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## Evaluating the Validity and Reliability of the Beliefs About Medicines Questionnaire in Low-Income, Spanish-Speaking Patients with Diabetes in the United States

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### Abstract

**Purpose**—The purpose of this study was to examine the reliability and validity of a Spanish version of the Beliefs About Medicines Questionnaire (BMQ) as a measure to evaluate beliefs about medications and to differentiate adherent from nonadherent patients among low-income Latino patients with diabetes in the United States.

**Methods**—Seventy-three patients were administered the BMQ and surveyed for evidence of medication nonadherence. Internal consistency of the BMQ was assessed by Cronbach's alpha along with performing a confirmatory factor analysis. Criterion validity was assessed by comparing mean scores on three subscales of the BMQ (General Overuse, General Harm, and Specific Necessity-Concerns difference score) between adherent patients and patients reporting nonadherence for three different reasons (unintentional nonadherence, cost-related nonadherence, and nonadherence due to reasons other than cost) using independent samples t-tests.

**Results**—The BMQ is a reliable instrument to examine beliefs about medications in this Spanish-speaking population. Construct validity testing shows nearly identical factor loading as the original construct map. General Overuse scores were significantly more negative for patients reporting each reason for nonadherence compared to their adherent counterparts. Necessity-concerns difference scores were significantly more negative for patients reporting nonadherence for reasons other than cost compared to those who did not report this reason for nonadherence.

**Conclusions**—The Spanish version of the BMQ is appropriate to assess beliefs about medications in Latino patients with type 2 diabetes in the United States, and may help identify patients who become nonadherent to medications for reasons other than out of pocket costs.

## Introduction

Adherence to a medication regimen is central to the proper management of chronic health conditions in general, and is critical to improving glycemic control and preventing complications for individuals with diabetes, specifically.<sup>1-4</sup> However, adherence to medications is not a simple task considering its multifactorial nature.<sup>5</sup> Studies have reported a variety of factors that may lead a patient to be nonadherent, including increasing costs of medications<sup>6</sup>, shared or personal beliefs about the potential harms of medications<sup>7</sup>, and lack of social support.<sup>7-10</sup> Such barriers to adherence are especially taxing on patients from low socioeconomic backgrounds<sup>7,11,12</sup>, most likely due to a lack of resources to support disease management. Latinos, particularly immigrants of Mexican descent, have lower levels of socioeconomic status and decreased levels of access to health insurance in comparison to their non-Hispanic White counterparts<sup>13</sup>. Understanding barriers to medication adherence may improve health outcomes for ethnically diverse patients with chronic illness.

Central to improving medication adherence is the understanding of a patient's reasons for nonadherence.<sup>14</sup> Existing measures of nonadherence can identify patients who exhibit unintentional nonadherence (due to forgetfulness or difficulty getting to the pharmacy<sup>15</sup>), intentional nonadherence due to cost<sup>16</sup>, or intentional nonadherence due reasons other than cost (concerns about side effects or a lack of benefit from the medication<sup>16,17</sup>). Unintentional nonadherence could possibly be remedied through automated reminders, social support or mail-order refills<sup>18-20</sup>. Likewise, intentional nonadherence due to cost can be reduced by lowering the out of pocket costs of medications<sup>21,22</sup>. Intentional nonadherence due to reasons other than cost, however, can be difficult to address as many patients do not communicate these negative beliefs to their health providers<sup>23-25</sup>. For this reason, identifying patients with negative beliefs about medications may help providers address these concerns and prevent future nonadherence, especially for the many patients who never initiate a newly prescribed medication<sup>26</sup> or discontinue the medications soon after starting<sup>27</sup>.

The Beliefs about Medicines Questionnaire (BMQ) has been used to identify patients with negative beliefs about medications that may lead to nonadherence<sup>28,29</sup>. The BMQ has been administered in various patient populations with different diagnoses, including chronic conditions such as asthma, hypertension, and HIV<sup>30-32</sup> and across diverse cultural groups<sup>33</sup>. Although the BMQ has been translated into Spanish and validated in previous studies conducted in Spain<sup>34-36</sup>, it has not yet been validated for use with Spanish-speaking Latino patients with diabetes living in medically underserved communities within the U.S. Because negative beliefs about medications are an important contributor to nonadherence in this population<sup>7</sup>, this study aims to assess the reliability and validity of a Spanish translation of the BMQ in order to (1) evaluate patient beliefs about medications, and (2) discriminate adherent from nonadherent patients among low-income, Latino adults with diabetes living in the U.S.

## Methods

### Design

The present study is a cross-sectional observational study of a subset of patients participating in the EMPATHy Toolkit randomized clinical trial<sup>37</sup>.

### Setting and Sample

**Parent study**—The sample for the current study consisted of a subset of participants in a larger parent study, described in detail elsewhere<sup>37</sup>. In short, participants for the parent study were recruited from a university-affiliated Federally Qualified Health Center (FQHC) in Santa Ana, California that predominantly serves low-income, ethnic minority patients, mostly of Hispanic ethnicity. Patients who met the following criteria were recruited: (1) age 18 and older; (2) poorly controlled type 2 diabetes (as indicated by A1C >7.5% (53 mmol/mol), LDL cholesterol >100 mg/dl (2.59 mmol/l) or systolic blood pressure >140 mmHg), (3) Hispanic ethnicity, and (4) English or Spanish speaking. Two hundred eighty-five eligible patients were approached before their regularly scheduled diabetes appointments. Of these, 210 (73.7%) consented to participate in the parent study.

**BMQ validation subset**—A subset of participants (the “BMQ validation subset”), recruited consecutively at the end of the parent study (N=73), was asked to complete an additional questionnaire about their medication-related beliefs (BMQ) and adherence behaviors. Participants in this BMQ validation subset comprise the analytic sample for this study.

### Measures

Participants in the BMQ validation subset were asked to complete a Spanish language version of the BMQ, adapted from a version developed and validated for use in Spain in a previous study<sup>35</sup>, during the baseline visit, in addition to obtaining measures collected as part of the parent study protocol.

**The Beliefs About Medicines Questionnaire (BMQ)**—The BMQ is an 18-item questionnaire consisting of two sections—the BMQ-General, which assesses the patient’s beliefs about medications in general, and the BMQ-Specific, which assesses beliefs about the patient’s specific medications<sup>38</sup>. The questionnaire has been utilized and validated in numerous clinical studies since then, including those investigating nonadherence in patients with diabetes<sup>38–41</sup>. The BMQ-General examines a person’s ideas about medicines in general, and consists of two sub-scales: General-*Overuse* and General-*Harm*. The BMQ-Specific, on the other hand, focuses on a person’s ideas about specific medicines that are prescribed for personal use, and also consists of two sub-scales: Specific-*Necessity* and Specific-*Concern*.

In this study, responses to the BMQ items were collected using a Likert scale (1 through 5), allowing the study participants to choose where they lie in agreement with each of a series of statements (“1” meant “Strongly Agree,” whereas “5” meant “Strongly Disagree”). The responses from each subscale were reverse coded as needed and averaged so that higher

scores correspond with a higher endorsement of beliefs described by the scale. Furthermore, following the Necessity-Concerns Framework posited by Horne and colleagues<sup>33</sup>, the difference between Specific-*Necessity* and Specific-*Concern* subscale scores was calculated for each patient in order to evaluate the patient-perceived benefit-cost analysis of medications.

Prior to data collection, the Spanish language items from a version of the BMQ that was previously validated in Spain<sup>35</sup> were reviewed for reading level and idiomatic compatibility with Latin American Spanish by a research staff member who is a native speaker of Latin American (Mexican) Spanish and is experienced working with Spanish-speaking patients in medically underserved communities in the U.S. Items for which the translation was not deemed appropriate for the target population were re-translated from English into Latin American Spanish by the staff member, and back-translated for verification by a second native Latin American (Mexican) Spanish speaker on the study team. The adapted questionnaire is compared to the original English version in Table 1.

**Characterization of Nonadherence Behaviors**—A brief baseline survey was administered to all participants prior to the study intervention. It included a 15-item questionnaire that asked about medication nonadherence behaviors within the past three months prior to the study visit. The questionnaire was adapted from a measure used in a national survey of Medicare beneficiaries<sup>16</sup> that has been used in previous research on contributors to suboptimal diabetes outcomes in low-income Latino patients.<sup>7,42</sup> Such responses were then used to characterize the nonadherence behaviors into three main types: (1) cost-related nonadherence, (2) nonadherence due to reasons other than cost, such as doubts about the medications' effectiveness or concerns about side effects, and (3) unintentional nonadherence, such as forgetting to take their medication.

**Out of pocket costs**—The patient's total monthly out of pocket costs for medications were assessed using a single question, "On average, how much do you spend on your medications per month?"

### Statistical analysis

All statistical analyses were performed using SPSS version 23.0 (IBM Corp, Armonk, NY). Participant characteristics were compared between adherent and nonadherent groups using univariate statistics. Internal consistency was assessed via the Cronbach's alpha for each BMQ domain. The construct validity of the BMQ was then evaluated using a confirmatory factor analysis with a two-factor structure for each of the BMQ sections, which replicated the original BMQ validation study<sup>38</sup>.

Finally, the convergent and discriminate criterion validity was tested by comparing BMQ mean scores, and out of pocket medication costs, for patients that did and did not report each type of nonadherence behavior. Specifically, it was posited that the convergent and discriminant criterion validity of the measures would be supported by the following pattern of associations (summarized in Table 2).

1. Patients exhibiting any type of nonadherence (unintentional, intentional related to cost and intentional for reasons other than cost) would report more negative beliefs on the BMQ-General Overuse and BMQ-General Harms subscales than adherent patients,
2. Patients reporting intentional nonadherence for reasons other than cost, but not patients reporting unintentional nonadherence or intentional nonadherence related to costs would report significantly more negative beliefs on the BMQ Specific Necessity-Concerns measure than their adherent counterparts on those measures, and
3. Patients reporting intentional nonadherence related to cost, but not patients reporting unintentional nonadherence or intentional nonadherence for reasons other than cost would report significantly higher out of pocket costs than their adherent counterparts on those measures.

## Results

Characteristics of the BMQ Validation subset sample ( $N = 73$ ) are described in Table 3. Of these patients, 61% reported unintentional nonadherence, 75% reported intentional nonadherence for reasons other than cost, and 26% reported cost-related nonadherence.

### Internal Consistency

The internal consistency of this Spanish version of the BMQ was examined in order to assess whether items under a particular construct produce similar scores to one another. The Cronbach's alpha was found to be .678 for the BMQ-Specific and .774 for the BMQ-General scales. The Cronbach's alpha for the subdomains of the BMQ-General were .786 and .694 for General-*Overuse* and General-*Harm*, respectively.

### Construct Validity

The construct validity of the BMQ in a Latino, Spanish-speaking population in Southern California was assessed through confirmatory factor analysis. The original measure development study<sup>38</sup> used exploratory factor analysis of 34 novel items to identify the factor structure that informed the selection of the final 18 items that comprise the BMQ, and guided the grouping of those items into the four BMQ subscales. Then, in the present study, confirmatory factor analysis of the Spanish translation of this measure was performed to examine whether this original factor structure of the BMQ is retained in the responses of U.S.-dwelling, Spanish-speaking Latino patients with diabetes.

Table 4 contains the two-factor structure of the 10-item BMQ-Specific. Each item loaded onto a single factor and did not display split loading. All five of the Specific-*Necessity* items loaded onto Factor 1. Similarly, all five of the Specific-*Concern* items loaded onto Factor 2. This 2-factor structure accounted for 48.6% of the total variance explained for the components of the BMQ.

Similarly, Table 5 shows the two-factor structure factor analysis of the 8-item BMQ-General. For the General-*Overuse* subdomain, three items loaded onto Factor 1. The four General-

*Harm* items loaded onto Factor 2. Thus, most items of the BMQ-General loaded appropriately. Only item Q4, 'Natural remedies are safer than medications,' demonstrated split loading between Factor 1 and 2. This two-factor structure accounted for 59% of the total variance explained for the components of the BMQ.

### Criterion Validity

Criterion validity was examined by comparing the mean scores of the BMQ subscales between adherent versus nonadherent respondents for each adherence outcome. Figure 1 shows the results of the independent samples t-tests comparing the General-*Overuse* mean score (Figure 1a), General-*Harm* mean score (Figure 1b), Specific-*Necessity-Concern* difference score (denoted as Sn-Sc, see Figure 1c) and mean monthly out of pocket cost of medications (Figure 1d) for adherent versus nonadherent respondents for each type of nonadherence. General-*Overuse* mean scores are higher in the groups that demonstrated unintentional nonadherence ( $P=0.003$ ), nonadherence not due to cost ( $P=0.001$ ), and cost-related nonadherence ( $P=0.001$ ) compared to their counterparts that reported adherence to their medications. General-*Harms* scores did not differ between adherent vs nonadherent patients for any adherence outcome. There is a significant difference in Sn-Sc score in patients who reported nonadherence not due to cost versus those that reported adherence (mean  $\pm$  SD= $0.77 \pm 0.90$  vs.  $1.30 \pm 1.03$ ;  $P=0.04$ ). Additionally, out of pocket monthly cost of medications differed between those who reported cost-related nonadherence compared to those who did not (mean  $\pm$  SD= $\$78.58 \pm \$80.17$  vs.  $\$29.39 \pm \$61.56$ ;  $P<0.001$ ).

### Discussion

This study assessed the validity and reliability of the Beliefs about Medicines Questionnaire in a patient population of Spanish-speaking Latinos with uncontrolled diabetes. The results of this study showed that the Spanish-language 18-item BMQ is reliable in this study population, as evidenced by acceptable Cronbach's alpha scores. The factor structure of the translated items is comparable to the original concept map proposed by Horne, et al<sup>38</sup>, and supports the construct validity of the measure in this population. Furthermore, the results of the criterion validity testing demonstrate that the domains of the BMQ are able to predict certain types of nonadherence outcomes and therefore may be useful in targeting patients that may be at risk of medication nonadherence.

Internal consistency testing demonstrated fair to moderate Cronbach's alpha values (.678 to .786). These values are consistent with other studies that have tested the BMQ in other patient populations<sup>28,43,44</sup>. Thus it can be concluded that the BMQ is a useful and reliable measure of patient beliefs about medications, including for a Spanish-speaking Latino population.

Confirmatory factor analysis of the BMQ demonstrated adequate factor loading for both domains. For the BMQ-Specific in particular, the items that loaded onto Factors 1 and 2 are well represented by the established constructs of Specific-*Necessity* and Specific-*Concern*, respectively. The items of the BMQ-General, conversely, did not load as strongly. The items that loaded onto Factors 1 and 2 most likely represent General-*Overuse* and General-*Harm*,

respectively; however, the factor analysis demonstrated split loading of the item “Natural remedies are safer than medicines.”

This deviation from the original concept map may be explained in part by cultural variations in usage of natural therapies. According to the 2002 National Health Interview Survey, Hispanics were the second largest ethnic group to report the utilization of complementary and alternative medicine (CAM). Hispanic older adults in particular had greater odds of utilizing CAM compared to their White counterparts<sup>45</sup>. Increased likelihood of utilization of CAM may reflect greater trust in natural remedies, which can in turn translate into mixed beliefs regarding the usage of allopathic medications, thus skewing the construct validity of this particular item. Overall, however, the factor analysis of the Spanish BMQ demonstrated valid measurement of the constructs, signifying that the BMQ scores can provide accurate information regarding the nature of the beliefs that affect medication adherence.

The intention of the criterion validity testing was to evaluate the accuracy of the BMQ scores to reflect an established measure of medication nonadherence<sup>16</sup>. According to the hypotheses of this study, if the Spanish BMQ were valid, stronger negative beliefs towards medications (defined by low *Specific-Necessity* mean scores or high *Specific-Concern*, *General-Overuse*, and *General-Harm* mean scores) would correlate highly with the presence of nonadherence behaviors. Particularly, the results of the criterion validity testing demonstrate that the *General-Overuse* subdomain was significantly associated with all three of the nonadherence behaviors. In other words, patients that reported nonadherence behaviors had greater mean *General-Overuse* scores compared to patients that reported adherence to their medications. Contrary to the study hypotheses, the *General-Harm* measure did not discriminate adherent from nonadherent patients on any of the nonadherence measures.

Additionally, the *Specific-Necessity-Concern* difference score was significantly associated with intentional nonadherence due to reasons other than cost. Patients that reported nonadherence for other reasons had a narrower difference between the *Specific-Necessity* and *Specific-Concern* mean scores. This implies that patients who believed that the risks of taking their medications (i.e. concerns) outweighed the benefit (i.e. necessity) were more likely to report intentional nonadherence due to reasons other than cost. This is consistent with the current literature, particularly in reference to the *Necessity-Concerns Framework*, which contextualizes the effect of this risk-benefit analysis on medication adherence. According to a meta-analysis inclusive of 94 studies that utilized the BMQ, higher adherence was associated with stronger perceptions of necessity of treatment and fewer concerns about medications<sup>33</sup>.

Furthermore, as a reference for the criterion validity testing, out of pocket monthly cost of medications was compared across adherence categories for all three forms of nonadherence. As expected, the results demonstrated that cost was significantly associated with cost-related nonadherence. Patients that reported cost-related nonadherence paid on average \$50 more per month for their medications than their adherent counterparts. A systematic review by Briesacher, et al. reported an established link between medication adherence due to cost, particularly in the presence of underlying financial burden<sup>46</sup>. This review also revealed that



heavy disease burden is also a contributing factor toward nonadherence<sup>46</sup>. Therefore, a possible next step for this measurement study would be to evaluate the effect of disease severity and patient-perceived burden on nonadherence behaviors, cost, and BMQ scores.

There are several limitations to this study. First, data were collected using a single cross-sectional survey. Therefore, a causal relationship between long-term beliefs and perceptions of medications cannot necessarily be inferred. For example, it is unclear if beliefs about medications lead to nonadherence or nonadherent behaviors persuade patients to alter their beliefs. Second, the focus of the study is to assess beliefs about medication adherence and not other adherence behaviors that are also critical for diabetes management, such as diet and exercise modifications. Third, the results are based on self-reported nonadherence, which is subjective by nature. For future studies, more objective measures of medication adherence, such as medication electronic monitoring system (MEMS) bottle caps that record each time a medication bottle is opened<sup>5</sup>, can be used. Fifth, because the study population consisted of Latino, Spanish-speaking patients with diabetes living in the United States, the results may not generalize to other populations.

Finally, although the content validity (i.e. the extent to which the measure represents all relevant facets of a construct) of the original BMQ was established through the item-generation process described in the original measure development study<sup>38</sup>, the content validity was not formally re-evaluated in the present study. Instead, consistent with other studies demonstrating the reliability and validity of the BMQ in novel populations and languages<sup>34–36</sup>, the study provides evidence for the internal consistency, construct validity and criterion validity to guide other investigators' evaluation of the BMQ for use in U.S.-dwelling Latinos with diabetes. It is possible, however, that additional tailoring of the item content may further improve the performance of the measure in this population.

### Implications for practice

The BMQ has been used extensively in clinical practice to predict adherence<sup>30–33</sup>. It is a practical and useful instrument that can help guide the patient-clinician discussion regarding disease management and can facilitate the communication of concerns that the patient may have regarding taking medications<sup>33</sup>. In this sense, the BMQ is effective in identifying patients at risk of medication nonadherence in order to further provide support and intervention. The assessments of validity and reliability that were employed in this study suggest that the measure is appropriate for use in Latino patients with diabetes living medically underserved communities in the U.S.

Studies on medication adherence and barriers to treatment are particularly lacking for minority and underrepresented patient populations, especially those that speak a language other than English<sup>35</sup>. Health beliefs—whether they are shared among community members or only held by the individual—have critical implications on an individual's disease management and perceptions of medication use. The findings from this study suggest that the beliefs that medications are overused in general may contribute to multiple types of nonadherence behavior, and supports the well-documented finding that higher out of pocket costs contribute to cost related nonadherence.<sup>22</sup> An additional, important implication of the findings is that negative beliefs about the tradeoff of benefits to harms about a specific

medication may contribute to nonadherence for reasons that cannot be addressed simply by reducing out of pocket costs. These negative beliefs can be measured reliably in a high risk population of Latino patients with diabetes living in medically underserved communities the U.S., and may represent an important target for intervention to reduce disparities in diabetes outcomes.

Just as providers can anticipate—and attempt to mitigate—cost-related nonadherence when prescribing expensive medications or unintentional nonadherence for patients with complex regimens or limited support, measures like the BMQ may be useful to help providers anticipate intentional nonadherence for reasons other than cost, and take steps to engage patients in a discussion about those beliefs. The findings support the need for future research to better understand the effects of Latino culture on beliefs about medications, and to develop interventions aimed to promote more positive beliefs about medications in underserved Latino patient populations with great potential to benefit from optimal therapy.

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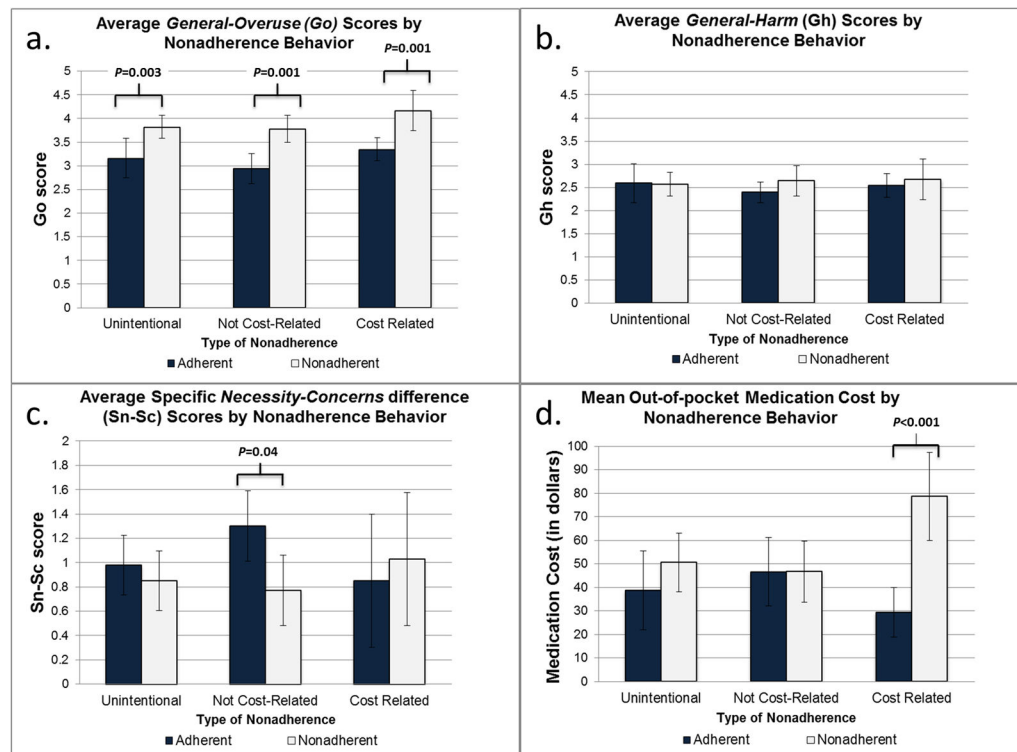
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**Figure 1. Comparing BMQ subscale scores and out of pocket medication costs between adherent vs. nonadherent patients on three measures of nonadherence**

Error bars represent 95% confidence intervals. P-values computed from independent samples t-tests. (a.) BMQ General-Overuse scores were significantly higher (more negative) in patients reporting unintentional nonadherence, nonadherence related to reasons other than cost, and nonadherence related to costs compared to their adherent counterparts; (b.) None of the three nonadherence behaviors were associated with BMQ General-Harm scores; (c.) BMQ Specific necessity-concerns difference scores were significantly lower (more negative) in patients who reported nonadherence related to reasons other than costs compared to those who did not; (d.) Monthly out-of-pocket medication costs were significantly higher in patients who reported nonadherence related to cost compared to those who did not.

**Table 1**English to Spanish translation of the BMQ<sup>a</sup>.

English Version	Spanish Version
<b>BMQ-Specific</b>	<b>BMQ-Especifica</b>
1. My health, at present, depends on my medicines	1. Actualmente mi salud depende de mis medicinas
2. Having to take medicines worries me	2. Me preocupa mis medicinas
3. My life would be impossible without my medicines	3. Mi vida sería imposible sin mis medicinas
4. Without my medicines I would be very ill	4. Sin mis medicinas estaría muy enfermo
5. I sometimes worry about long-term effects on my medicines	5. A veces me preocupo por los efectos a largo plazo de mis medicinas
6. My medicines are mystery to me	6. Mis medicinas son un misterio para mi
7. My health in the future will depends on my medicines	7. En el futuro mi salud dependerá de de mis medicinas
8. My medicines disrupt my life	8. Mis medicinas trastornan mi vida
9. I sometimes worry about becoming too dependent on my medications	9. A veces me preocupo si llego a depender demasiado en mis medicinas
10. My medicines protect me from becoming worse.	10. Mis medicinas impiden que mi diabetes empeore
<b>BMQ-General</b>	<b>BMQ-General</b>
1. Doctors use too many medicines	1. Los médicos utilizan demasiados medicamentos
2. People who take medicines should stop their treatment for a while every now and again	2. Las personas que toman medicamentos deben dejar su tratamiento por un tiempo de vez en cuando
3. Most medicines are addictive	3. La mayoría de los medicamentos son muy adictivos
4. Natural remedies are safer than medicines	4. Los remedios naturales son más seguros que los medicamentos
5. Medicines do more harm than good	5. Los medicamentos hacen más daño que bien
6. All medicines are poisons	6. Todos los medicamentos son venenosos
7. Doctors place too much trust on medicines	7. Los médicos ponen demasiada confianza en los medicamentos
8. If doctors had more time with patients they would prescribed fewer medicines	8. Si los médicos pasaran más tiempo con los pacientes ellos prescribirían menos medicamentos

<sup>a</sup>The Beliefs about Medicines Questionnaire (BMQ) is an 18-item questionnaire, with each item eliciting ratings of agreement with a statement on a Likert scale (1 through 5, where "1" meant "Strongly Agree (Muy de Acuerdo)," "2" "Agree"(De Acuerdo), "3" "Neutral" (Neutral), "4" "Disagree" (No de Acuerdo) whereas "5" meant "Strongly Disagree" (Muy en Desacuerdo)"<sup>33,36</sup>.

**Table 2**Hypothesized associations between BMQ subscales, out of pocket costs and types of nonadherence outcomes<sup>a</sup>

Measures	Nonadherence outcomes		
	Unintentional nonadherence	Nonadherence related to cost	Nonadherence related to beliefs
BMQ General Overuse	+	+	+
BMQ General Harms	+	+	+
BMQ Specific-Necessity difference score			+
Out of pocket costs		+	

<sup>a</sup>Cells marked with a '+' correspond to pairs of measures and nonadherence outcomes for which a statistically significant association would support the convergent criterion validity of the measure. Blank cells correspond to pairs of measures and nonadherence outcomes for which the absence of a statistically significant association would support the discriminant criterion validity of the measure.

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**Table 3**

Patient demographic information.

	Adherent*	Nonadherent*
Age, mean years (SD)**	55.9 (11.5)	54.8 (9.8)
Gender, % (N)***		
Male	80 (20)	66.3 (122)
Female	20 (5)	33.7 (62)
Highest level of education, ** mean years (SD)	8.9 (5.6)	9.1 (4.8)
Nativity, % (N)***		
Born in the U.S.	8 (2)	3.3 (6)
Born outside of the U.S.	92 (23)	96.7 (178)
Pay status, % (N)***		
Out of pocket	40 (10)	37.5 (69)
Insured	60 (15)	62.5 (130)

\* Based on self-reported behaviors of any of the three types of nonadherence. Patients who did not report nonadherence were placed in the adherent group.

\*\* Means compared using independent samples t-test.

\*\*\* Means compared using 2-tailed Chi-squared test.

None of the results above were statistically significant ( $P>0.05$ ).



**Table 4**Confirmatory Factor Analysis of BMQ-Specific<sup>a</sup>

Items	Factor 1	Factor 2
Q1. My health, at present, depends on my medicines.	.673	
Q2. Having to take my medicines worries me.		.414
Q3. My life would be impossible without my medicines.	.906	
Q4. Without my medicines I would be very ill.	.883	
Q5. I sometimes worry about the long-term effects of my medicines.		.718
Q6. My medicines are a mystery to me.		.683
Q7. My health in the future will depend on my medicines.	.859	
Q8. My medicines disrupt my life.		.619
Q9. I sometimes worry about becoming too dependent on my medicines.		.537
Q10. My medicines protect me from becoming worse.	.317	
Eigenvalues	3.119	1.743
Percent variance explained	31.2	17.4
Cumulative percent variance explained	31.2	48.6

<sup>a</sup>Table values are varimax rotated factor loadings. Factor loadings <0.3 are not presented in table.

**Table 5**Confirmatory Factor Analysis of BMQ-General<sup>a</sup>

Items	Factor 1	Factor 2
Q1. Doctors use too many medicines.	.865	
Q2. People who take medicines should stop their treatment every now and then.		.697 .795
Q3. Most medicines are addictive.	.584	.528
Q4. Natural remedies are safer than medicines.		.674
Q5. Medicines do more harm than good.		.659
Q6. All medicines are poisonous.	.660	
Q7. Doctors place too much trust in medicines.	.835	
Q8. If doctors had more time with patients, they would prescribe fewer medicines.		
Eigenvalues	3.186	1.540
Percent variance explained	39.8	19.2
Cumulative percent variance explained	39.8	59.0

<sup>a</sup>Table values are varimax rotated factor loadings. Factor loadings <0.4 are not presented in table.