)	30 (13.16)		
Social support, mean (SD)	16.51 (3.88)	16.66 (3.87)	16.17 (3.90)	0.049	8 (1.10)
Life stressors, mean (SD)	3.00 (1.97)	2.71 (1.84)	3.64 (2.09)	<.001	11 (1.51)
CES-D symptoms, mean (SD)	7.17 (4.26)	6.71 (4.13)	8.15 (4.37)	<.001	15 (2.05)
Self-efficacy, mean (SD)	9.27 (1.61)	9.35 (1.59)	9.11 (1.65)	0.145	11 (1.51)
Inadequate health literacy	109 (14.99)	65 (13.03)	44 (19.30)	0.028	3 (0.41)
Behavioral Factors					
Current or past smoker	405 (56.17)	284 (57.49)	121 (53.30)	0.293	9 (1.23)
Current drinker	286 (39.23)	211 (42.20)	75 (32.75)	0.015	1 (0.14)
Medication non-adherence	158 (22.35)	103 (21.33)	55 (24.55)	0.338	23 (3.15)
Health-Related Factors					
Poor self-rated health	123 (17.13)	58 (11.76)	65 (28.89)	<.001	12 (1.64)
Any ADL limitations	413 (57.60)	252 (51.12)	161 (71.88)	<.001	13 (1.78)
Body mass index, mean (SD)	30.29 (7.95)	30.37 (7.80)	30.09 (8.27)	0.427	3 (0.41)
Disease Diagnoses					
Hypertension	331 (45.34)	238 (47.50)	93 (40.61)	0.083	-
Diabetes	171 (23.42)	121 (24.15)	50 (21.83)	0.493	-
Heart failure	346 (47.40)	228 (45.51)	118 (51.53)	0.131	-
Acute MI	107 (14.66)	76 (15.17)	31 (13.54)	0.563	-
Atrial fibrillation	204 (27.95)	136 (27.15)	68 (29.69)	0.476	-
Stroke	121 (16.58)	78 (15.57)	43 (18.78)	0.279	-
Healthcare Access and Utilization					
Difficulty accessing care	107 (14.76)	70 (14.00)	37 (16.44)	0.391	5 (0.68)
Length of stay, median (IQR)	5.19 (6.95)	4.97 (6.70)	5.91 (8.52)	0.048	-

	Overall (N = 730)	Low Perceived Risk (N = 501)	High Perceived Risk (N = 229)	*P* value	Missing N (%)
Any admissions in the past year	319 (43.70)	201 (40.12)	118 (51.53)	0.004	-
30-Day readmission rate	133 (18.22)	79 (15.77)	54 (23.58)	0.011	-

Abbreviations: ADL: Activities of Daily Living; CES-D: Center for Epidemiologic Studies Depression; H.S.: High school; IQR: Interquartile range; MI: Myocardial infarction; SD: Standard deviation.

Note: Categorical variables reported as n (%) and continuous variables reported as mean (SD) or median (IQR)

Table 2.

Unadjusted and Adjusted Associations between Perceived and Actual Risks of 30-day Readmission (N = 730)

Variables	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Perceived high risk	1.66 (1.10–2.51)	0.015	1.31(0.87–1.96)	0.200
Age (years)	0.99 (0.98–1.01)	0.267	0.99 (0.98–1.01)	0.235
Female	1.30 (0.87–1.93)	0.200	1.11 (0.64–1.94)	0.704
Non-white	1.50 (1.12–2.02)	0.006	1.53 (1.03–2.28)	0.036
H.S. or less education	1.30 (0.78–2.16)	0.310	1.23 (0.66–2.29)	0.517
Not currently working	0.62 (0.43–0.91)	0.014	0.74 (0.42–1.31)	0.305
Insurance status (ref: currently insured)				
Medicaid only	1.09 (0.54–2.21)	0.803	0.50 (0.18–1.34)	0.166
Uninsured	1.00 (0.50–2.01)	0.997	0.79 (0.31–2.05)	0.630
Marital status (ref: currently married)				
Never married	1.90 (1.29–2.81)	0.001	1.61 (0.96–2.71)	0.069
Divorced	0.88 (0.41–1.87)	0.735	0.78 (0.33–1.81)	0.557
Widowed	1.86 (1.16–2.98)	0.010	1.55 (0.80–3.01)	0.191
Social support	0.98 (0.93–1.02)	0.278	1.00 (0.94–1.06)	0.949
Life stressors	1.07 (0.99–1.15)	0.097	0.97 (0.86–1.09)	0.574
CES-D symptoms	1.05 (1.01–1.09)	0.018	1.03 (0.97–1.09)	0.300
Self-efficacy	1.06 (0.93–1.20)	0.387	1.08 (0.95–1.23)	0.258
Inadequate health literacy	0.94 (0.56–1.58)	0.817	0.72 (0.43–1.20)	0.207
Current or past smoker	0.95 (0.67–1.35)	0.783	1.02 (0.66–1.56)	0.940
Current drinker	0.67 (0.50–0.89)	0.006	0.75 (0.55–1.03)	0.071
Medication non-adherence	1.06 (0.67–1.68)	0.803	1.04 (0.67–1.61)	0.870
Poor self-rated health	2.27 (1.59–3.25)	0.000	2.04 (1.33–3.14)	0.001
Any ADL limitations	1.34 (0.92–1.94)	0.127	1.04 (0.67–1.60)	0.867
Body mass index	0.98 (0.95–1.00)	0.099	0.97 (0.94–1.00)	0.030
Hypertension	0.98 (0.70–1.37)	0.906	1.08 (0.73–1.58)	0.701
Diabetes	0.86 (0.57–1.30)	0.469	0.81 (0.48–1.38)	0.437
Heart Failure	1.14 (0.76–1.71)	0.537	0.86 (0.51–1.46)	0.589
Acute MI	0.67 (0.40–1.14)	0.138	0.67 (0.37–1.24)	0.207
Atrial fibrillation	1.00 (0.71–1.42)	0.990	1.15 (0.72–1.82)	0.566
Stroke	0.95 (0.53–1.70)	0.864	0.89 (0.53–1.50)	0.661
Difficulty in accessing to care	2.12 (1.39–3.22)	<0.001	2.06 (1.32–3.23)	0.002
Length of stay	1.01 (1.00–1.02)	0.010	1.00 (0.99–1.01)	0.374
Any admissions in the past year	1.70 (1.10–2.62)	0.017	1.55 (1.02–2.34)	0.040

Abbreviations: ADL: Activities of Daily Living; CES-D: Center for Epidemiologic Studies Depression; CI: Confidence Interval; H.S.: High school; MI: Myocardial infarction; OR: Odds ratio; SD: Standard deviation

Note: *P* values are based on logistic regression models for both unadjusted and adjusted ORs

Table 3.

Factors Associated with 30-Day Readmission in Patients Who Perceived High Risks of Readmission (N = 229)

Variables	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Age	0.99 (0.97–1.01)	0.346	-	-
Female	1.25 (0.73–2.17)	0.419	-	-
Non-white	1.97 (1.33–2.92)	0.001	2.07 (1.28–3.36)	0.003
H.S. or less education	0.72 (0.38–1.34)	0.298	-	-
Not currently working	1.00 (0.56–1.79)	0.991	-	-
Insurance status (ref: currently insured)				
Medicaid only	0.79 (0.23–2.73)	0.711		
Uninsured	1.49 (0.48–4.67)	0.489		
Marital status (ref: currently married)				
Never married	1.81 (0.98–3.33)	0.059	-	-
Divorced	1.52 (0.55–4.17)	0.419	-	-
Widowed	0.56 (0.22–1.42)	0.218	-	-
Social support	0.99 (0.92–1.07)	0.872	-	-
Life stressors	1.13 (0.96–1.33)	0.147	-	-
CES-D symptoms	1.09 (1.02–1.17)	0.010	-	-
Self-efficacy	0.99 (0.81–1.20)	0.913	-	-
Inadequate health literacy	0.56 (0.25–1.25)	0.154	-	-
Current or past smoker	0.88 (0.49–1.56)	0.653	-	-
Current drinker	0.65 (0.36–1.19)	0.163	-	-
Medication nonadherence	1.24 (0.61–2.51)	0.548	-	-
Poor self-rated health	2.35 (1.45–3.80)	<0.001	2.30 (1.38–3.85)	0.002
Any ADL limitations	1.28 (0.76–2.16)	0.357	-	-
Body mass index	0.98 (0.95–1.02)	0.423	-	-
Hypertension	0.91 (0.52–1.59)	0.743	-	-
Diabetes	1.35 (0.72–2.55)	0.352	-	-
Heart Failure	1.02 (0.55–1.88)	0.957	-	-
Acute MI	0.44 (0.19–0.99)	0.046	-	-
Atrial fibrillation	1.25 (0.68–2.28)	0.467	-	-
Stroke	0.83 (0.35–2.02)	0.680	-	-
Difficulty in accessing to care	2.96 (1.55–5.66)	0.001	2.72 (1.24–6.00)	0.013
Length of stay	1.01 (0.99–1.03)	0.375	-	-
Any admissions in the past year	2.04 (1.12–3.71)	0.019	2.13 (1.21–3.74)	0.001

Abbreviations: ADL: Activities of Daily Living; CES-D: Center for Epidemiologic Studies Depression; CI: Confidence Interval; H.S.: High school; MI: Myocardial infarction; OR: Odds ratio; SD: Standard deviation.

Note: *P* values are based on logistic regression models for both unadjusted and adjusted ORs. Results from the adjusted model were derived using backward stepwise-selection procedures.

Table 4.

Factors Associated with 30-Day Readmission in Patients who Perceived Low Risks of Readmission (N = 501)

Variables	Unadjusted OR (95% CI)	*P* value	Adjusted OR (95% CI)	*P* value
Age	0.99 (0.98–1.01)	0.373	-	-
Female	1.46 (0.82–2.60)	0.196	-	-
Non-white	1.36 (0.82–2.25)	0.238	-	-
H.S. or less education	1.42 (0.74–2.72)	0.295	-	-
Not currently working	1.68 (0.97–2.91)	0.064	-	-
Insurance status (ref: currently insured)				
Medicaid only	1.03 (0.30–3.53)	0.964		
Uninsured	0.48 (0.06–4.20)	0.508		
Marital status (ref: currently married)				
Never married	1.88 (1.06–3.33)	0.030	1.79 (0.98–3.27)	0.060
Divorced	0.56 (0.27–1.16)	0.119	0.54 (0.26–1.13)	0.100
Widowed	2.71 (1.64–4.47)	<0.001	2.69 (1.60–4.51)	<0.001
Social support	0.99 (0.94–1.04)	0.638	-	-
Life stressors	0.99 (0.89–1.11)	0.886	-	-
CES-D symptoms	1.01 (0.96–1.07)	0.688	-	-
Self-efficacy	1.11 (0.94–1.32)	0.218	-	-
Inadequate health literacy	1.09 (0.57–2.08)	0.786	-	-
Current or past smoker	0.97 (0.60–1.57)	0.901	-	-
Current drinker	0.71 (0.48–1.05)	0.085	-	-
Medication nonadherence	0.99 (0.59–1.68)	0.976	-	-
Poor self-rated health	1.67 (1.01–2.78)	0.048	-	-
Any ADL limitations	1.24 (0.75–2.05)	0.401	-	-
Body mass index	0.97 (0.94–1.01)	0.172	-	-
Hypertension	1.09 (0.67–1.79)	0.726	-	-
Diabetes	0.63 (0.36–1.11)	0.112	-	-
Heart Failure	1.13 (0.66–1.94)	0.651	-	-
Acute MI	0.78 (0.32–1.90)	0.587	-	-
Atrial fibrillation	0.89 (0.55–1.47)	0.658	-	-
Stroke	1.08 (0.52–2.24)	0.832	-	-
Difficulty in accessing to care	1.91 (1.09–3.34)	0.023	1.89 (1.07–3.33)	0.028
Length of stay	1.01 (1.00–1.02)	0.022	-	-
Any admissions in the past year	1.47 (0.94–2.32)	0.095	-	-

Abbreviations: ADL: Activities of Daily Living; CES-D: Center for Epidemiologic Studies Depression; CI: Confidence Interval; H.S.: High school; MI: Myocardial infarction; OR: Odds ratio; SD: Standard deviation.

Note: *P* values are based on logistic regression models for both unadjusted and adjusted OR. Results from the adjusted model were derived using backward stepwise-selection procedures.