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Health literacy, numeracy, and other characteristics associated with hospitalized patients' preferences for involvement in decision-making

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Abstract

Little research has examined the association of health literacy and numeracy with patients' preferred involvement in the problem-solving and decision-making process in the hospital. Using a sample of 1,249 patients hospitalized with cardiovascular disease from the Vanderbilt Inpatient Cohort Study (VICS), we assessed patients' preferred level of involvement using responses to two scenarios of differing symptom severity from the Problem-Solving Decision-Making (PSDM) Scale. Using multivariable modeling, we determined the relationship of health literacy, subjective numeracy, and other patient characteristics with preferences for involvement in decisions, and how this differed by scenario. We found that patients with higher levels of health literacy desired more participation in the problem-solving and decision-making process, as did patients with higher subjective numeracy skills, greater educational attainment, female gender, less perceived social support, or greater health care system distrust ($p < 0.05$ for each predictor in multivariable models). Patients also preferred to participate more in the decision-making process when the hypothetical symptom they were experiencing was less severe (i.e., they deferred more to their physician when the hypothetical symptom was more severe). These findings underscore the role that patient characteristics, especially health literacy and numeracy, play in decisional preferences among hospitalized patients.

Keywords

Health literacy; Decision Making; Decisional preferences; Problem Solving; Numeracy

Introduction

Shared decision making is “the process through which clinicians and patients share information with each other and work toward decisions about treatment chosen from medically reasonable options that are aligned with the patients' values, goals, and preferences” (Allen et al., 2012). According to the Institute of Medicine, shared decision making is a key tenet of quality and patient-centered care. It is also associated with better health outcomes for patients and their families (Greenfield, Kaplan, Ware, Yano, & Frank, 1988; Mandelblatt, Kreling, Figueiredo, & Feng, 2006; Murray, Pollack, White, & Lo, 2007; Wright et al., 2008). By comparison, a preference for passivity during decision making is associated with worse outcomes among primary care patients, and with anxiety and depression among family members of intensive care unit patients (Anderson, Arnold, Angus, & Bryce, 2009; Brody et al., 1989; Deber, 1994). Despite more than a decade of study, research describing decisional preferences has been limited in the hospital setting, where patient preferences may influence use of costly resources (Tak, Ruhnke, & Meltzer, 2013). Patients hospitalized with acute coronary syndromes (ACS) or heart failure represent an important population for study, accounting for more than 2 million hospitalizations annually in the United States (Go et al., 2014).

Previous research has examined the demographic, socioeconomic, and clinical factors related to decisional preferences. Throughout these studies, various instruments have been used in different populations to determine a person's preferences for involvement during the decision making process, which may account for some of the heterogeneity of results that has been observed (Chewning et al., 2012). Patient factors such as education, age, gender, depression, and disease severity have been cited as influential in some, but not all, studies (Arora & McHorney, 2000; Cassileth, Zupkis, Sutton-Smith, & March, 1980; Collins, Crowley, Karlawish, & Casarett, 2004; Deber, Kraetschmer, & Irvine, 1996; Deber, Kraetschmer, Urowitz, & Sharpe, 2007; L. F. Degner et al., 1997; L. F. Degner & Sloan, 1992; Janz et al., 2004; Murray et al., 2007; Robinson & Thomson, 2001; Rothenbacher, Lutz, & Porzsolt, 1997; Yin et al., 2012). Other patient factors such as health literacy (HL), marital status, numeracy, and self-perceived health status have not been examined as extensively. For example, we found only a few studies that looked directly at the association between HL and preferred involvement in medical decisions (Aboumatar, Carson, Beach, Roter, & Cooper, 2013; Mancuso & Rincon, 2006; Naik, Street, Castillo, & Abraham, 2011; Yin et al., 2012). Many of these studies were conducted in outpatient settings, and many times patients were only asked one screening question to determine their decisional preference. Since there is evidence that both HL and preference to engage in the decision-making process are associated with improved health outcomes and patient satisfaction (Aboumatar et al., 2013; Golin, DiMatteo, Duan, Leake, & Gelberg, 2002; Mancuso & Rincon, 2006), the need to further examine the relationship between them using validated measures in an inpatient setting is compelling.

The aim of the study was to assess patient decisional preferences in the hospital setting using two vignettes from the Problem-Solving Decision-Making (PSDM) scale which depict hypothetical situations of a burning sensation when urinating and chest pain (Deber et al., 1996). We evaluated the association of patient factors such as HL and numeracy on

preferences for decision-making involvement in these two scenarios. Secondly, we sought to determine if patients reported differing levels of desired participation if they were hypothetically experiencing a more severe symptom.

Methods

Study design and setting

The Vanderbilt Inpatient Cohort Study (VICS) is a prospective cohort study of patients with cardiovascular disease admitted to Vanderbilt University Hospital in Nashville, Tennessee. Study participants were interviewed in the hospital and scheduled for three follow-up calls after discharge. Data were collected using Research Electronic Data Capture (REDCap) (Harris et al., 2009). Details of VICS are described elsewhere (Meyers et al., 2014). The study was approved by the Vanderbilt University Institutional Review Board.

Participants

We recruited hospitalized patients over the age of 18 with a likely diagnosis of acute coronary syndrome (ACS) and/or acute decompensated heart failure (ADHF), as determined by medical record review conducted by a physician. Key exclusion criteria consisted of severe cognitive impairment or altered mental status, unstable psychiatric illness, inability to communicate in English, on hospice, or otherwise too ill to participate in the interview. Patients enrolled in VICS between October 2011 and August 2013 were included in this analysis.

Baseline assessment

After consenting, participants completed a series of interviewer-administered baseline measures. Socio-demographic information, such as age, gender, marital status, employment status, educational attainment (highest grade or year of school completed), household income, and self-reported race was collected during this time. Household income was reported using the strata from the Behavioral Risk Factor Surveillance System (BRFSS) questionnaire (Centers for Disease Control and Prevention, 2010).

Perceived social support was assessed using six items from the ENRICH Social Support Inventory (ESSI) (Mitchell et al., 2003). Participants were asked questions about emotional and instrumental support and each question had a 5-item response scale. The ESSI score is reported as a continuous score ranging from 6 to 30, where higher scores indicate more perceived social support.

Depressive symptoms during the two weeks prior to hospitalization were assessed by the Patient Health Questionnaire-8 (PHQ-8) (Kroenke, Spitzer, Williams, & Lowe, 2010). The 8-item sum ranges from 0 to 24 and higher scores indicate more severe depressive symptoms.

Self-reported health status was measured using the first five questions from the Patient-Reported Outcome Measurement Information System (PROMIS) Global Health Scale that address physical, mental, and social health status as well as quality of life using a 5-item response scale (Hays, Bjorner, Revicki, Spritzer, & Cella, 2009). Only the first five items of

the PROMIS Global Health Scale were administered during the baseline VICS assessment because the other items assess domains (e.g., pain) that are more likely to fluctuate in acutely ill hospitalized patients. In our sample, this set of five items is both unidimensional and internally consistent with a Cronbach's alpha of 0.83. The mean of all five items was calculated, and higher scores indicate better health and well-being.

We assessed cognition using the Short Portable Mental Status Questionnaire (SPMSQ) (Pfeiffer, 1975). This is a 10-item measure, which is adjusted for education attainment, and higher scores reflect worse cognitive status. The total score may be categorized as not impaired (0-2 errors) or impaired (3-10).

The Subjective Numeracy Scale (SNS) aims to quantify the participants' perceived quantitative abilities and comfort with numbers (Fagerlin et al., 2007); to decrease response burden, we administered a shortened 3-item version. Specifically, the three items ask patients to rate their math skills and preferences for numerical information on a 6-point response scale. The full 8-item SNS correlates very highly with objective numeracy measures (Zikmund-Fisher, Smith, Ubel, & Fagerlin, 2007), and the shortened scale has been shown to be as valid as the longer measure (Wallston, 2011). The SNS-3 score is reported as the mean of the three items and ranges from 1 to 6, with higher scores reflecting higher subjective numeracy.

The 36-item short form of the Test of Functional Health Literacy in Adults (s-TOFHLA), which includes two reading comprehension passages, was administered as an objective measure of HL (Baker, Williams, Parker, Gazmararian, & Nurss, 1999). Scores range from 0 to 36, with higher scores indicating higher HL.

Trust in the health care system was measured using the Revised Health Care System Distrust Scale (RHCSDS) (Shea et al., 2008). This instrument orients patients to think about the health care system as a whole (including hospitals, clinics, labs, insurance companies, and drug companies) instead of thinking about individual people as they answer the questions. The RHCSDS assesses patients' perceptions of honesty, confidentiality, competence, and fidelity regarding the health care system. The responses to the nine questions are summed (range 9-45), and higher scores reflect higher levels of distrust.

Outcome measure

The Problem-Solving Decision-Making Scale (PSDM) was used to determine patients' decisional preferences (Deber et al., 1996). The PSDM Scale consists of two vignettes differing in symptom severity: the one with the less severe symptom (the morbidity vignette) describes a scenario in which the patient feels a burning sensation when s/he goes to the bathroom; the vignette with the more severe symptom (the mortality vignette) describes a patient experiencing chest pain or shortness of breath who is being admitted to the hospital. In a series of six questions, patients are asked who should problem solve and who should make decisions: the doctor alone (1), mostly the doctor (2), the doctor and the patient (3), mostly the patient (4), or the patient alone (5). Lower scores indicate less desire to participate and higher score indicate more desire to participate. The inference is that the more the patient selects "the doctor" as the one to problem solve or make decisions, the less

desire the patient has to participate in those situations; conversely, choosing the responses indicating “the patient” is an indication of desire for more participation in the decision-making process.

Of the six questions per vignette, the first four are associated with problem-solving and the last two with decision-making. The problem-solving questions involve “identifying a single correct solution to a problem,” whereas the decision-making questions involve “making a choice, often requiring trade-offs, from a number of possible alternatives” (Deber et al., 1996). In our sample, for the burning sensation vignette the two subscales correlated 0.32 ($p < 0.001$), and for the chest pain vignette they correlated 0.39 ($p < 0.001$). For our analyses, we averaged the mean of the problem-solving responses and the mean of the decision-making responses to get a total decisional preference score for each vignette which equally weighted problem solving and decision making. The total scores were used as continuous variables (range 1 to 5), and had Cronbach's alphas of 0.67 for the burning sensation vignette and 0.72 for the chest pain vignette.

Statistical analysis

In the unadjusted analysis, we used Kruskal-Wallis tests to determine associations between the continuous PSDM scores and categorical variables (gender, race, diagnosis, employment status, cognition status, depression, and HL) for each symptom scenario. We used the t approximation to the upper tail of the Spearman correlation for associations between continuous PSDM scores and continuous variables (age, income, education, perceived social support, subjective numeracy, health care system distrust and HL) for each symptom scenario. We tested HL as both a categorical and continuous variable in the univariate analysis, but only included the continuous variable in the multivariate analysis. To describe the PSDM score distributions for each symptom scenario, we used a graphic of the empirical cumulative distribution functions. Such depictions are particularly useful because they capture all percentiles of a distribution as opposed to a select few percentiles.

Multivariable linear regression analyses were constructed to examine baseline patient factors that were independently associated with the level of decisional preference. For each scenario, higher PSDM scores are in the direction of more desired participation and low scores indicate less desire for participation. Two regression models were fitted: the PSDM score for the burning sensation during urination scenario and the PSDM score for the chest pain scenario. Patient factors considered here were pre-specified, and all continuous variables were scaled approximately by their inter-quartiles range so that regression results could be interpreted as the change in the mean outcome associated with an inter-quartile range change in each patient factor (while holding other patient factors fixed).

For regression modeling, all continuous variables were initially entered into the models using restricted cubic splines with four knots. Balancing ease of interpretation with model flexibility, we sought to remove the non-linear components for the continuous variable effects only if there was no evidence that such effects existed in either primary model. In fact, the smallest p -value for a non-linear effect was 0.14 and most of them were relatively large. Therefore, all continuous variables were entered into regression models as linear terms.

Among the 1,249 patients included in analyses, most variables were available on nearly all subjects. The variables with the most missing data were: s-TOFHLA (45 missing) and the income category (37 missing). All other variables had fewer than 20 missing values. To avoid casewise deletion of records with missing covariates, we employed multiple imputation with five imputation datasets using predictive mean matching. All analyses were conducted in R version 3.0.2.

Results

Among 1,549 eligible patients with ACS and/or ADHF, 1,261 (81.4%) provided consent and enrolled. Excluding 12 who later withdrew, 1,249 patients are included in this analysis. In this sample, 45% of patients were female and 83% were white (Table 1). The mean age was 60 years (standard deviation (SD) $\pm$ 13) and the average educational attainment was 13.5 years (SD $\pm$ 2.9). Sixty-three percent of patients had ACS, 30% had ADHF, and 8% had both diagnoses. Additionally, 12% had inadequate HL (s-TOFHLA score=0-16), 8% had marginal HL (s-TOFHLA score = 17-22), and 78% had adequate HL (s-TOFHLA score=23-36). The average subjective numeracy score was 4.4 (SD $\pm$ 1.4) with a range of 1-6, indicating that, on average, the patients felt comfortable with numerical information, although a sizable number were not.

Univariate (Unadjusted) Analyses

The distributions of patient characteristics based on level of desired participation are displayed in Table 2. Diagnosis, gender, age, marital status, cognition status, depression, and perceived health status were not associated with desire for participation during the problem-solving and decision-making process in both scenarios. However, HL, numeracy, education, income, perceived social support, and health care system distrust were all significantly associated with desire for participation in both scenarios ($p < 0.01$ for each). Of particular note, there are significantly more patients with inadequate or marginal HL desiring low participation in the problem-solving and decision-making process. Race and employment status were only significant in the burning sensation during urination scenario. African-Americans were somewhat less desirous for participation than Whites in that scenario, while those who were employed preferred to be more involved than those who were not employed.

Empirical Cumulative Distribution Functions

Figure 1 shows the empirical cumulative distribution functions for the burning sensation during urination and chest pain PSDM scores, in which higher scores indicate a preference for more participation in the decision-making process. Burning sensation during urination scores were higher than chest pain scores ($p < 0.001$ using a Wilcoxon signed-rank test) with medians (interquartile ranges) equal to 2.6 (2.1-3.0) and 2.4 (1.8-2.9), respectively. This indicates that overall, patients had more desire to participate in the problem-solving and decision-making process in the less severe of the two scenarios. However, the two outcomes were highly correlated with one another with an estimated Spearman correlation equal to 0.67.

Multivariable (Adjusted) Analyses

Table 3 shows the results from the regression analyses that simultaneously relate all of the patient factors to PSDM scores. Overall, the findings were consistent across the two clinical scenarios. The variables that were observed to be significantly associated with a preference for more participation during decision making in both scenarios were higher HL, higher subjective numeracy, higher education, female gender, less perceived social support, and greater health care system distrust. For example, a nine-point increase in the s-TOFHLA was associated with a 0.07 (95% Confidence Interval (CI)= 0.02 – 0.12) change in the mean PSDM score toward more desired participation; a two-point increase in the subjective numeracy score was associated with a 0.12 CI=(0.05-0.19) change in the mean PSDM score toward more desired participation.

Discussion

In multivariate analyses, patients with higher HL preferred to have more involvement during the problem-solving and decision-making process than patients with low HL. Higher subjective numeracy, higher education, female gender, less perceived social support, and more health care system distrust were also significantly associated with desire to participate more in the problem-solving and decision-making process. These effects were present in both the morbidity and mortality scenarios. Education and gender have been implicated as factors predicting desire for participation during medical decision-making (Cassileth et al., 1980; Deber et al., 2007; L. Degner, 1992), but social support and health care system distrust have not previously been reported as significant factors. Health numeracy's association with decisional preferences has been evaluated previously, but not numeracy in general (Naik et al., 2011). Because numeracy is conceptually subsumed under literacy, our discovery that even with HL controlled for in the multivariate analyses greater subjective numeracy predicts participation for involvement is especially noteworthy.

Patients' HL or numeracy skills are associated with their health care involvement in many ways, such as asking questions in medical encounters, participation in informed consent discussions, medication adherence, and other aspects of disease self-management (Berkman, Sheridan, Donahue, Halpern, & Crotty, 2011; Katz, Jacobson, Veledar, & Kripalani, 2007; Tamariz, Palacio, Robert, & Marcus, 2013; Williams, Davis, Parker, & Weiss, 2002). Based on the findings of this study and others, clinicians should be aware that patients with low HL or numeracy are less likely to participate in decision-making (Aboumatar et al., 2013; Mancuso & Rincon, 2006; Naik et al., 2011; Yin et al., 2012). Particularly in circumstances when a passive stance may not be in the patient's best interest, clinicians should consider employing strategies to involve the patient in the problem-solving and decision-making process. Evidence suggests that by doing this, providers could improve patient outcomes (Greenfield et al., 1988; Kaplan, Greenfield, & Ware, 1989). Other evidence suggests that when patients are compelled to participate in health decisions, there were no ill effects (Wallston, 1989). Thus, encouraging physicians to facilitate patient involvement would pose little threat to the patient.

We also found that greater distrust in the health care system was associated with patients desiring more involvement in decisions that affect their care and outcomes, and this makes

sense conceptually. The social support findings, however, are a little more difficult to understand. In the univariate, unadjusted analyses, the results appear to suggest that those who had a low desire for participation perceived more social support than those who desired medium or high participation. Yet, in the adjusted analyses, the effect for social support goes in the opposite direction; the regression coefficient for those patients with greater perceived social support is negative indicating that lower support is associated with a higher preference for involvement. This “reversal of sign” is most likely due to the fact that the multivariate analyses controls for all of the other factors in the model, such as education, income, HL, and so forth. After those things are accounted for, it is not surprising that patients who feel unsupported by others might feel a need to engage more in the decision-making process regarding their own care.

Age, race, marital status, employment status, cognition, income, perceived health status, and depression were not associated with desired level of participation during the decision-making process in our study, yet age, race, health status, and depression had been identified as factors in previous research (Cassileth et al., 1980; Collins et al., 2004; Deber et al., 2007; L. F. Degner et al., 1997; Murray et al., 2007). One possible reason for the discordance is that factors associated with desired level of participation in medical decisions could be sample-specific (Chewning et al., 2012). Here, we studied cardiac inpatients, while others have studied primarily outpatients. Another possible reason is that other studies did not account for the number of covariates that we did in our multivariate analyses, which ultimately affects which predictor variables appear to make significant unique contributions to understanding the variance in the dependent variable.

Several studies suggest that familiarity with the hypothetical situation described during the decisional preference assessment increases patients' desire to participate in medical decisions (Cassileth et al., 1980; Deber et al., 2007; L. F. Degner et al., 1997). In this sample of adults admitted with acute cardiovascular issues, we would therefore have expected a preference for greater decision-making involvement in the chest pain scenario. However, we observed the opposite. We postulate that a symptom's potential to cause mortality might dictate level of desired participation, more so than familiarity with the symptom. Thus, for the chest pain scenario, patients were more likely to defer to their physicians to make decisions. Deber et al. (1996) also reported the severity of the hypothetical situation affected patients' desired involvement, so further examination of this relationship in the future would be beneficial.

In an ad hoc analysis (not presented in detail), we explored which factors might explain differences between responses to the two vignettes. We found that only income and education were associated with the difference in desired level of participation based on the hypothetical scenario presented. Because other studies have not performed a similar analysis, we are unable to compare our findings with previous research. Although there were only two factors that differentially explained the variance in PSDM scores between the two scenarios, we feel that the approach we took, while exploratory, merits replication by other researchers.

One unique aspect of our analysis was our method of using the PSDM scale scores. Similar to Kraetschmer, Sharpe, Urowitz, and Deber (2004), we combined the problem-solving and decision-making subscales to determine an overall problem-solving, decision-making preference, but we reported the outcome score differently. Previously, the patient's decisional preference was expressed as a categorical outcome: passive, shared, or autonomous (Kraetschmer et al., 2004). For our analysis, we used decisional preference as a continuous outcome variable, allowing us to detect subtle differences between the amount of involvement patients claimed to desire for each scenario. This also enabled us to better determine the degree of preferred participation. We believe that using decisional preference scores as continuous outcomes, rather than categorical outcomes, allows us to better determine where patient preferences exist on the spectrum.

Using the decisional preference score as a continuous variable also influenced which patients were included in our analysis. Previous research has excluded a group of participants whose responses were considered to be “theoretically implausible” (Kraetschmer et al., 2004). This group was defined by the developers of the PSDM scale as people who report that they would like to “share” or “keep” the responsibility of problem solving, but prefer to “hand over” decision making (Kraetschmer et al., 2004). In our sample, this group included 28 participants. Because we did not use the categorical coding that Kraetschmer et al. (2004) employed, we did not feel as though those patients should be excluded and kept them in the analysis. Overall, we felt that including these people would not adversely affect the accuracy of our results.

There were a few limitations regarding this study. The information collected during this study may not be generalizable to other populations because this study took place in a single referral center in Tennessee; however, patients in this sample came from more than 140 unique counties and 15 states. The average educational attainment of the patients our study is 13.5 years, which is typical of the patients seen in our university hospital but higher than might be seen in other settings. Additionally, as noted in other research reports, apparent decision-making preferences may vary according to the instrument used. Keeping that in mind, we selected the PSDM scale that had been tested in multiple settings and had been used with cardiac patients in the past. Nevertheless, only two clinical situations were included in the vignettes and a different set of situations might have elicited a different set of responses. Furthermore, the decision to combine problem-solving and decision-making into a single preference score meant that we did not separately investigate whether different patient characteristics would affect problem-solving than those that affect decision-making.

More than balancing these limitations, however, are the strengths of this study. Our sample size was large enough to allow us to include a number of covariates, some of which were being examined for the first time (subjective numeracy, perceived social support and health care system distrust). Although we learned about determinants of patients' decisional preferences in the medical setting, we did not explore mediators and moderators of those determinants in this paper; those relationships could be the focus of future studies. Also, as mentioned before, it would be beneficial to determine if determinants of problem-solving differ from those of decision-making. Finally, given the relatively high correlation of

preference scores across the two vignettes, researchers might combine the scores from the two vignettes to have a more robust measure of patient decisional preferences.

Conclusion

HL, numeracy, and several other patient characteristics are independently associated with patients' preferred involvement in the problem-solving and decision-making process. Being aware of these relationships, and possibly eliciting preferences from patients directly, could help clinicians and patients work together more effectively to make decisions about clinical care.

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Decisional Preference Scores

Figure 1.

Table 1

Descriptive statistics for all variables for the total sample (n=1,249).

Patient characteristics (categorical)	N (%)
Diagnosis	
ACS	783 (62.7)
Heart Failure	371 (29.7)
Both	95 (7.6)
Gender	
Male	687 (55.0)
Race	
White	1029 (82.6)
Black/African-American	192 (15.4)
Other	25 (2.0)
Missing/Refused	3 (0.2)
Marital status	
Married/Living with partner	744 (59.6)
Employment	
Employed	397 (31.8)
Unemployed	851 (68.2)
Missing/Refused	1 (0.1)
Health literacy category	
Inadequate or Marginal	234 (18.8)
Adequate	970 (77.7)
Missing/Refused	45 (3.6)
Cognition	
Not Impaired	1132 (90.9)
Impaired	113 (9.1)
Missing/Refused	4 (0.3)
Depression	
None/Minimal/Mild	796 (63.7)
Moderate	275 (22.0)
Moderately Severe/Severe	168(13.4)
Missing/Refused	10 (0.8)
Patient characteristics (continuous)	50th (10th, 90th) percentiles
Health literacy (STOFHLA) score	33(16,36)
Age	60(43,76)
Education	13(11,17)
Income	5 (2,8) ^a
Health and Well-Being (PROMIS)	3(2,4)
Social Support (ESSI)	27(19,30)
Subjective Numeracy (SNS)	5(2,6)

Patient characteristics (categorical)	N (%)
Healthcare Distrust (RHCSDS)	25(18,33)

^a. income was considered a continuous variable but the numbers represent ordinal categories: 1=<\$10,000, 2=\$10,000-\$14,999, 3=\$15,000-\$19,999, 4=\$20,000-\$24,999, 5=\$25,000-\$34,999, 6=\$35,000-\$49,999, 7=\$50,000-\$74,999, 8=\$75,000-\$99,999, 9=\$100,000+

Table 2

Results of Univariate Analyses by Vignette.

	Desire for participation: Burning Sensation			Desire for participation: Chest Pain		
	Low N = 219	Medium N = 621	High N = 395	Low N = 321	Medium N = 640	High N = 273
Patient characteristics: categorical, N (%)						
Diagnosis (%)						
ACS	62.1	63.1	62.8	60.4	66.2	57.9
Heart Failure	33.3	28.0	29.9	33.0	26.6	32.2
Both	4.6	8.9	7.3	6.5	7.2	9.9
Gender (%)						
Male	57.1	54.4	54.4	57.0	54.4	53.5
Race (%)						
White	80.2	81.8	85.1	80.3	82.8	84.6
Black/African-American	16.6	16.9	12.4	17.2	15.3	13.6
Other	3.2	1.3	2.5	2.5	1.9	1.8
Marital status (%)						
Married/Living partner	56.6	60.2	60.3	56.7	61.3	59.0
Unmarried	43.4	39.8	39.7	43.3	38.8	41.0
Employment (%)						
Employed	26.0	31.7	34.5	25.9	34.7	31.2
Unemployed	74.0	68.3	65.5	74.1	65.3	68.8
Health literacy (%)						
Inadequate/Marginal	31.9	16.6	16.5	29.4	16.1	14.5
Adequate	68.1	83.4	83.6	70.6	83.9	85.6
Cognition (%)						
Not Impaired	88.5	92.4	89.6	90.3	91.4	90.1
Impaired	11.5	7.6	10.4	9.7	8.6	9.9

	Desire for participation: Burning Sensation			Desire for participation: Chest Pain		
	Low N = 219	Medium N = 621	High N = 395	Low N = 321	Medium N = 640	High N = 273
Depression (%)						
None/Minimal/Mild	59.4	65.5	65.0	58.9	67.8	62.6
Moderate	25.1	21.3	22.3	24.9	20.3	23.4
Mod. Severe/Severe	15.5	13.2	12.7	16.2	11.9	13.9
Patient characteristics: continuous, 50 th (10 th , 90 th) percentiles						
Health literacy score	29(12,35)	34(16,36)	34(17,36)	31(12,35)	34(18,36)	33(18,36)
Age	61(42,77)	60(43,76)	60(44,75)	61(42,78)	60(43,76)	60(45,73)
Education	12(9,16)	13(11,17)	14(12,18)	12(9,16)	13(11,18)	14(12,18)
Income *	5(2,7)	6(2,9)	6(2,8)	5(2,8)	6(2,9)	6(2,8)
Health and Well-Being (PROMIS)	3(2,4)	3(2,4)	3(2,4)	3(2,4)	3(2,4)	3(2,4)
Social Support (ESSI)	28(21,30)	27(19,30)	27(19,30)	28(19,30)	27(20,30)	27(18,30)
Subjective Numeracy (SNS)	4(2,6)	5(2,6)	5(3,6)	4(2,6)	5(2,6)	5(3,6)
Healthcare Distrust (RHCSDS)	24(16,31)	25(18,33)	26(19,35)	24(17,32)	25(18,33)	26(19,35)

¹ Kruskal-Wallis test

² Spearman Correlation

* Income was considered a continuous variable but the numbers represent ordinal categories: 1=<\$10,000, 2=\$10,000-\$14,999, 3=\$15,000-\$19,999, 4=\$20,000-\$24,999, 5=\$25,000-\$34,999, 6=\$35,000-\$49,999, 7=\$50,000-\$74,999, 8=\$75,000-\$99,999, 9=\$100,000+

Table 3

Results of the Multivariate Analyses by Type of Vignette.

Variable	Burning sensation ^a	Chest Pain ^a
Intercept	1.50 (1.04, 1.96)	1.16 (0.69, 1.64)
Heart failure only (vs ACS only)	0.05 (-0.04, 0.14)	0.07 (-0.03, 0.16)
Heart failure and ACS (vs ACS only)	0.15 (0.00, 0.30)*	0.08 (-0.07, 0.24)
Female (vs male)	0.09 (0.01, 0.17)*	0.09*(0.01, 0.18)
Black/African-American (vs white)	-0.09 (-0.20, 0.03)	-0.06 (-0.18, 0.05)
Other race (vs white)	-0.06 (-0.34, 0.21)	-0.08 (-0.36, 0.20)
Unmarried (vs married)	0.00 (-0.09, 0.10)	-0.04 (-0.13, 0.06)
Unemployed (vs employed)	-0.01 (-0.11, 0.09)	-0.02 (-0.12, 0.08)
Cognition (per 1 point change on the SPMSQ)	0.01 (-0.03, 0.05)	0.02 (-0.03, 0.06)
Depression (per 8 unit change on the PHQ)	0.00 (-0.07, 0.07)	0.00 (-0.07, 0.07)
Health literacy (per 9 point change on the s-TOFHLA)	0.07 (0.02, 0.12)*	0.07 (0.02, 0.13)*
Age (per 15 year change)	-0.02 (-0.07, 0.03)	-0.02 (-0.08, 0.03)
Education (per 3 year change)	0.07 (0.02, 0.12)*	0.12 (0.07, 0.17)*
Income (per 3 category change)	0.06 (-0.01, 0.13)	-0.01 (-0.09, 0.06)
Health and well-being (per 1.5 point change on the PROMIS)	0.04 (-0.05, 0.12)	0.06 (-0.02, 0.15)
Social support (per 5 unit change on the ESSI-6)	-0.08 (-0.12, -0.04)*	-0.08 (-0.13, -0.04)*
Subjective numeracy (per 2 point change on the SNS)	0.12 (0.05, 0.19)*	0.12 (0.06, 0.19)*
Healthcare system distrust (per 8 unit change on the RHCSDS)	0.16 (0.11, 0.21)*	0.15 (0.10, 0.21)*

* p-value <0.05

^a Regression coefficient (95% Confidence interval)