Research in Social and Administrative Pharmacy 13 (2017) 754–758

Contents lists available at ScienceDirect

Research in Social and Administrative Pharmacy

journal homepage: www.rsap.org

Association between health literacy and 30-day healthcare use after hospital discharge in the heart failure population

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ARTICLE INFO

Article history:
Received 19 September 2016
Accepted 19 September 2016

Keywords:
Medication safety
Hospital re-admissions
Cohort study
Health literacy
Prospective evaluation

ABSTRACT

Background: Low health literacy increases the risk for hospital readmissions. Despite this, the measurement and use of health literacy to guide discharge counseling and planning in heart failure patients is not commonly performed. A short 3-Question Brief Health Literacy Screen (BHLS) is available and takes less than three minutes to complete, but has never been evaluated to help determine whether health literacy affects healthcare use after discharge in patients with heart failure.
Objective: The purpose of this study was to assess 30-day readmissions and emergency department visits based on health literacy evaluated by the BHLS in an acute care heart failure population.
Methods: This was a prospective observational cohort study conducted at a large quaternary health system. Hospitalized patients with a diagnosis of heart failure were assessed for health literacy using the BHLS. Unplanned healthcare use after discharge including 30-day, all-cause ED visits and hospital readmissions was assessed using univariate and logistic regression models.
Results: Two hundred and sixty four patients aged 66.6 ± 14.3 (mean ± SD) years met inclusion/exclusion criteria of whom 175 (66.3%) had a BHLS score >9 (adequate health literacy) and 89 (33.7%) had a BHLS score ≤9 (low health literacy). Predictors of low health literacy included older age ($p = 0.019$), lower education level ($p < 0.001$) and unemployed ($p = 0.048$). After controlling for potential confounders, low health literacy was independently associated with 30-day healthcare use after hospital discharge (OR:1.80; 95% CI: 1.04–3.11; $p = 0.035$).
Conclusion: Using a short, 3-question validated survey instrument, it was demonstrated that low health literacy was associated with increased 30-day unplanned healthcare use after discharge in this heart failure population. These results provide a clinically useful, easily incorporated tool that could identify high-risk patients at need for clinical interventions.

1. Background

The unplanned use of healthcare resources following hospital discharge is costly. Thirty-day readmissions cost U.S. Medicare over $17 billion per year.[1] Heart failure is the leading cause of 30-day readmission in the United States. Twenty-two percent of patients hospitalized with heart failure are re-admitted within the following 30 days. In response to this problem, the U.S. Centers for Medicare and Medicaid Services (CMS) implemented the Readmission Reduction Program, which penalizes hospitals with high 30-day readmission rates for specific populations, including heart failure, with lower rates of reimbursement. In 2015, 75% of hospitals were penalized for poor 30-day readmission rates.[2] Patients with heart failure are also at an increased risk for 30-day emergency room (ED) visit following discharge. McNaughton and colleagues reported thirty-two percent of patients with heart failure had either an ED visit or readmission within 30 days of discharge.[3]

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http://dx.doi.org/10.1016/j.sapharm.2016.09.003
1551-7411/

Health literacy is defined by the Institute of Medicine as the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions.[4] Low health literacy increases the risk for readmission with estimated associated costs of $215 billion in increased annual healthcare use.[5–9]

Five studies have evaluated the impact of low health literacy on hospitalization in the heart failure population.[3,5–7,10] Most studies (four of five) demonstrated that health literacy is associated with an increased risk of readmission.[3,5–7] Despite these positive findings, the measurement and use of health literacy to guide discharge counseling and planning in heart failure patients is not well documented in the literature. This could be partly due to the many other complex issues surrounding patient discharge not allowing enough time to ask patients to complete a long health literacy screening such as the Short Test of Functional Health Literacy in Adults (S-TOHFLA), which is 36 questions in length or the Rapid Estimate of Adult Literacy in Medicine (REALM), which requires the administrator to be present for the entire assessment.[11,12] However, a short, subjective 3-Question Brief Health Literacy Screen (BHLS), which requires independent completion by the patient, is available and has been validated against these other objective health literacy assessments.[13] Taking less than three minutes to complete, the BHLS could easily be included as part of the discharge planning process for hospitalized patients. However, the BHLS has never been evaluated as a tool to identify if health literacy is associated with 30-day healthcare use after discharge in patients with heart failure. The purpose of this study was to assess 30-day readmissions and emergency department visits based on health literacy evaluated by the BHLS in an acute care heart failure population.

2. Methods

This was a prospective observational cohort study conducted at a large quaternary health system in the Texas Medical Center, Houston, Texas (U.S. State). Hospitalized patients with a diagnosis of heart failure were screened for inclusion into this study. Patients were included if they were at least 18 years of age, had a diagnosis of heart failure confirmed by either an echocardiogram or a diagnosis in the patient's medical chart, and available for telephone follow-up post hospital discharge. Patients were excluded if they were non-English speaking, unable to see the survey questions due to visual impairment, hearing impaired without a telephone assist service or device, diagnosed with valvular disease, a candidate for heart transplant or received a heart transplant within the previous 12 months, if they had any heart function assist device (left or right ventricular assist device), or if they had an unknown date of death post-discharge.

Informed consent was obtained from all patients who met inclusion and exclusion criteria. After obtaining informed consent, health literacy was assessed using the 3-Question Brief Health Literacy Screen or BHLS (Appendix 1). The BHLS uses a 5-point Likert scale for each of the three questions. Each question was scored between 1 and 5 for a total score between 3 and 15.[10,13,14] Patients were then categorized as either low health literacy ($\leq$9 BHLS score) or adequate health literacy (>9 BHLS score).[5,15,16] Investigators provided patients with a paper copy of the BHLS in 18-point Calibri font and requested patients complete the assessment independently. The principal investigator scored the completed assessments. Patients unable to answer the questions due to inability to read or comprehend the questions were automatically given a score of 3 and categorized as low health literacy. Clinicians treating the patient were not provided the health literacy score or health literacy categorization. On day 31 following the patient's discharge, the principal investigator reviewed the patient's electronic medical record for a subsequent ED visit or hospital readmission. Patients for whom no ED visits or readmissions to the study hospital were found by day 31 were then called to determine if they had an ED visit or readmission to any other hospital within 30 days of their discharge. Up to 10 phone calls were attempted from day 31 to day 40 before coding the patient as unreachable. This study was approved by the institutional review board at Houston Methodist Hospital (HMH). The data analysis was also approved by the Committee for the Protection of Research Subjects at the University of Houston and served as data for the thesis defense for the principal investigator (SC).

Covariates collected include: age, sex, marital status, race, insurance, highest level of education, employment status, body mass index (BMI), length of stay (LOS), systolic blood pressure (SBP), heart rate (HR), blood urea nitrate (BUN), serum creatinine (Scr), serum sodium (Na), number of hospital admissions in the previous 12 months, comorbidities, ejection fraction (EF), brain natriuretic peptide (BNP), dialysis, prescription for medications that have been proven to reduce readmissions or increase lifespan in heart failure (ACE inhibitors, beta blockers, diuretics, digoxin, nitrates, inotropes, or aldosterone inhibitors), total number of medications on the patient's discharge reconciliation list, medication regimen complexity index (MRCI), completed medication history documented by a pharmacist, documentation of pharmacy education, documentation of pharmacy discharge counseling, post-discharge care navigator consult, and the type of heart failure. The last vital sign and laboratory values prior to discharge were collected.

2.1. Statistical analysis

Sample size for the study was calculated using assumptions that 20% of the patient population would have low health literacy and 30-day readmission or ED visits would differ by 15% between patients with high vs. low health literacy (alpha: 0.05; power: 80%). Following enrollment of 300 patients, power calculations were re-performed based on 45% low health literacy and 55% adequate health literacy. Based on the updated distribution of health literacy and a difference in 30-day healthcare use of 12% or greater, the study had a greater than 80% power to detect a difference. Therefore, the study was closed and a formal analysis was undertaken.

The primary analysis was to determine whether health literacy evaluation using the BHLS was associated with unplanned healthcare use after discharge including 30-day all-cause ED visits and hospital readmissions. Univariate analysis assessed differences in low versus adequate health literacy based on collected covariates. The chi-square test was conducted for nominal data and student's t-test for continuous data. A stepwise, multivariate logistic regression model was built that included the primary independent and dependent variable in addition to any covariate that was associated (defined as $p < 0.2$) with 30-day healthcare use after discharge. All variables significantly associated with 30-day healthcare use (defined as $p < 0.05$) were included in the final model. SPSS version 23 (IBM Corporation) was utilized for all analyses.

3. Results

A total of 300 patients were enrolled in the study. Twenty-five patients were unable to be contacted after discharge due to a non-working or incorrect phone number, five patients died after enrollment with an unknown date of death, three were not