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Measuring patients' self-efficacy in understanding and using prescription medication

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Abstract

Objective—To create a brief assessment tool, the Medication Understanding and Use Self-Efficacy Scale (MUSE).

Methods—An existing scale (Communication and Attitudinal Self-Efficacy Scale) was modified, augmented, and piloted among 267 primary care patients in Chicago, New York City, and Shreveport, LA. Participant sociodemographics, literacy, current medication use, understanding medication instructions, and medication self-efficacy were measured.

Results—Using principal components analysis, two scales emerged: taking medication and learning about medication; these two factors accounted for 55% of the total variance of understanding medication instructions. Performance on the MUSE differed by literacy level; multivariate analysis detected no interaction between literacy level and MUSE score. Regression analysis, adjusted for age, education, literacy level and number of current prescription medications indicated that participants' MUSE scores predicted patient understanding of common medication instructions ($\beta = 0.07$, 95% CI 0.001–0.14, $p = 0.04$).

Conclusion—The MUSE is a valid and reliable tool measuring self-efficacy of understanding and using prescription medication. This scale differs from existing medication-specific self-efficacy scales as it addresses both learning about one's medications and adherence to the prescribed regimen.

Practice Implications—The MUSE is an effective and brief research tool that can be utilized among participants with varying literacy levels.

Keywords

Self-efficacy; Medication use; Patient comprehension; Literacy

1. Introduction

Patient misunderstanding of prescription medication instructions has been identified as both a patient safety and a health literacy concern [1–3]. Patients often misunderstand the proper

dosage of the medication as well as misunderstand the warnings associated with the medication [4–6]. Medication errors and injuries often result from patients' unintentional misuse of or non-adherence to prescription medication. Hence, there has been a focus on increasing provider-patient communication around the topic of medication and medication use [7,8].

Among other factors, health literacy and self-efficacy have been repeatedly recognized as predictors in one's ability to understand medication instructions and ultimately to adhere to medication regimens. Prior studies have demonstrated that patients with limited health literacy are more likely to misunderstand or misinterpret prescription medication instructions [2,3,9,10]. Self-efficacy, or one's beliefs in one's ability to successfully execute a behavior required to produce a certain outcome [11], also has been identified as a critical predictor of numerous health behaviors, including medication adherence [12–15]. Multiple instruments have been developed to assess self-efficacy across a wide range of chronic conditions; however many are disease condition- or context-specific [15–20]. Other more general self-efficacy scales related to medication use and behavior tend to focus on the act of taking medication under certain conditions, such as when travelling or when one's medication schedule is not convenient [21,22]. Ultimately, taking a medication as directed is the patient's responsibility; however, if the patient has not received adequate information, or has left an encounter not understanding how to take the medication properly, medication misuse or non-adherence is not a surprising result. This critical issue of misunderstanding prescription medication instructions, particularly among individuals of lower literacy, leads us to focus on not only the act of taking the medication, but the precursor of that act—specifically a patients' understanding of how the medication is to be taken. Thus, in this study we sought to begin to fill the existing lacuna between a provider's provision of information to a patient and the patient's ultimate adherence or lack thereof to the prescribed regimen by creating a brief tool to assess patients' self-efficacy related to the concepts of both understanding and using prescription medication.

2. Methods

2.1. Participants and procedures

A cross-sectional study of in-person, structured interviews was conducted among 359 adult outpatients attending one of three primary care clinics in Chicago, Illinois, New York, New York, and Shreveport, Louisiana. From May to December 2006, consecutive patients in each clinic were approached while in the waiting room. Patients were eligible if they were 18 years of age or older and were excluded if they reported severely impaired vision, hearing problems, were acutely ill, or were non-English speaking. A total of 401 patients were approached; 373 consented to participate in the study. Of these participants, nine were excluded due to language barriers, and three were ineligible due to visual impairment. Thus, 359 adults consented and were eligible for participation. Of those, 267 had complete data and constituted the final study sample for the analyses reported here. All study procedures were approved by the Institutional Review Boards of the three participating institutions (Northwestern University, Mount Sinai School of Medicine, Louisiana State University Health Services Center at Shreveport).

2.2. Measures

2.2.1. Sociodemographics—Self-reported sociodemographic information included participant age, gender, race/ethnicity, education, and the number of different prescription medications taken daily.

2.2.2. Literacy test: REALM—Literacy was measured using the Rapid Estimate of Adult Literacy in Medicine (REALM) [23], a word recognition test widely used to assess adult literacy skills in a health care setting [24].

2.2.3. Medication Understanding and Use Self-Efficacy (MUSE) scale—Items from two subscales from the Communication and Attitudinal Self-Efficacy (CASE)—Cancer measure [25] were selected and modified to reflect participants' understanding of and confidence in taking their prescription medications. Items directly pertaining to patients' self-efficacy related to the action of taking their medications (e.g., "It is easy for me to take my medicine on time") were added. In all, a total of 18 items were pilot tested for inclusion in the scale. Each item was written at a 6th grade reading level or below, as determined by Lexile analysis [26,27]. Although the questionnaire was initially administered as a part of a structured interview, the readability of the scale items indicates that the phrasing of the items should be understandable for most patients.

In an initial scale development stage, exploratory factor analysis was used to assess the underlying structure of the 18 items. This analysis allowed us to identify the redundancy in some items, as well as to reduce items to a set of derived factors. Items with the highest factor loadings were selected for the final version of the scale, while those items with lower factor loadings (below 0.60) were eliminated, with the exception of one item with a factor loading of 0.54 with a low cross-loading. In this first analysis, nine items were eliminated due to low factor loadings. In the initial principal components factor analysis, one additional item was eliminated due to a low factor loading (<0.30) on both identified factors. Thus, 8 of the initial 18 items remained; four items were associated with *taking medication* and four items were associated with *learning about medication*. Table 1 presents all 18 items, and identifies which items were removed at which step.

2.2.4. Demonstrated understanding of appropriate medication use—Ten mock pill bottles with common prescription label instructions were given to participants by the trained research assistant; participants were asked to teach back how and when they would take each medicine. Participant responses were documented verbatim, and three general internal medicine attending physicians (blinded to patient characteristics) independently coded each response as either correct or incorrect. Inter-rater reliability between physicians was very high (kappa = 0.84); any disagreements were resolved by an independent panel. This procedure has been used widely and successfully to assess patients' functional understanding of prescription medication instructions [2,28–30]. A final continuous score (0–10) of patients' understanding of prescription medication use was calculated.

2.3. Data analyses

All analyses were performed using STATA version 9 (College Station, TX). Principal components analysis was used to assess the construct validity of the MUSE scale; Cronbach's alpha was used to assess the internal consistency (reliability) of the two derived subscales. Scores on the measure could range from 0 to 32. To examine predictive validity, a generalized linear regression model was used to determine the association between MUSE scores and patients' demonstrated understanding of prescription medication instructions, while controlling for a minimal number of covariates (age, gender, education, and literacy level). We hypothesized that higher scores on the MUSE would correspond with higher comprehension of common written prescription instructions.

3. Results

Participants' mean age was 47.9 years (SD 13.4, range 20–78 years); 67.8% were female and 52.7% were African American. In this sample, 43.1% were recruited in Shreveport, 33.3% in New York City, and 23.6% in Chicago. Twenty percent of respondents had less than a high school education; 13.5% were identified as reading at or below a 6th grade level (low literacy), and 28.5% were reading at the 7–8th grade level (marginal literacy). On average, patients were currently taking 2.9 prescription medications (SD = 3.0, range 0–15). Low literacy was associated with older age, African American race, and lower education (all $p < 0.001$). Table 2 presents sociodemographic characteristics of study participants stratified by literacy level.

3.1. MUSE scale

Principal components factor analysis with Varimax rotation identified two factors (both with Eigenvalues > 1); item factor loadings and percent variance explained are shown in Table 3. Factor 1, with a Cronbach's alpha of 0.77 was labeled "taking medication," and Factor 2, with a Cronbach's alpha of 0.68 was labeled "learning about medication." Taken together, the two factors accounted for 55% of the total variance of understanding medication instructions. MUSE scores ranged from 11 to 32 ($M = 28.6$, $SD = 3.8$). Table 4 presents the inter-correlation of the two subscales as well as the correlation of each item with the MUSE scale and each subscale. Performance on the MUSE scale differed by literacy level (inadequate, marginal, adequate literacy: 28.7 (SD = 4.3), 28.5 (SD = 3.7), and 29.1 (SD = 3.7) respectively; $p < 0.001$). In multivariate analysis, however, no interaction between literacy level and MUSE score was detected. Scores on the MUSE, while associated with literacy level, were not found to be significantly related to age, gender, race, education, number of medications, or site. Regression analysis, adjusted for age, education, literacy level and number of prescription medications currently taken indicated that participants' scores on the MUSE were a predictor of patient understanding of common medication instructions ($\beta = 0.07$, 95% CI 0.001–0.14, $p = 0.04$). Examining each subscale, "learning about medication" was more strongly associated with the outcome of understanding than the "taking medication" subscale ($\beta = 0.12$, 95% CI 0.01–0.25, $p = 0.05$; $\beta = 0.08$, 95% CI 0.01–0.19, $p = 0.09$).

4. Discussion and conclusion

4.1. Discussion

The MUSE is a brief, valid and reliable research tool that can be used in clinical and research settings to assess patients' understanding and use of prescription medication. This scale was derived initially from two subscales of the CASE-Cancer measure [25]; these subscales were augmented with additional items designed to reflect participants' understanding of and confidence in taking their prescription medications. Measurement using the MUSE may offer a more general approach to measuring self-efficacy in medication use than existing disease- or context-specific measures, while at the same time recognizing the importance of patient understanding of their medications. Many existing self-efficacy scales related to medication use focus on the patient's confidence in her capability and ability to take medication correctly, even when circumstances may be less than favorable [16,17,20–22]; other measures, as noted, have been developed to be disease- or condition-specific [15–20,25]. This focus on specific barriers or conditions is commendable, as self-efficacy is behavior-specific [31]. However, as self-efficacy has been shown to be a significant predictor for numerous health behaviors, not all of which are likely to pertain to individualized, specific conditions, the existence of a more general scale can be of utility, both for clinical and research purposes. It would be unlikely for practitioners, who

are not engaging in research, to keep on hand various ways of measuring self-efficacy, depending on the patient's specific condition. Many patients also take medications for multiple conditions; asking patients to respond to numerous condition-specific scales could become both unwieldy for the researcher and confusing for the patient. Thus, having a brief 8-item scale to assess patients' self-efficacy in learning about and taking their medications across numerous disease states, could be of great value for clinicians and researchers alike.

In merely addressing self-efficacy as related to the act of taking the medication, many medication self-efficacy scales neglect the integral aspect of patient understanding of the medication regimen. Our scale, in contrast, prompts patients to ask themselves whether or not they feel confident in their understanding of the information they have received about their medication while also inquiring about perceived self-efficacy in medication adherence behaviors. In measuring self-efficacy in medication understanding, the MUSE highlights a subtly unique facet of medication adherence using a measure demonstrated in this study in multivariate analyses to perform similarly across varying levels of patient literacy. This scale may be useful as a repeat measure for clinicians to ascertain changes in their patients' confidence related to medication use; the brevity of the MUSE also allows for its use in studies to assess the effectiveness of interventions in increasing self-efficacy related to medication understanding and use.

In these analyses, we have presented the MUSE, and its two subscales, as independent predictors of patient understanding of common medication instructions; identifying a slight difference in the predictive value of each subscale. Future research should consider alternate explanations. For example, the learning about medication subscale may act as a mediator as opposed to an independent predictor, particularly if the outcome measure is medication adherence and not solely the proximal measure of patient understanding. Past research has demonstrated that patient understanding is a strong proxy for patient-reported medication adherence, particularly in the context of HIV treatment regimens [10,32]. Patients with limited knowledge about their condition and related medication may be less likely, or even unable, to understand medication instructions, and may be more likely to be non-adherent [10]. Future research utilizing the MUSE in the context of longitudinal data and medication adherence measures will be of great benefit in to this line of research.

Participants were English-speaking only; and 68% were female. Language was limited due to the use of the REALM as the instrument to assess literacy, which available in English only. The predominance of females in the study was an accurate depiction of the clinic patient populations. The majority of participants in our study, drawn from three primary care clinics in diverse areas of the country, were socioeconomically disadvantaged, which may affect the generalizability of the study. However, such a sample may be representative of those individuals who are disproportionately affected by poor health outcomes. We measured patients' understanding of *written* prescription instructions only, not their actual prescription medication-taking behaviors. Patients' understanding of medication instructions also were based on prescription bottles that were provided to the patients, not on their understanding of their *own* prescriptions. It is possible that participants' comprehension, as well as motivation and concentration on the task, may have been greater were they reporting on medication they themselves had been prescribed [28]. In addition, our data include participants' self-report of the average *number* of medications taken per day; however, we did not ask participants to identify which medications they took. Understanding and adherence may differ by medication and may be based on variations in individuals' attitudes and previous experience with each medication. Future research using the MUSE may seek to assess the presence and extent of such variation. Finally, as our predictive validity was measured using a proximal measure (patient comprehension of common medication instructions) we cannot assess the effect of their MUSE score on actual behavior (such as

setting a schedule to take medications, and medication adherence), but only on their understanding of the prescription label provided to them. Future research assessing predictive validity on a variable that is not so proximal, such as patient adherence to a prescribed medication regimen, would benefit this line of research, as would further in-depth psychometric studies of the tool.

4.2. Conclusions

The MUSE can be a valuable brief assessment tool for clinicians and researchers. This scale differs from existing medication-specific self-efficacy scales as it addresses both learning about one's medications as well as adherence to the prescribed regimen. The similar performance of the MUSE across varying literacy levels is encouraging and suggests it can be used in a wide variety of contexts among varying patient populations.

4.3. Practice implications

The MUSE measures an individual's perceived ability to seek out and understand information about his or her prescribed medicines, and to follow instructions for appropriate use. Although such measurement has the potential to be of great utility for researchers and clinicians alike, regardless of a patient's self-efficacy, or literacy level, communication best practices still apply. Providers are encouraged to adopt a universal approach, always use plain language with all patients, and try to avoid the use of medical jargon [33]. Such a practice may not always be possible, thus providers should define and clarify potentially confusing terms and concepts when they arise. Practitioners should verify patient understanding of information, and incorporate interactive communication strategies such as using the "teach back" technique during clinical encounters with patients in order to ensure adequate comprehension and promote adherence [34,35].

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Table 1

Original MUSE scale items.

Original scale items	
1.	It is easy for me to take my medicine on time.
2.	It is easy for me to ask my doctor questions about my medicine.
3.	It is easy for me to ask my pharmacist questions about my medicine.
4.	It is easy for me to understand my doctor's instructions for my medicine.
5.	It is easy for me to understand my pharmacist's instructions for my medicine.
6.	It is easy for me to understand instructions on medicine bottles.
7.	It is easy for me to get all the information I need about my medicine.
8.	My medicines are easy to take.
9.	It is easy to remember to take all my medicines.
10.	It is easy for me to set a schedule to take my medicines each day.
11.	It is easy for me to learn how to take my medicines.
12.	It is easy for me to take my medicines every day.
13.	If I miss a dose of my medicine, it is easy for me to know what to do.
14.	I am confident that I am able to deal with any unexpected health problems.
15.	If I don't understand something, it is easy for me to ask for help.
16.	I know that I will be able to actively participate in decisions about my health.
17.	<i>It is easy for me to take my medicines the way I am supposed to.</i>
18.	Taking my medicines is part of my daily routine.

Items in plain text were eliminated in the first principal components factor analysis due to low factor loadings. The single item in italics was eliminated upon a second principal components factor analysis due to low factor loadings on both factors (<0.30 on both factors). Bolded items are retained in final MUSE scale.

Table 2Sociodemographic characteristics of the sample by literacy level ($n = 267$).

Characteristic	Literacy level			<i>p</i> -Value
	Adequate ($n = 155$)	Marginal ($n = 75$)	Low ($n = 37$)	
Age, $M(SD)$	44.9 (13.1)	51.6 (13.2)	53.2 (11.9)	<0.001
Female, %	67.7	66.7	71.4	0.88
Race, %				<0.001
African American	43.2	74.7	82.9	
White	41.3	14.7	0.0	
Other	15.5	10.6	17.1	
Education, %				<0.001
Grades 1–8	1.9	5.3	14.3	
Grades 9–11	8.4	20.0	37.1	
Completed high school/GED	29.7	50.7	40.0	
>High school	60.0	24.0	8.6	
#of Rx taken daily, $M(SD)$	2.6 (2.9)	3.2 (3.0)	3.5 (2.7)	0.16
Site, %				0.39
Chicago, IL	17.2	22.7	25.8	
New York, NY	25.7	33.3	35.5	
Shreveport, LA	57.1	44.0	38.7	

Table 3

Medication Understanding and Use Self-Efficacy (MUSE) scale.

Items	Factor loading	Eigenvalue	α
<i>Factor 1: Taking medication</i>		2.46	0.77
It is easy for me to take my medicine on time.	0.65		
It is easy to remember to take all my medicines.	0.84		
It is easy for me to set a schedule to take my medicines each day.	0.85		
It is easy for me to take my medicines every day.	0.64		
<i>Factor 2: Learning about medication</i>		1.92	0.68
It is easy for me to ask my pharmacist questions about my medicine.	0.75		
It is easy for me to understand my pharmacist's instructions for my medicine.	0.77		
It is easy for me to understand instructions on medicine bottles.	0.61		
It is easy for me to get all the information I need about my medicine.	0.54		
Variance explained:		55%	

Table 4

Item-total correlations with the MUSE scale, and taking medication and learning about medication subscales.

Scale/items	MUSE	Taking medication subscale	Learning about medication subscale
<i>Taking medication</i>	0.89	1.00	0.42
It is easy for me to take my medicine on time.	0.67	0.73	0.35
It is easy to remember to take all my medicines.	0.74	0.83	0.35
It is easy for me to set a schedule to take my medicines each day.	0.71	0.81	0.31
It is easy for me to take my medicines each day.	0.60	0.69	0.28
<i>Learning about medication</i>	0.79	0.42	1.00
It is easy for me to ask my pharmacist questions about my medicine.	0.50	0.23	0.68
It is easy for me to understand my pharmacist's instructions for my medicine.	0.53	0.26	0.71
It is easy for me to understand instructions on medicine bottles.	0.58	0.33	0.69
It is easy for me to get all the information I need about my medicine.	0.60	0.35	0.72