Relationship of Health Literacy to Intentional and Unintentional Non-Adherence of Hospital Discharge Medications

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BACKGROUND: Inadequate health literacy is prevalent among seniors and is associated with poor health outcomes. At hospital discharge, medications are frequently changed and patients are informed of these changes via their discharge instructions.

OBJECTIVES: Explore the association between health literacy and medication discrepancies 48 hours after hospital discharge and determine the causes of discharge medication discrepancies.

DESIGN: Face-to-face surveys assessing health literacy at hospital discharge using the short form of the Test of Functional Health Literacy in Adults (sTOFHLA). We obtained the medication lists from the written discharge instructions. At 48 hrs post-discharge, we phoned subjects to assess their current medication regimen, any medication discrepancies, and the causes of the discrepancies.

PARTICIPANTS: Two hundred and fifty-four community-dwelling seniors ≥ 70 years, admitted to acute medicine services for >24 hours at an urban hospital.

RESULTS: Of 254 seniors [mean age 79.3 yrs, 53.1% female], 142 (56%) had a medication discrepancy between their discharge instructions and their actual home medication use 48 hrs after discharge. Subjects with inadequate and marginal health literacy were significantly more likely to have unintentional non-adherence—meaning the subject did not understand how to take the medication [inadequate health literacy 47.7% vs. marginal 31.8% vs. adequate 20.5% $p = 0.002$]. Conversely, those with adequate health literacy were significantly more likely to have intentional non-adherence—meaning the subject understood the instructions but chose not to follow them as a reason for the medications discrepancy compared with marginal and inadequate health literacy [adequate 73.3% vs. marginal 11.1% vs. inadequate 15.6%, $p < 0.001$]. Another common cause of discrepancies was inaccurate discharge instructions (39.3%).

CONCLUSION: Seniors with adequate health literacy are more inclined to purposefully not adhere to their discharge instructions. Seniors with inadequate health literacy are more likely to err due to misunderstanding

their discharge instructions. Together, these results may explain why previous studies have shown a lack of association between health literacy and overall medication discrepancies.

KEY WORDS: discharge instructions; adherence; health literacy.

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INTRODUCTION

Medication discrepancies frequently occur surrounding an acute hospitalization, both at admission and at discharge.^{1–3} Medication discrepancies are differences between medication regimens (i.e. between medications prescribed on discharge from the hospital and a patient's home regimen).⁴ In 2006 and again in 2011, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) required and reaffirmed that all healthcare organizations perform medication reconciliation to avoid medication errors such as omissions, duplications, dosing errors, or drug interactions.⁵ While admission medication reconciliation has been targeted by JCAHO, discharge medication reconciliation has not been as strongly promoted. Subsequently, many patients are forced to reconcile their own medications lists as outpatients.

Compared to younger patients, older adults experience an increased risk of medication discrepancies and adverse medication events.^{6,7} Age has been shown to be an independent predictor of medication discrepancies.^{8–10} Studies have found that 19%–23% of discharged seniors experienced an adverse event within one month, with the most common being medication-related (72%).^{6,11} Of these adverse events, half were deemed preventable or ameliorable.¹² Medication discrepancies may also contribute to readmissions. Coleman et al. found a total of 14.3% of the patients who experienced medication discrepancies were rehospitalized at 30 days compared with 6.1% of the patients who did not experience a discrepancy.¹³

Adherence is the decision to follow the recommendations or treatment plan of the prescribing health care professionals.¹⁴ A recent literature review of medication adherence in the elderly divided the barriers of adherence into patient-related (e.g. socio-demographics, comorbidities, health beliefs) and drug-related (e.g. side effects, multiple dosings).¹⁵ A potential patient-related cause of non-adherence among seniors may be worsening

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cognition. In a study of patients with HIV/AIDS, executive function was reciprocally related to whether a patient was adherent to their anti-retroviral medications.¹⁶ Cognitive impairment may cause patients to inadvertently be non-adherent to medication regimens or “make mistakes”. Limited health literacy may also be a patient-related barrier to medication adherence.

Forty million people have inadequate health literacy and are unable to understand the basic principles behind taking their medications or following directions from their physicians.¹⁷ In the National Assessment of Adult Literacy, seniors had lower average health literacy than adults in younger age groups. The percentage of adults in the 65 and older age group who had Below Basic and Basic levels of Health Literacy was 29% and 30%.¹⁸ Low health literacy is associated with multiple negative outcomes, such as poor use of preventative care¹⁹ and increased hospitalizations.^{20,21} However, multiple studies have shown that there is not a direct relationship between health literacy and medication adherence. Paasche-Orlow et al. found that low health literacy was not associated with lower odds of anti-retroviral medication adherence or virologic suppression among HIV infected adults.²² Another study showed that caregivers of infants who had limited health literacy were twice as likely to report high adherence to a daily multivitamin with iron regimen in infants as caregivers with adequate health literacy.²³ In all of these studies, medication adherence was not delineated as being voluntary (where the subject chooses not to adhere) or involuntary (where the subject makes a mistake).

No prior studies have investigated the association between health literacy and the causes of post-hospital discharge medication discrepancies. This study aims to explore the association between health literacy and medication discrepancies 48 hours after hospital discharge and determine the causes of discharge medication discrepancies.

METHODS

Recruitment of Subjects

The Institutional Review Board of Northwestern University Feinberg School of Medicine approved this study. Research staff (4) received training in the research interview protocol and recruited consecutive community-dwelling seniors aged 70 and older who were hospitalized to the acute hospitalist medicine services from June 2007 through February 2009. Researchers queried the electronic health records (EHR) for admission information and contacted the hospitalist to determine subject eligibility. Subjects were excluded if they were (1) blind or severely vision impaired and uncorrectable with glasses (since reading was required as part of the health literacy and cognitive assessments), (2) unable to consent to their own procedures while hospitalized (as required by IRB), (3) admitted for or history of mental status changes or cognition issues (as low cognition could affect health literacy), (4) reliant on a caregiver or home aide services ≥ 8 hours per day (as a caregiver may influence medication usage), (5) expected to be hospitalized < 24 hours (due to personnel limitations), or (6) living outside of a 60 mile radius of the

hospital (as this was part of study that had a 1-month post-discharge home visit²⁴).

Interviews

Hospital Day of Discharge Interview. A trained research assistant consented subjects and administered the structured interview within 24 hours prior to hospital discharge (i.e. day of discharge). This timing was coordinated by speaking with the treating hospitalist. The interviewer asked demographic questions, and evaluated cognitive function. To determine global cognition, interviewers used the Folstein Mini Mental Status Examination (MMSE)²⁵ with low cognition being < 25 for subjects with high school education and < 18 for subjects with less than high school education. The interviewer then obtained a pre-hospitalization outpatient medication history, asking patients “What medications were you taking before you came into the hospital?” Interviewers used specific prompts to elicit medication names, doses, purposes, and frequency of use. Subjects could furnish their written medication lists if they were brought into the hospital and interviewers confirmed the use of each medication with the subject. All interviewers were trained to obtain medication histories by a physician who teaches medication history taking to medical students. The pre-hospitalization medication histories were collected to confirm medications that subjects stated resuming but may not be listed on their discharge instructions.

To determine participants’ health literacy, interviewers administered the short form of the Test of Functional Health Literacy in Adults (sTOFHLA).²⁶ The sTOFHLA assesses the functional literacy of patients by sampling their ability to read and comprehend actual hospital and medical texts. It has been used as a marker of health literacy and it has been validated and deemed reliable in the literature.²⁷ This was scored in the standard manner with scores for adequate health literacy 23–36, marginal health literacy 17–22, and inadequate health literacy 0–16 points. At the end of the interview, research staff scheduled the subject for a telephone call 48 hours post discharge. The subject was then discharged as part of the standard hospital discharge protocol by the medical team which included both verbal and written discharge instructions. Researchers were not present and did not have any role in the discharge process.

Discharge Medication Electronic Medical Record Review.

Shortly after discharge, researchers obtained the discharge instructions for each subject from the EMR. These discharge instructions had been given to the subject on their release from the hospital by their treating hospitalists. Staff extracted the medications listed on the discharge instructions and compiled them into a database with the pre-hospitalization outpatient medications.

Post-Hospital Discharge Telephone Interview.

Between 48–72 hours following hospital discharge, researchers phoned subjects in their homes and assessed what medications the subjects were taking. Researchers asked “What medications are you currently taking?” Subjects were allowed to use any available home information to relay their medications which included pill bottles, discharge instructions, and medication lists. While on the telephone, researchers then compared the subjects’ current medication use with their hospital discharge instructions.

Discrepancies occurred if a subject was (1) taking a medication not listed on the discharge instructions, (2) not taking a medication listed on the discharge instruction, or (3) taking a medication listed on the discharge instruction incorrectly (i.e. dose, frequency). When a medication discrepancy was discovered, interviewers inquired about the cause using open-ended question, and responses were recorded verbatim. Patients were instructed to speak with their primary care physician about the discrepancy.

Coding Medication Discrepancies

Research staff recorded (1) the medications the subject reported taking pre-hospitalization, (2) the medications listed on the discharge instructions, and (3) the medications the subject reported taking 48 hours post-discharge. Each medication was matched to the medication taken previously. Discrepancies were identified. Following creation of the medication database, a physician blinded to subject information examined the medication list database for discrepancy accuracy; The physician reviewed the medications for generic/trade name variability (e.g. discharge instructions listed "atorvastatin" and patient reporting taking "Lipitor", which is not a discrepancy) and spelling/phonetic errors (e.g. discharge instructions listed Alendronate and the patient was taking Alednate, which is not a discrepancy). Over-the-counter medications were excluded except aspirin, folic acid, iron, and calcium which may be prescribed by a physician.

Coding Patient Responses for Medication Discrepancies.

During the telephone interview, patients were asked why there was a difference between the discharge instructions and their actual post-hospitalization use. Responses were recorded verbatim. Two reviewers, blinded to the health literacy of the subjects, then independently classified the qualitative responses for each medication discrepancy into the following categories which were modified from earlier studies^{28,29}: (1) Intentional non-adherence, e.g. *"I was told to but I chose not to."* (2) Unintentional non-adherence, e.g. *"I did not know I needed this medicine"* (3) Inaccurate discharge instructions, e.g. *"I was taking it previously but it was left off my instructions"* (4) Conflicting information from multiple sources (5) Unable to obtain prescription [e.g. time/transportation/health/money] or (6) Allergy/adverse reaction. Each medication discrepancy response could have more than one category. As an example, one subject felt a new hospital prescription was too expensive and wanted to talk with their primary care physician prior to starting it. This response would be categorized into both (a) Intentional non-adherence and (b) Unable to obtain prescription (i.e. time/ transportation/ health/ money). Where the two reviewers experienced discordant coding, a third reviewer blinded to patient information gave a final ruling. There were four discordant responses.

Data Analysis

Statistical analyses were performed with the SPSS Statistics 17.0 (SPSS Inc., Chicago, IL). Descriptive statistics (percentage, mean, and standard deviation) were calculated for each variable. Chi-square tests were used to evaluate the association between: (1) inadequate, marginal, and adequate health literacy with medica-

tion discrepancies and (2) inadequate, marginal, and adequate health literacy with reasons for medication discrepancies. A p value ≤ 0.05 was considered statistically significant. Analysis of variance (ANOVA) was used to evaluate the mean number of discrepancies by health literacy level. Multivariate analyses were conducted with the primary independent variables of interest being discrepancy and discrepancy cause (intentional and unintentional non-adherence). The multivariate model included the potential confounding variables age, gender, health literacy, marital status, and cognition. While cognition is associated with health literacy³⁰, it was examined separately but included in the final model to present the effect of health literacy on rates of adherence. In multivariate analyses, health literacy was classified either as inadequate, marginal, or adequate. The proportion of subjects with medication discrepancy reasons of intentional and unintentional non-adherence was compared by using odds ratios and 95% CIs, adjusted with logistic regression for the variables of health literacy, cognition, age, sex, and marital status.

RESULTS

Participant Characteristics

The mean age of subjects ($n=254$) was 79.3 yrs (range 70–100 yrs, SD 6.4) with 53.1% female. Table 1 shows their educational level, marital status, and living arrangements. Of note, over half of the subjects were college educated with 25.6% attending graduate school. Subjects' health literacy was limited; 32.3% of the subjects had inadequate literacy and 23.6% had marginal literacy. 86.6% of subjects managed their own medications.

Medication Discrepancies

A total of 142 (56%) subjects in our study population were found to have at least one medication discrepancy between hospital discharge and 48 hours later. The mean number of discrepancies per subject, between the hospital discharge list and home medications reported 48 hours later, was 2.02 [SD 1.8, range 1–13]. Health literacy was not associated with having a medication discrepancy in simple bivariate analysis; 65.9% subjects with low health literacy, 63.3% subjects with marginal health literacy, and 67.9% subjects with adequate health literacy experienced at least one medication discrepancy ($p=0.84$). The mean number of medication discrepancies was also similar across literacy levels; subjects with low health literacy experienced 2.1 (SD 1.8), with marginal health literacy 2.4 (SD 2.8), and with adequate health literacy 1.9 (SD 1.5) medication discrepancies ($p=0.52$ across groups).

Causes of Medication Discrepancies

The most common cause of discrepancies was inaccurate discharge instructions ($n=79$, 39.3%). The next most common categories were intentional non-adherence ($n=45$, 22.4%)—meaning the subject understood the instructions but chose not to follow them, and unintentional non-adherence ($n=44$,

Table 1. Characteristics of Study Participants (N=254)

Mean Age (Standard Deviation)	79.3 (6.4)
Female (%)	135 (53.1%)
Race	n (%)
White	174 (68.5)
African American	66 (26.0)
Asian	6 (2.4)
Hispanic	6 (2.4)
Other	2 (0.8)
Marital Status	n (%)
Married	96 (37.8)
Never Married	31 (12.2)
Widowed	88 (34.6)
Divorced	39 (15.4)
Living Arrangement	n (%)
Lives alone	141 (55.5)
Lives with Spouse only	67 (26.4)
Lives with offspring only	26 (10.2)
Lives with Spouse and offspring	20 (7.9)
Has Someone Help with Medications	34 (13.8)
Spouse	16 (8.0)
Offspring	10 (5.0)
Visiting Nurse/Homemaker	8 (2.5)
Education	n (%)
8th grade or less	19 (7.5)
Some High School	20 (7.9)
High School Grad	52 (20.5)
Some College	55 (21.7)
College Grad	43 (16.9)
Less than or equal to 4 years Grad school	46 (18.1)
More than 4 years Grad school	19 (7.5)
Health Literacy	n (%)
Inadequate	82 (32.3)
Marginal	60 (23.6)
Adequate	112 (44.1)
Low Cognition *	77 (30.3)

* MMSE <25 for subjects with high school education and <18 for subjects with less than high school education

21.9%)—meaning the subject received correct instructions but did not understand how to take the medication. Inability to obtain prescriptions (due to time, transportation, or cost) was the reason for 6.9% of the medication discrepancies. Conflicting information from multiple sources (i.e. a nurse or

Figure 1. Frequency of non-adherence types of medication discrepancies by health literacy.

Table 2. Multivariate Predictors of Unintentional Medication Discrepancies (n=254)

Characteristic	Adjusted Odds Ratio (95% CI)	P Value
Health Literacy	Reference	0.003**
Adequate	4.22 (1.63–10.88)	0.001**
Marginal	5.42 (2.05–14.37)	
Inadequate		
Age	1.03 (0.977–1.09)	0.25
Female	1.99 (0.904–4.39)	0.09
Marital status	Reference	0.55
Married	0.725 (0.256–2.05)	0.37
Never Married	1.77 (0.509–6.16)	0.85
Widowed	1.12 (0.365–3.40)	
Divorced		
Low Cognition*	1.92 (0.835–4.40)	0.13

* MMSE <25 for subjects with high school education and <18 for subjects with less than high school education

**p<0.05, significant

physician had told the subject to do something other than the written discharge instructions) accounted for 5.5% of the discrepancies. Allergy accounted for one medication discrepancy.

Among subjects who experienced medication discrepancies (n=112), those subjects with inadequate and marginal health literacy were significantly more likely to have unintentional non-adherence [inadequate health literacy 47.7% vs. marginal 31.8% vs. adequate 20.5%, p= 0.002]. Subjects with adequate health literacy were significantly more likely to have intentional non-adherence as a reason for the medications discrepancy compared with marginal and low health literacy [adequate 73.3% vs. marginal 11.1% vs. inadequate 15.6%, p< 0.001]. (Fig. 1)

Multivariate Risk Factors for Discrepancy Reason

Subjects with inadequate or marginal health literacy were more likely to “make a mistake” and unintentionally not adhere to their medication discharge instructions (adjusted odds ratio 5.42, 95% confidence interval, 2.05–14.37 for inadequate vs. adequate; adjusted odds ratio 4.22, 95%

Table 3. Multivariate Predictors of Intentional Medication Discrepancies (n=254)

Characteristic	Adjusted Odds Ratio (95% CI)	P Value
Health Literacy	Reference	0.002 **
Adequate	.170 (0.057–.509)	0.003 **
Marginal	.203 (0.070 –.590)	
Inadequate		
Age	.983 (0.954 –1.013)	0.26
Female	1.35 (0.615–2.97)	0.45
Marital Status	Reference	0.91
Married	1.07 (0.363–3.14)	0.98
Never Married	.986 (0.266–3.65)	0.79
Widowed	1.16 (0.389–3.47)	
Divorced/Separated		
Low Cognition*	.607 (0.220–1.67)	0.34

* MMSE <25 for subjects with high school education and <18 for subjects with less than high school education

** p<0.05, significant

confidence interval 1.63–10.88 for marginal vs. adequate). Subjects with adequate health literacy were more likely to intentionally not adhere to their medication discharge instructions. Tables 2 and 3 show the adjusted odds for risk factors of intentionally and unintentionally adherence.

DISCUSSION

We sought to examine the relationship between health literacy and medication discrepancies following a hospital stay. At 48 hours post hospital discharge, we found that over half of the recently discharged seniors experienced a medication discrepancy. Almost one out of every four medication discrepancies was the result of subjects consciously choosing not to follow their discharge medication instructions.

Overall, health literacy was not related to experiencing a medication discrepancy. However, health literacy was significantly associated with the reason behind the medication discrepancy. Seniors with low and marginal health literacy were more likely to err due to misunderstanding their discharge instructions. In essence, these seniors made unintentional mistakes. On the other hand, seniors with adequate health literacy were more likely to purposefully not adhere to their discharge instructions. They intentionally chose to not to take the prescribed medications. Many of these empowered seniors chose to overlook hospitalist orders and refrained from making medication changes.

Previous studies have shown that no association exists between health literacy and medication discrepancy.^{22,23,31} To our knowledge, these studies have only looked at the overall frequency of medication discrepancies in relationship to health literacy. In delving deeper into the cause of these discrepancies, we were able to uncover a link between health literacy and unintentional medication discrepancies. Our results offer a possible reason as to why some prior research has shown a lack of association between health literacy and medication discrepancies. In both health literacy and discharge research, future studies need to look deeper into the actual cause of medication discrepancies and medication non-adherence.

Another finding of this study was the number of medication discrepancies that were due to inaccurate discharge instructions. The discharge instructions are often the only written information that patients have to reference upon returning home. If these instructions contain inaccuracies, the patient may or may not identify the inaccuracy and experience adverse effects. Hospital-based clinicians must continue to strive to provide as accurate as possible medication list on discharge. Subsequently, primary care clinicians should try to be in contact with patient shortly after discharge to remedy any inaccuracies or questions that patients have.

Limitations of this study were the sample size, advanced age, and high educational status of the sample, which limits generalizability. Furthermore, the study was limited to a single urban tertiary care hospital that utilized a hospitalist service. It is unclear the degree to which the results from this sample can be generalized to rural or non-hospitalist hospital systems. Hospitals where the primary care physicians are involved at discharge may not experience as many patients who intentionally do not follow physician orders.

Future studies need to design discharge interventions that would be effective in convincing non-adherent patients to take their medications after leaving the hospital. An obvious first step is determining how we can intervene to gain the trust of the hospitalized patients. Including primary care physicians in the discharge process may be one answer. Patients may trust their primary care physicians more than the treating hospital physician and be more willing to adhere to discharge medications when reinforced by a trusted physician. All patients who leave the hospital should (1) receive understandable written discharge medication instructions, (2) have their questions answered adequately, and (3) have appropriate follow-up with their usual physician of care.³² These are universally necessary to all hospital discharges. While most hospital systems have concentrated on the first two aspects, the third may be the most crucial. Without timely primary care follow-up, medication discrepancies—either intentional or unintentional—may not be caught in time to save the patient unnecessary injury or rehospitalization.

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