

## ORIGINAL ARTICLE

# Searching for underlying social determinants of health for thirty-day hospital readmissions

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**Received:** August 12, 2019

**Accepted:** October 8, 2019

**Online Published:** October 12, 2019

**DOI:** 10.5430/jha.v8n6p24

**URL:** <https://doi.org/10.5430/jha.v8n6p24>

## ABSTRACT

**Objective:** An evaluation of social factors associated with 30-day readmission was undertaken at our institution to determine which factors would be significantly associated with time to hospital readmission.

**Methods:** Prospective observational study at an academic tertiary care hospital in the mid-Atlantic region of patients who were readmitted within 30 days of their last inpatient discharge. The electronic health record in conjunction with the regional hospital information system was used to generate a daily report to identify a convenience sample of readmitted patients. Using a standardized interview, data on 117 patients were collected for an exploratory analysis of social factors associated with readmission.

**Results:** Regression modeling demonstrated poor correlation with prediction of time to readmission (R-squared = 0.2189). No individual social variables were found to be significant for influencing time to readmission (all  $p$ -values > .05). Common social factors were seen within the population affecting their utilization and access of healthcare. Poly-pharmacy was found in the majority of patients. Self-reported medication adherence was good, except with regards to mental health medication compliance. 97% of patients reported filling their prescriptions. 36% of the patients went to their follow-up appointment within 7 days although the vast majority of patients (92%) reported having a primary care doctor. 23% of patients expressed difficulty getting to their follow up appointments.

**Conclusions:** At one single-center tertiary care hospital, there were some common underlying social determinants of health that may be related to readmission; however, no factors in isolation were predictive of hospital readmission. While there are common themes among readmitted populations, particularly in regard to factors driven by poverty, it is likely that the complex interaction of social factors with health continues to limit attempted administrative modeling of these data.

**Key Words:** Thirty-day readmission, social factors, discharge planning

## 1. INTRODUCTION

Hospital readmissions are costly;<sup>[1]</sup> frequently are deemed preventable; and noted to be a negative quality marker of inpatient care. There is wide variability in readmission rates with some hospitals having excess readmission ratios in many Centers for Medicare and Medicaid Services (CMS) categories.<sup>[2]</sup> Understanding why certain patients are more likely

to be readmitted to the hospital based on the various social determinants of health may be beneficial<sup>[3]</sup> in developing care pathways related to reducing hospital readmissions based on social factors. Current predictive models for hospital readmission correlate poorly with future readmission risk; have inconsistent performance; and have focused on general medical condition related variables.<sup>[4]</sup> Very few prior models

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have focused on social predictors of health such as income, employment, education, insurance status, caregivers, home health and access to care.<sup>[5]</sup>

An evaluation of social factors associated with 30-day readmission was undertaken at our institution. The goal of the project was to understand which patients are more likely to be readmitted to the hospital based on demographics and contributing social risk factors using face-to-face interviews; hypothesizing that from a pre-determined list of social determinants of health, one or more of these risk factors would be significantly associated with time to hospital readmission.

**2. METHODS**

Prospective observational study at a 926 bed academic tertiary care hospital in the mid-Atlantic region of patients who were readmitted within 30 days of their last inpatient discharge. Patients were excluded from analysis if they were under the age of 18; planned readmissions; admitted to a psychiatric, labor and delivery or managed care unit; or non-English speaking. After obtaining IRB approval, the electronic health record (Microsoft Amalga, Redmond, Washington) was used in conjunction with the Chesapeake Regional Information system for our Patients (CRISP) to generate a daily report identifying a convenience sample of patients who had been readmitted within 30 days. Using a standardized interview tool, trained medical students interviewed 117 patients and entered data into an electronic database (Microsoft Access, Redmond, Washington). Table 1 demonstrates a summary of the questions from the comprehensive interview questionnaire shortened for brevity. This tool was derived internally and reviewed by hospital administration before standardization of the script occurred to facilitate training of the medical student interview team in order to ensure consistency. The primary outcome of the study was defined a priori as an exploratory analysis of social factors associated with admission. Given the hypothesis generating nature of the study, alpha was set to 0.05 and was not adjusted for multiple comparisons. Stata (Version 14; StataCorp LP, College Station, Texas) statistical software was used to generate multivariate regression models evaluating time to readmission (total number of days from discharge to readmission) in the 96 patients that contained responses to all categorical variables presented in Table 1 as well as the continuous variable “age”. A descriptive analysis of socio-demographic variables was also undertaken to provide an understanding of hospital wide readmission patterns.

**3. RESULTS**

Regression modeling demonstrated poor correlation with prediction of time to readmission (*R*-squared = 0.2189). None of

the individual variables presented in Table 1 were found to be significant for influencing time to readmission (all *p*-values > .05). The median age of patients was found to be 58.1 (std dev 14.6) with 43% of the patients greater than 65 years old. Table 1 presents socio-demographic factors identified from the survey. Notably, 74% of patients were African-American consistent with the hospital’s predominant population served. 65% of the patients interviewed had received education at or below the level of a high school diploma or GED. 78% of patients were from neighborhoods with a median household income of \$39,000 or less.

**Table 1.** Shortened version of survey questions for social factors affecting readmission, *p*-values presented are from multivariate linear regression modeling of time to readmission (days from discharge to readmit)

Survey Question	Proportion Responding “Yes”	<i>p</i> -value
Unemployed	0.10	.331
Disabled	0.11	.578
African-American	0.74	.367
Male	0.51	.258
Saw PMD within 7 days	0.36	.174
Current smoker	0.12	.511
Past smoker	0.50	.451
Current alcohol use	0.26	.600
Past alcohol use	0.66	.591
Current illicit substance use	0.04	.788
Past illicit substance use	0.28	.244
Treated for substance abuse	0.09	.079
Taking mental health medications as prescribed	0.28	.940
Mental health diagnosis	0.21	.193
Mental health treatment	0.18	.144
GED or Highschool completion	0.76	.335
College Completion	0.35	.173
Graduate School Completion	0.12	.202
Problems with Discharge Instructions	0.13	.808
Discharged with Medications	0.73	.460
Able to fill prescriptions	0.97	.244
Took medications as prescribed	0.91	.080
Has help for medication assistance	0.40	.912
Lives with someone	0.85	.510
Home health aide at home	0.18	.067
Personal care aide at home	0.09	.190
Follows diet	0.49	.253
Has difficulty getting to appointments	0.23	.981
Has primary care physician	0.92	.696
Follow up scheduled at discharge	0.71	.440

Common social factors were seen within the population affecting their utilization and access of healthcare. Poly-pharmacy was found in the majority of patients with 31% of patients taking 3-5 medications, 41% taking 6-10 and 23% taking 10 or more medications. Self-reported medication adherence was good (91%), except with regards to mental health medication compliance (28%). Impressively, 97% of patients reported filling their prescriptions, possibly helped by the 73% of patients that had their prescription dispensed at discharge (bedside dispensing). Only 36% of the patients went to their follow-up appointment within 7 days despite that the vast majority of patients (92%) reported having a primary care doctor. 23% of patients expressed difficulty getting to their follow up appointments.

#### 4. DISCUSSION

In the patient population served by this hospital, there were some common underlying social determinants of health that may be related to their readmission to the hospital; however, no factors in isolation were predictive of hospital readmission. Limited prior attempts to model social factors affecting readmission have also been poorly predictive and our findings are similar.<sup>[6]</sup> While there are common themes among readmitted populations, particularly in regard to factors driven by poverty,<sup>[7]</sup> it is likely that the complex interaction of social factors with health continues to limit attempted modeling reflecting the underlying challenges in administrative utilization of these data. In particular, recurring themes included poly-pharmacy, non-attendance of follow up and inadequate transportation.

Limitations of the study include its small patient population, single center design, and that interviews were limited to En-

glish speaking patients on the general medical/surgical floors. These exclusions were felt necessary at an adult hospital with access limitations in place on some wards and lack of research team access to prolonged interpreter resources.

Many survey questions centered on patient's ability to obtain follow up and medications after discharge. Most patients had a primary care doctor (92%) and had scheduled follow up or specialist care already on discharge. It is possible that the increasing attention provided to factors affecting health care access at discharge is already adequately compensating for underlying social risk factors for readmission that were resultant not uncovered in this model (type II error). Overall medication compliance was good (91%) which was likely helped by the large proportion of bedside dispensing. The importance of anticipatory outpatient medication management has also been previously demonstrated prospectively by randomizing patients to intensive pharmacist interventions prior to discharge.<sup>[8]</sup> Future studies are needed to determine whether a continued focus on preventing 30-day readmission can uncover usable predictive interactions for clinical workflow.

#### ACKNOWLEDGEMENTS

The authors would like to thank the following scholars for their support to this study: Daniel Toscano, MS, Colleen Hamm, MS, Hepzibha Alexander, RN, Douglass Johnson, MS, Khaled Kabbara, MS, Robert Hagerty, MS, Arsha Ostowari, MS, Alexander Oster, MS, Christopher Kyaw, MS, Andrew Horn, MS, Aidan Neustadt, Brandon Passano, MS.

#### CONFLICTS OF INTEREST DISCLOSURE

The authors declare they have no conflicts of interest.

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