

# DISEASE-RELATED EMOTIONAL DISTRESS OF HISPANIC AND NON-HISPANIC TYPE 2 DIABETES PATIENTS

Garry Welch, PhD; Carolyn E. Schwartz, ScD;  
Paula Santiago-Kelly, RN; Jane Garb, MS; Rebecca Shayne, MPH;  
Rita Bode, PhD

**Background:** Diabetes is a serious chronic illness that disproportionately affects prevalence and comorbidity rates among Hispanic populations. Little comparative research has been conducted on the emotional distress experienced by Hispanic patients living with type 2 diabetes.

**Purpose:** To conduct a psychometric examination of an established measure of emotional distress specific to diabetes and to use this tool to examine levels and predictors of distress in a comparative study of Hispanic and non-Hispanic type 2 diabetes patients.

**Method:** Psychometric analyses were conducted (skewness, kurtosis, differential item function (DIF), confirmatory factor analysis (CFA), internal consistency reliability) to examine the equivalence of US English and US Spanish language versions of a measure of diabetes-related distress (Problem Areas in Diabetes (PAID)). Regression modeling was used to evaluate differences in distress by ethnic group, after adjusting for blood glucose control, sex, age, education, physical functioning, mental health functioning, and spirituality. Psychometric results showed that PAID had high reliability ( $\alpha=0.96$ ). Skewness, kurtosis, and DIF were not present. CFA identified a large general factor, supporting use of the total PAID score. Univariate analyses found a significantly higher mean PAID score for Hispanic patients compared to non-Hispanic ( $45.9 \pm 28.5$  vs  $35.9 \pm 26.4$ ). A final regression model based on age, physical functioning, and mental functioning accounted for approximately 50% of PAID variance.

**Conclusion:** Our findings supported the reliability and unidimensionality of the US Spanish and US English PAID versions for comparative research. Compared to non-Hispanic patients, Hispanic patients reported higher distress, which was substantially predicted from age and physical and mental functioning. (*Ethn Dis.* 2007;17:541-547)

**Key Words:** Type 2 Diabetes, Emotional Distress, Hispanic, Psychometric

From Behavioral Medicine Research (GW, RS), High Street Adult Medical Clinic (PSK), and Department of Surgery (JG), Baystate Medical Center, Springfield, MA; DeltaQuest Foundation, Concord, MA, Social Sectors Development Strategies, Boston, MA, and Department of Medicine,

## INTRODUCTION

Type 2 diabetes is a common and serious medical condition that is reaching epidemic proportions in the United States. Diabetes now affects 7% of the US population, up from 4.9% in 1990.<sup>1</sup> Hispanic populations have a disproportionately higher rate of diabetes than other ethnic groups: they are 1.5 times more likely to have diabetes than non-Hispanic Whites of similar age.<sup>2</sup> Hispanic groups also suffer from more comorbidities of diabetes where rates of retinopathy, nephropathy, and lower limb amputations are higher than those of non-Hispanic Whites. The greater frequency and comorbidities reflect differences in genetic predisposition, disease severity, access to diabetes prevention and control programs, and self management patterns. A complex array of treatment behaviors must be implemented by the patient in the face of domestic and economic responsibilities, competing life priorities, and distracting life events.<sup>3</sup> Cultural, economic, and language barriers to effective diabetes self-management are common and provide additional challenges for the clinical team and patient. It is not surprising that, given the burden of living with diabetes, many patients experience epi-

sodes of emotional distress including guilt, anxiety, frustration, confusion, loneliness, anger, and dissatisfaction with the healthcare system.<sup>4,5</sup> The purpose of the present work is to investigate differences in diabetes-specific emotional distress in Hispanic and non-Hispanic people with diabetes.

Studies to date have shown that high levels of diabetes-related emotional distress as measured by the Problem Areas In Diabetes (PAID)<sup>6</sup> scale are correlated with patient coping, health beliefs, and social support and predict poorer blood glucose control.<sup>6-9</sup> Differences in emotional distress have been found between treatment groups with insulin-using patients experiencing greater distress than those on oral agents or diet only.<sup>10</sup> While this research has advanced our understanding of the role of emotional distress in diabetes, little comparative research among ethnic groups exists. Hispanics represent 13.7% of the US population and are now the largest ethnic group.<sup>11</sup> Generally, there is a paucity of psychological research that focuses on the interaction of culture and ethnicity with diabetes<sup>12</sup> and on the emotional characteristics of cultural and ethnic groups.<sup>13</sup> To our knowledge, no studies have specifically investigated

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University of Massachusetts Medical School, Worcester, MA (CES); Department of Physical Medicine & Rehabilitation, Feinberg School of Medicine, Northwestern University, Chicago, IL (RB).

Address correspondence and reprint requests to Garry Welch, PhD; Behavioral Medicine Research; Baystate Medical Center; 140 High Street, Room 2104; Springfield, MA 01199; 413-794-2012; 413-794-3890; garry.welch@bhs.org

diabetes-related emotional distress among type 2 Hispanic patients and compared these findings with non-Hispanic patients. We therefore conducted a cross-sectional study using a sample of outpatients attending a community health center.

## METHODS

We explored current levels of diabetes-related emotional distress and determinants of this distress among adult Hispanic and non-Hispanic type 2 outpatients. Assessment involved a widely used measure of diabetes-related emotional distress (PAID) that had been translated into US Spanish from US English.<sup>14</sup> We examined the psychometric equivalence of the PAID language versions and conducted a series of regression analyses to compare PAID emotional distress levels for Hispanic and non-Hispanic patient groups attending a community-based internal medicine clinic.

### Patients

Adult type 2 diabetes patients were recruited using a diabetes patient registry at a large neighborhood internal medicine clinic in Springfield, Massachusetts. Hispanic patients comprised 63% of the patient registry and non-Hispanic patients accounted for the remaining 37% (ie, 19% Black, 17% White, 1% Asian). Hispanic is a term not linked specifically to race but rather to culture and nationality and implies a link to South America rather than Spain.<sup>15</sup> Hispanics (or Latinos) can originate from Mexico, Puerto Rico, the Caribbean islands, and Central and South America. In our study almost all Hispanic patients originated from Puerto Rico, reflecting a dominant immigration pattern into the Springfield, Massachusetts area that began in the 1950s.

Two hundred patients (97 Hispanic, 103 non-Hispanic) took part, representing a 70% response rate. The study sample sizes were chosen to meet

minimum requirements for our psychometric and regression analyses.<sup>16</sup> Inclusion criteria were: 1) age >18 years; 2) type 2 diabetes diagnosis >1 year; and 3) willingness to take part in study and sign patient consent form. The hospital institutional review board committee approved the study and all patients gave informed consent in either Spanish or English, including permission to obtain a recent glycosylated hemoglobin test result from clinic records.

Study questionnaires were completed as part of individual patient interviews with the study coordinator (PSK), a bicultural (Puerto Rican) nurse educator fluent in English and US Spanish in written and spoken forms. Eligible patients were contacted by the study coordinator and scheduled for a research visit in the next week when patient informed consent forms were completed. Patients completed the battery of study measures at this visit with the assistance of the study coordinator if literacy, vision, or comprehension issues were identified. The study coordinator's role in this situation was to support those patients to complete the questions by repeating the questions but not actively interpreting or otherwise influencing patient responses. Patients received a stipend for their participation.

### Measures

#### *Demographic data*

Patient demographic information was gathered on age (years), sex, education (years), and race/ethnicity (Hispanic/White/African American/Native American/Asian/Pacific Islander/Other). In addition, the following clinical and psychological assessments were made:

**Glycosylated haemoglobin.** HbA1C is a blood test that provides an estimate of glycemic control for the previous 2–3 months. Baystate Medical Center uses the High Pressure Liquid Chromatography method (Bio-Rad Laboratories, Hercules, CA). The nondiabetic range is

4.0% to 6.0%. Most recent HbA1C was obtained from patient medical charts.

#### *Diabetes-specific emotional distress.*

The PAID is a self-report questionnaire that assesses diabetes-related emotional distress on a 0–100 scale, with higher scores indicating greater distress. The PAID, using 20 items, captures the patient's perspective on the breadth and severity of emotional distress from living with diabetes. There have been numerous published psychometric and clinical reports published on the PAID, but these have principally involved non-Hispanic patient groups. Empirical studies have shown the PAID to: 1) have consistently high internal reliability (ie,  $\alpha > 0.90$ ) in a wide range of treatment settings; 2) have sound ( $r = .83$ ) test-retest reliability among a sample of medically stable patients; 3) correlate strongly with a wide range of theoretically related constructs such as general emotional distress, depression, diabetes self-care behaviors, diabetes coping, and health beliefs.<sup>6–8</sup> Finally, a recent review found good support for the responsiveness of the PAID across diabetes treatment interventions.<sup>17</sup>

#### *Physical and mental health functioning.*

This was assessed using the 12-item SF-12 physical (PCS) and mental health (MCS) summary measures. Test-retest reliability ( $r$ ) for the PCS is .89 and MCS is .76.<sup>18</sup> The SF-12 includes: two questions each on physical functioning, role limitations because of physical health problems, role limitations because of emotional problems, and general mental health (psychological distress and psychological well-being); and one question each on bodily pain, general health perceptions, vitality (energy/fatigue), and social functioning.

#### *Religious denomination and spirituality.*

Spirituality was included in our set of predictors as this construct has been shown to be associated with physical and mental health outcomes.<sup>19</sup> The term spirituality is commonly used as

a broader concept concerned with transcendence and connection with a greater power, within which religious involvement is one aspect.<sup>20</sup> We assessed spirituality with a measure we have used in previous studies;<sup>21–23</sup> the measure is based on the commonly used scale of Gorsuch and McFarlane.<sup>24</sup> Spirituality was assessed by a single question related to emotional or physical state: “How important is spiritual practice to your well-being?” using a 4 point rating scale ranging from “Not at all” to “A great deal.” Religious denomination was assessed as: Catholic/Other Christian/Buddhist/Other.

### Statistical analyses

A comprehensive series of psychometric analyses were conducted to check the item characteristics, reliability and internal structure of the US Spanish and US English language versions of the PAID. Item-total correlations were calculated with a criterion that all items should correlate  $r=.40$  or higher with the total test. Internal consistency (Cronbach's coefficient alpha) was calculated with a criterion that  $\alpha=.80$  or higher would demonstrate sound scale reliability for use in comparison of group means and  $\alpha=.90$  or higher would demonstrate the higher level of reliability needed for use of the scale with individual scores. We examined kurtosis and skewness of total PAID score distributions. Values of 2 or more (regardless of sign) were defined as significant for both skewness and kurtosis. Confirmatory factor analyses (CFA) were conducted to assess the dimensionality of the PAID item set separately for Hispanic and non-Hispanic data. Goodness of fit is usually reported in terms of exact fit (chi-square) and ‘close fit’ indices. Because exact fit statistics tend to be significant with larger sets of items, we used two close fit criteria for acceptable fit: a comparative fit index (CFI) of .95 and a root mean square error of approximation (RMSEA) of .08. Mplus

**Table 1. Descriptive statistics for Hispanic and non-Hispanic groups**

	Hispanic <i>n</i> =97	Non-Hispanic <i>n</i> =99
<b>Continuous Variables</b>		
Age (years)	Mean (SE) 57.2 (1.2)	Mean (SE) 56.2 (1.1)
Blood sugar control HbA1C (%)	7.9 (0.2)	7.9 (0.2)
Diabetes emotional distress (0–100)	45.3 (2.9)	35.1 (2.7)
Physical functioning (0–100)	36.7 (1.1)	38.3 (1.1)
Mental functioning (0–100)	41.7 (0.9)	42.8 (1.4)
<b>Categorical Variables</b>		
	%	%
Sex (% female)	72.2	62.6
Education		
<=Grade 9	59.2	29.5
Some high school	10.2	17.9
High school graduate	21.4	33.7
Some college or college graduate	9.2	18.9
Spirituality importance rating		
A great deal	81.4	62.6
Somewhat	12.4	15.2
A little	6.2	13.1
Not at all	0	9.1
General health perception		
Excellent/very good	9.3	12.1
Good	23.7	30.3
Fair	37.1	41.4
Poor	29.9	16.2
Religious denomination		
Catholic	60.8	30.2
Other Christian	32.0	58.3
Other	7.2	11.5

version 3.2,<sup>25</sup> with polychoric correlations and a weighted least squares (WLSMV) estimator was used to conduct a single-factor CFA. To further explore the factor structure of the PAID, exploratory factor analysis with promax rotation was conducted, also using Mplus. The criterion for determining the number of significant factors was an eigenvalue  $>1$ . Ordinal logistic regression (OLR) technique was used to examine both uniform and non-uniform differential item functioning (DIF) to determine measurement invariance of individual PAID items using a procedure from Zumbo.<sup>26</sup>

Univariate factors associated with PAID were evaluated using ANOVA for categorical factors and Pearson's correlation coefficient for continuous factors. Univariate analyses included age, sex, education, HbA1C, SF-12 physical functioning, SF-12 mental functioning, spirituality well-being rating, and ethnicity. Significant univariate factors (defined as  $P<.2$ ) were candidates for a multivariate

model of PAID predictors using multiple linear regression.<sup>27</sup> All variables listed in Table 1 were tested, using the *t*-statistic to determine significance of individual variables in the regression model. Variables were selected for inclusion in the final model in a backwards stepwise manner, those with the highest *P*-value  $\geq .1$  being dropped from the model at each step. All variables with  $P<.1$  were retained. The Statistical Package for the Social Sciences<sup>28</sup> was used for all analyses.

### RESULTS

Table 1 shows the descriptive data for the study sample of 197 patients in both Hispanic and non-Hispanic ethnic groups. Mean age for both groups was approximately 56 years, with 68% and 45% respectively of Hispanic and non-Hispanic patients having some high school education or less. Seventy percent of Hispanics and 62% of non-Hispanics were female. A large majority

were Catholic or another Christian denomination (90.1%, 85.9%). Mean blood glucose control was approximately 8% for both ethnic groups (ie, indicating poor blood glucose control).

The skewness statistic for the distribution of PAID scores for the Hispanic patient group was .72 and Kurtosis was -1.64 indicating neither was present. Similarly, skewness for the non-Hispanic patient PAID data was .69 and kurtosis -0.71, also indicating no significant skewness or kurtosis. For Hispanic patients, all PAID items correlated  $> .40$  with the total test (range .45 to .88). Similarly, for non-Hispanic patients all items correlated  $> .40$  with the total test (range .55 to .88). PAID internal reliability (coefficient alpha) was high for both Hispanic ( $\alpha=.96$ ) and non-Hispanic ( $\alpha=.96$ ) PAID data.

The CFA dimensionality results for the non-Hispanic sample showed a significant chi-square (64.308;  $P<.001$ ) but good fit using the CFI (.979), and not quite acceptable fit using RMSEA (.097). One item (q15, *satisfaction with diabetes physician*) loaded weaker than the rest (squared item-factor correlation or R-square = .307). The results for the Hispanic sample were lower but still within the good range. The chi-square was significant (88.520;  $P<.001$ ) but the CFI was good (.953) and again, the RMSEA was not acceptable (.143). The same item (q15) loaded weaker than the rest (.393). None of the modification indexes in either analysis were significant; therefore, no modifications to the model specification were required. In the EFAs for the Hispanic and non-Hispanic samples, one strong and one weak factor was identified, with one item (q15) loading on the second factor in both samples. The correlation between factors was moderate (.664 and .625 for non-Hispanic and Hispanic samples, respectively). In summary, despite a relatively weak loading of one out of 20 items, one could conclude that the PAID scale is unidimensional in both Hispanic and Non-Hispanic groups. (Table 2)

**Table 2. Results of PAID principal component loadings by ethnic group**

PAID Item #	Hispanic			Non-Hispanic		
	PC1	PC2	PC3	PC1	PC2	PC3
1	<b>0.73</b>	0.09	-0.35	<b>0.68</b>	0.13	0.29
2	<b>0.76</b>	0.21	0.34	<b>0.81</b>	0.12	0.13
3	<b>0.83</b>	-0.09	-0.26	<b>0.83</b>	-0.21	-0.03
4	<b>0.73</b>	0.01	-0.34	<b>0.69</b>	-0.24	<b>0.43</b>
5	<b>0.76</b>	-0.06	-0.14	<b>0.73</b>	-0.02	<b>0.44</b>
6	<b>0.87</b>	-0.09	-0.23	<b>0.86</b>	-0.16	-0.08
7	<b>0.86</b>	0.03	-0.18	<b>0.83</b>	0.08	-0.13
8	<b>0.84</b>	-0.15	0.05	<b>0.89</b>	0.02	-0.21
9	<b>0.69</b>	-0.26	0.28	<b>0.73</b>	0.00	-0.13
10	<b>0.88</b>	-0.04	0.05	<b>0.86</b>	-0.08	-0.09
11	<b>0.78</b>	-0.26	0.19	<b>0.81</b>	-0.18	0.06
12	<b>0.72</b>	-0.33	0.14	<b>0.76</b>	-0.31	-0.19
13	<b>0.84</b>	-0.21	0.22	<b>0.85</b>	-0.19	-0.12
14	<b>0.79</b>	0.10	<b>-0.71</b>	<b>0.77</b>	<b>0.41</b>	0.21
15	<b>0.54</b>	0.71	0.23	<b>0.45</b>	<b>0.74</b>	-0.15
16	<b>0.84</b>	0.06	0.21	<b>0.79</b>	0.02	-0.21
17	<b>0.81</b>	0.11	<b>0.55</b>	<b>0.86</b>	0.05	0.06
18	<b>0.69</b>	<b>0.54</b>	0.29	<b>0.70</b>	0.16	0.16
19	<b>0.79</b>	-0.03	0.19	<b>0.79</b>	0.08	-0.28
20	<b>0.87</b>	0.02	0.21	<b>0.86</b>	-0.04	-0.05
Mean	0.78	-0.01	0.03	0.78	0.01	0.01
SD	0.08	0.26	0.26	0.10	0.24	0.21
% variance	61.5%	5.6%	5.0%	61.4%	5.4%	4.3%

Note: Significant loadings are in bold

Although Hispanic and non-Hispanic patients significantly differed in total PAID scores ( $t(df=193) = -2.32$ ;  $P<.05$ ), the analyses showed that no items displayed DIF (either uniform or non-uniform). That is, the groups differed in overall level of emotional distress, but when adjustments were made for these differences, they did not differ in their responses to individual items.

Mean PAID scores were significantly higher ( $F=7.46$ ,  $P<.007$ ) for Hispanic ( $45.9 \pm 28.5$ ) compared to non-Hispanic ( $35.9 \pm 26.4$ ) patients. The effect size for the difference in Hispanic and non-Hispanic ( $ES=.35$ ) mean PAID score was in the small-to-moderate range. PAID scores were not significantly associated with educational level, religious denomination, or degree of spirituality but were significantly associated with age, HbA1C, PCS, and MC (Table 3). PAID scores were negatively associated with age ( $r = -0.26$ ,  $p<0.01$ ) and positively associated with HbA1C ( $r=.24$ ,  $P<0.01$ ) (Table 3). Significant negative correlations were found for mental and physical

functioning scores (MCS,  $r=-0.56$ ,  $P<.01$ , PCS,  $r=-0.46$ ,  $P<.01$ ). In the multivariate model, however, HbA1C was no longer a significant independent predictor when PCS and MCS were included in the model. The final model explained 47.7% of PAID variance ( $F(df=186) = 4.186$ ;  $P<.001$ ). Patient age, physical functioning, mental health functioning, and ethnic group were all significant independent predictors of PAID. ( $P<.001$ ) (Table 4)

## DISCUSSION

There is a growing awareness of significant health disparities in the prevention and treatment of diabetes.<sup>29</sup> While there is a sizeable body of research documenting the emotional burden of diabetes for non-Hispanic patients living with this chronic condition,<sup>30-32</sup> little data exists from comparative studies across ethnic patient groups. A systematic exploration of the role of behavioral, attitudinal, emotion-

**Table 3. Results showing significant univariate predictors of diabetes emotional distress**

Variable	Category	Mean PAID	SE
Ethnicity*	Hispanic	45.3	2.9
	Non-Hispanic	35.1	2.7
General Health Perceptions*	Excellent/V.Good	19.1	3.9
	Good	27.1	3.3
	Fair	40.0	2.8
	Poor	64.1	3.6
Variable	Correlation (r)		
Age*	-.26		
HbA1C*	.24		
Mental functioning*	-.56		
Physical functioning*	-.45		

\*  $P < .01$ 

al, and socioeconomic factors could provide important insights that inform clinical management strategies in communities serving diverse populations.

In this paper, we examined disease specific emotional distress among poorly controlled Hispanic and non-Hispanic type 2 patients attending a busy community health center. Our ground-work included a series of comprehensive psychometric analyses of the questionnaire we used to measure diabetes-specific emotional distress. An important methodological issue facing researchers conducting comparative research is to identify sound measurement tools in terms of reliability and validity across target populations. This is particularly important where different language versions of questionnaires are needed. The PAID was originally developed in US English and used principally with patient groups attending tertiary care diabetes clinics. Since then, it has been applied in more

representative socioeconomic settings and a wider range of ethnic groups. For example, studies have involved African American patients attending an inner city hospital<sup>33</sup> and primary care patients participating in an intensive diabetes education program.<sup>34</sup> In these settings, its reliability, face validity, construct validity, and responsiveness were sound.

The psychometric data reported here confirmed that both the US English and US Spanish PAID language versions were reliable, unidimensional measures of diabetes-related emotional distress that could be recommended for similar studies involving Hispanics and non-Hispanic patients. The findings specifically showed that a large general factor was present for both language versions and that the PAID had high internal consistency (above .90). This high level of reliability supports its use both as an individual screening tool and as a tool for group research.<sup>35</sup>

**Table 4. Final regression model including age, mental and physical functioning, and ethnic/racial group as predictor variables**

Variable	Coefficient	Std. Error of $\beta$	T-test	Significance (P)
Constant	161.495	10.902	14.814	<.0001
Age	-0.550	.137	-4.028	<.0001
Physical health functioning	-0.897	.146	-6.128	<.0001
Mental health functioning	-1.023	.140	-7.291	<.0001
Ethnic group	-9.350	2.953	-3.166	<.0018

Note:  $F=42.45(4,186)$   $P<.0001$ ,  $R^2=.477$ 

*The psychometric data reported here confirmed that both the US English and US Spanish PAID language versions were reliable, unidimensional measures of diabetes-related emotional distress that could be recommended for similar studies involving Hispanics and non-Hispanic patients*

A second aim of the study was to explore differences in the level of emotional distress reported by Hispanic and non-Hispanic patient groups attending a community medical center. The patients who took part in the study were predominantly middle-aged, in poor blood glucose control, and female, the latter reflecting the sex-attendance bias generally seen at our community medical center. Greater diabetes emotional distress at the level of a small-to-moderate effect size (ie, .35 of a standard deviation) was found for Hispanic compared to non-Hispanic patients. Our regression analyses showed that this distress was predicted principally by age and physical and mental health functioning. The latter included daily role limitations because of physical and emotional problems, bodily pain, vitality, social functioning, psychological distress and psychological well-being, and general health perceptions. This constellation of variables accounted for half of the variance in perceived emotional distress.

Our findings of a higher level of diabetes emotional distress among Hispanic than non-Hispanic patients may reflect greater difficulties in carrying out daily diabetes self-management among Hispanic patients or the impact of

diabetic complications that create difficulties in functioning and symptom reporting. Alternately, the findings may reflect true differences in cultural expression of emotions.<sup>36</sup> Gordon reported that Puerto Rican patients demonstrated greater expressiveness of pain and higher levels of emotional response to pain than non-Hispanic counterparts.<sup>37</sup> More recent studies have also reported that depressed Hispanics have a greater tendency to somatize emotional distress<sup>38</sup> and that ethnic differences in reported pain were even greater among depressed patients than among non depressed patients.<sup>39</sup> Brodie et al<sup>40</sup> reported that more than half of foreign-born Latinos believe they do not control their destiny, compared to one-quarter of US-born Latinos feel this way, suggesting a higher level of fatalism that could affect diabetes self-care and emotional distress. While this area of research into the relationship between emotional distress and culture and ethnicity is in its infancy, future studies could examine the role of culture, acculturation, and self-identified reference group to the expression of emotional distress in diabetes. Cultural identity, cultural expression and folklore-based explanations of illness, culturally defined stressors and supports, cultural and institutional elements of the clinician-patient relationship including treatment planning practices are embedded in the cultural experience of Hispanic patients living in the United States. More focused and empirically driven research may help us better understand the differences in levels of emotional distress captured by self-report questionnaires of emotional distress that we report here.

One construct included in our exploratory univariate analyses that did not achieve statistical significance was a patient rating of spirituality. Several reasons may exist for this null finding. First, while active religious involvement may be expected to be protective, other risk factors may simply be stronger than any

protective effect of spirituality in this study population. For example, while the sample reported high levels of religious identity and importance of spirituality, the geographic area from which the patients were drawn is economically depressed with elevated levels of unemployment and economic distress compared to other parts of the country.<sup>11</sup> Economic stress may negatively influence a patient's ability to purchase medications, diabetic supplies, eat healthy foods, or arrange for childcare when visiting the doctor. Also, both positive and negative constructs can be defined within spirituality<sup>19</sup> and a teasing out of these differing dimensions may reveal a more complex pattern of relationships with the PAID. Assessing spirituality in depth was not possible in this pilot study and our approach was to use a broadly defined assessment of spirituality and well-being. Future studies could include recently developed multidimensional models and tools targeting spirituality (eg, Daily Spiritual Experiences Scale).<sup>41</sup> The DES would provide a deeper analysis of salient constructs in the realms of religiousness and spirituality that might influence diabetes related self management and emotional distress.

The study had a number of limitations. First, while 70% of patients volunteered to take part in the study, information was not obtained in this pilot study on some salient demographic and clinical characteristics of the non-participants, such as time since diagnosis and the presence or severity of diabetes comorbidities. These characteristics might differentially affect patient reports of diabetes emotional distress across Hispanic and non-Hispanic groups. Metabolic control (HbA1C) was estimated from the most recent laboratory test reported in the patient notes. A more accurate estimate would be obtained by a fasting blood glucose test at the time of PAID questionnaire completion. While literacy and visual limitations were assessed informally by the bicultural project manager and support provided

to each patient who reported difficulties in these areas, we did not formally measure these limitations. Finally, depression influences perceptual processes and is thought to make people less tolerant of pain and physical symptoms<sup>30</sup> but was not specifically measured here, although some items from the mental health subscale we used did assess depression. Depression may influence the presentation of physical symptoms and indeed, a recent study has highlighted the close association between diabetes-specific emotional distress and depression.<sup>42</sup> Future estimates of the emotional impact of diabetes on emotional functioning could be improved by attention to these methodological issues and the findings replicated on larger samples that could accommodate an exploration of African American and White subgroup data within the non-Hispanic population.

In summary, we found empirical support in this study for the psychometric equivalence of US English and US Spanish versions of a measure of diabetes specific emotional distress as well as significant differences in reported emotional distress between poorly controlled Hispanic and non-Hispanic type diabetes patient groups attending a neighborhood medical center. A substantial amount of this distress was explained by age and physical and mental health functioning. While comparative studies of emotional distress in chronic illness across ethnic and cultural groups are clearly in their infancy, this study highlighted a significant difference in emotional response to the experience of type 2 diabetes for Hispanic patients that requires further exploration.

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#### AUTHOR CONTRIBUTIONS

*Design concept of study:* Welch, Schwartz, Garb  
*Acquisition of data:* Schwartz, Santiago-Kelly, Garb

*Data analysis and interpretation:* Welch, Schwartz, Garb, Shayne, Bode

*Manuscript draft:* Welch, Schwartz, Garb, Shayne

*Statistical expertise:* Welch, Schwartz, Garb, Bode

*Acquisition of funding:* Welch, Schwartz  
*Administrative, technical, or material assistance:* Welch, Santiago-Kelly, Shayne  
*Supervision:* Welch, Schwartz