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Psychometrics of the Zarit Burden Interview in Caregivers of Patients with Heart Failure

Sami Y. Al-Rawashdeh, RN, PhD,

Assistant Professor at Hashemite University – Faculty of Nursing, Zarqa-Jordan

Terry A. Lennie, PhD, RN, FAAN, and

Professor at University of Kentucky College of Nursing, Lexington, KY

Misook L. Chung, PhD, RN, FAHA, FAAN

Professor at University of Kentucky College of Nursing, Lexington, KY

Abstract

Background—Identification of family caregivers who are burdened by the caregiving experience is vital to prevention of poor outcomes associated with caregiving. The Zarit Burden Interview (ZBI), a well-known measure of caregiving burden in caregivers of patients with dementia, has been used without being validated in caregivers of patients with heart failure (HF).

Purpose—The purpose of this study was to examine the reliability and validity of the ZBI in caregivers of patients with HF.

Methods—A total of 124 primary caregivers of patients with HF completed survey questionnaires. Caregiving burden was measured by the ZBI. Reliability was examined using Cronbach's alpha and item-total/item-item correlations. Convergent validity was examined using correlations with the Oberst Caregiving Burden Scale (OCBS). Construct validity was demonstrated by exploratory factor analysis and known hypothesis testing (i.e., the hypothesis of the association between caregiving burden and depressive symptoms).

Results—Cronbach's alpha for the ZBI was .921. The ZBI had good item-total ($r = .395 - .764$) and item-item correlation (mean $r = .365$). Significant correlations between the ZBI and the OCBS ($r = .466$ for the caregiving time subscale and $.583$ for the caregiving task difficulty subscale; $p < .001$ for both) supported convergent validity. Four factors were identified (i.e., consequences of caregiving, patient's dependence, exhaustion with caregiving and uncertainty, and guilt and fear for the patient's future) using factor analysis, which are consistent with prior studies. Caregivers with high burden scores had significantly higher depressive symptoms than caregivers with lower burden scores (7.0 ± 6.8 vs. 3.1 ± 4.3 , $p < .01$).

Conclusion—The findings provide evidence that the ZBI is a reliable and valid measure for assessing burden in caregivers of patients with HF.

Corresponding author: Dr. Sami Al-Rawashdeh, Faculty of Nursing-Hashemite University, P.O.Box 330133, Zarqa, 13133 Jordan, +962-5-3903333 Ext. 5396, Fax +962-5-3903351, samiy@hu.edu.jo.

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Keywords

Zarit Burden Interview; Family Caregivers; Heart Failure; Psychometrics

Introduction

Heart failure (HF) is a chronic disorder associated with frequent hospitalizations, high mortality rates, and increased health care expenditures.¹ It is estimated that 5.1 million Americans 20 years or older have HF and prevalence continues to increase.² Self-care of HF is an essential part of the treatment plan. As HF progresses, greater levels of self-care are required from patients, often necessitating more assistance from family caregivers.

Caregivers of patients with HF have reported substantial burden associated with their caregiving responsibility.^{3–5} Family caregiving burden is defined as the experience of physical, psychological, emotional, social, or financial problems due to caring responsibility for an ill family member.⁶ Caregiving burden has been shown to be associated with caregivers' depression and poor quality of life (QoL) as well as patients' poor outcomes including reduced QoL, hospitalization, and death.⁷

Quantification of family caregivers' burden, using a valid and reliable instrument, is vital for clinicians trying to identify caregivers who need intervention. The Zarit Burden Interview (ZBI, 22-item) is one of the most commonly used instruments to assess caregiving burden in clinical and research settings. The ZBI was originally developed to assess burden among caregivers of community-dwelling persons with dementia.^{8,9}

The psychometric properties of the ZBI have been most commonly reported in caregivers of dementia, cancer and brain trauma patients (Table 1). Recently, the ZBI has been used to assess burden among caregivers of patients with cardiovascular disease, especially caregivers of patients with HF.^{7,10–12} However, the psychometric properties of the ZBI have not been reported in this population. Therefore, the purpose of this study was to examine internal consistency reliability, convergent and construct validity of the ZBI in caregivers of patients with HF. We used Cronbach's alpha, item-total and item-item correlations to examine internal consistency reliability. To assess convergent validity, we examined association of the ZBI with the Oberst Caregiving Burden Scale (OCBS), which served as the standard criterion measure. Construct validity was examined using known hypothesis testing and factor analysis. Our known hypothesis was that caregivers with high burden scores would have higher depressive symptoms scores than caregivers with low burden scores. This hypothesis was based on previous findings that caregiving burden and depression were positively correlated across studies of caregivers of patients with various diseases.^{7,13,14} We also conducted exploratory factor analysis to identify the dimensionality of the ZBI. The ZBI was developed as a unidimensional scale, however, dimensionality of the scale is inconsistent among study samples (Table 1) and the dimensionality of the ZBI has not been explored in caregivers of patients with HF.

Methods

Design, Sample and Setting

We used baseline data from a longitudinal study involving both patients and caregivers in which we investigated the effect of family caregivers' emotional distress on outcomes in patients with HF. Patients in outpatient clinics affiliated with two community hospitals and an academic medical center in Central Kentucky were referred by nurses and physicians. Eligible patients and their primary family caregivers were invited to participate in the study. Patients were eligible if they had a confirmed diagnosis of chronic HF; were not receiving active treatment for cancer; did not have history of acute myocardial infarction or hospital admission in the prior three months; and did not have terminal illness or a referral for heart transplantation. Caregivers were eligible if they had no major life-threatening conditions such as HF, cancer, or terminal illnesses. Caregivers were excluded if they had difficulty understanding the study or if they had dementia or Alzheimer's disease. All participants had to be more than 18 years old and able to read, write, and speak English.

Procedures

Approval for the study was obtained from the Institutional Review Board prior to data collection. Following referral, researchers contacted eligible patients and caregivers in the outpatient clinics or by phone. After obtaining informed consent, participants were provided with questionnaires (including demographic data) to complete and return in a stamped and addressed envelope.

Measures

The Zarit Burden Interview (ZBI)—The ZBI consists of 22 items rated on a 5-point Likert scale that ranges from 0 (never) to 4 (nearly always) with the sum of scores ranging between 0–88.⁹ Higher scores indicate greater burden. A score of 17 or more was considered high burden.⁹ The ZBI was developed as a unidimensional measure of burden.^{15–17} However, two to four dimensions have been reported in the literature (Table 1). Dimensions reported include consequences of caregiving, patient's dependence, exhaustion and uncertainty, guilt or self-criticism, embarrassment/ anger or frustration, psychological burden and emotional reactions, personal strain, and role strain. The ZBI's psychometric properties have been extensively examined in caregivers of patients with dementia^{13,18–22} and demonstrate strong evidence for reliability and validity in that population.⁹ The ZBI has also been examined in caregivers of patients with cancer²³ and brain injury.¹⁵ The reported Cronbach's alpha for the ZBI in caregivers of patients with cancer and dementia ranged between .85 and .93.^{13,19–23} Evidence for criterion validity of the ZBI has been demonstrated in caregivers of patients with dementia in whom the ZBI was highly correlated with the Burden Assessment Scale.²² Evidence of ZBI construct validity was demonstrated through strong correlations with the General Health Questionnaire-28, an established measure of distress.²²

The Oberst Caregiving Burden Scale (OCBS)—The modified OCBS (18 items) was used as a criterion in convergent validity testing. The original OCBS (15 item items) was developed to assess caregivers' perceived amount of time and difficulty associated with

caregiving tasks in caregivers of stroke survivors.²⁴ In this study, we used a modified version (18 items) for HF which has been used with caregivers of patients with HF²⁵ to improve the ability of the scale to better identify difficulties faced by this population of caregivers.¹⁶

The modified OCBS has two subscales that measure caregivers' perceived time spent on, and difficulty associated with, caregiving tasks. All items are rated on a five point scale to indicate the amount of time spent (1 = none to 5 = a great amount) and the level of difficulty (1 = not difficult to 5 = extremely difficult) for each task. Each subscale score is calculated by summing the responses of the time spent and the level of difficulty of each task. The possible score range for each subscale was 18 to 90 and higher scores indicate greater time spent on, or difficulty associated with, the caregiving task.²⁴

Evidence of OCBS reliability has been demonstrated in caregivers of patients with stroke with Cronbach's alpha of .90 for the time subscale and .94 for the difficulty subscale²⁴. Similar Cronbach's alpha of .92 for the time subscale and .88 for difficulty subscale were reported in a sample of 21 caregivers of patients with HF.²⁵ In our study, Cronbach's alpha was 0.92 for the time subscale and .89 for the difficulty subscale.

Patient Health Questionnaire (PHQ-9)—The PHQ-9 is a measure of depressive symptoms and this instrument was used to examine a known hypothesis testing for construct validity. The nine items of the PHQ-9 are based on criteria for the diagnosis of depression in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV).²⁶ Each item is rated on a 4-point scale: 0 “not at all”, 1 “several days”, 2 “more than half the days”, and 3 “nearly every day” during the previous two weeks. The scores range between 0 and 27 with higher scores indicating higher levels of depressive symptoms.^{26,27} Construct and criterion validity have been widely supported as have internal consistency reliability.^{26,28} In this study, the Cronbach's Alpha of the PHQ-9 was 0.91.

We also collected demographic characteristics (e.g., age, gender, marital status, education, employment, and financial status) and health conditions using a structured survey questionnaire.

Data Management and Analysis

Data analyses were performed using the Statistical Package for the Social Sciences version 20 (IBM SPSS Statistics) and an alpha of .05 was chosen as significance level prior to analysis. Data were verified and cleaned prior to analysis.

Reliability—Internal consistency reliability was assessed using Cronbach's alpha coefficient. A coefficient of greater than 0.70 was considered indicative of acceptable internal consistency. Item-total and item-item correlations were used to demonstrate homogeneity of the items as a basis of internal consistency.²⁹ Item-total correlations of more than 0.20 were considered acceptable.²⁹ Item-item correlations were considered acceptable if they ranged between .30 and .70.³⁰ Correlations greater than .70 indicate item redundancy while correlations less than .30 indicate the item is not related to other items in the scale.³⁰

Validity—Convergent validity was evaluated by Pearson correlation between ZBI scores and OCBS scores. Evidence of construct validity was demonstrated through hypothesis testing and factor analysis. The hypothesis that depressive symptoms would be higher in caregivers with higher burden scores was tested by independent sample t-test to compare differences in depressive symptom levels between caregivers with high burden (ZBI 17) to caregivers with lower burden.

Exploratory factor analysis using Principal Component Analysis was conducted to examine dimensionality of 21 items. The item that measures global burden was excluded from the analysis as in previous studies.^{19,20} The Bartlett's test and the Kaiser-Meyer-Olkin index were used to assess of suitability of data for factor analysis. If Bartlett's test is significant ($p < .05$), the correlation matrix for the data is appropriate to conduct factor analysis. When the Kaiser-Meyer-Olkin value was greater than .7, sampling of the data was considered adequate. Factors were extracted on the basis of the Eigenvalues > 1 . Extracted factors were rotated using varimax rotation with Kaiser Normalization. Any item with a difference between loadings less than .20 was considered cross-loaded. Loadings less than 0.3 were ignored.³¹ Loading size and conceptual consideration were taken into account in determining the appropriate categorization of items on factors.

Results

Sample Characteristics

A total of 143 caregivers completed baseline assessment in the parent study, but we included only those 124 primary family caregivers of patients with HF who had no missing data on study variables (Table 2). The mean age of caregivers was 56.4 years. Most of the caregivers were female, Caucasian, married or cohabitating, and helping patients on a daily basis. About one third of the caregivers (37%) were healthy without having a health condition. Hypertension was the most common health condition among caregivers followed by diabetes. Only one third of caregivers were employed full or part-time outside the home. Slightly less than 20% reported not having enough income to make ends meet.

Reliability

Cronbach's alpha for the ZBI was .92, indicating adequate internal consistency. The item-total correlations of the ZBI were acceptable, ranging from 0.40 to 0.76. The Cronbach's alpha did not change significantly when deleting any item, remaining close to the full scale Cronbach's alpha of .92. Table 3 shows item means, standard deviations and item-total correlations. The item-item correlations were significant and ranged between .30 and .70 except for item #20 (feel could to do more for the patient) and #21 (feel could do a better for the patient). Item #20 and #21 had weak correlation less than .30 across almost all other items. High item-item correlations were found between item 11(having inadequate privacy) and item #12 (suffering in social life) at .80 and item 20 (feel could do more for the patient) and item #21 (feel could do a better for the patient) at .82. The mean item-item correlation was .365.

Validity

Convergent validity was supported by a significant positive correlation between ZBI scores with the time and difficulty of caregiving tasks on the OCBS (Pearson's $r = .466$ and $.583$, $p < .001$, respectively). The hypothesis for construct validity was supported. As predicted, caregivers with a high level of burden (ZBI 17) had more than double the mean depressive symptom score of caregivers with lower burden scores (7.0 ± 6.86 vs 3.11 ± 4.35 , $t(77.69) = 3.56$, $p < .01$)

The Bartlett's test ($p < .001$, appropriate correlation matrix for the analysis) and the Kaiser-Meyer-Olkin index (.864, sampling adequacy for analysis) indicated that the data were appropriate for factor analysis. Four factors had Eigenvalues > 1 and explained 62.8% of the variance (Table 4). The four factors identified were consequences of caregiving on the caregiver; patient's dependence; exhaustion with caregiving and uncertainty; and guilt and fear for the patient's future.

The results of item loading on each factor are presented in Table 4. Ten items loaded on the Factor I, Consequences of Caregiving, with a value > 0.4 . Three items in Factor I (item # 3, 9, and 10) cross-loaded on the Factor II, Patient Dependence, but they conceptually fit with Factor 1. Three items (Item # 8, 1, and 14) loaded on factor 2 only and they are related to patient's dependence. Item #17 was also cross-loaded on Factor III but it conceptually fit with Factor I. Five Items (item # 4, 13, 16, 18, and 19) with the strongest loading on Factor 3 conceptually fit into a factor related to caregivers' feelings of exhaustion and uncertainty about caregiving. Item #4 (embarrassed of patient behavior) on Factor 3 cross-loaded on Factor 2 but we concluded that it conceptually fit into one to caregivers' feelings of exhaustion and uncertainty. Lastly, 3 items (item # 7, 20, and 21) loaded on factor 4 were related to caregivers' feelings of guilt (can do better) and fear about the patient's future.

Discussion

The results of this study provide support for the reliability and validity of the ZBI as a measure of caregiving burden in caregivers of patients with HF. There was good evidence of reliability as indicated by acceptable Cronbach's alpha. A Cronbach's alpha of more than 0.90 may indicate item redundancy,²⁹ but in the current study no significant changes were observed when any item was deleted and none of the item-total correlations were less than 0.30, indicating that all items contribute to the scale. Cronbach's alpha in this study was similar to that seen in previous studies.^{13,19–22} The mean item-item correlation, a useful index of internal consistency fell within the acceptable range of .15 – .50.³² All item-total correlations were significantly and positively correlated with the total score supporting the homogeneity of the scale. The low correlations of items 20 and 21 with other items and high correlation with each other could be explained by the fact that these two items are future oriented rather than about current caregiving situation.

We found that the moderate strength of correlations between ZBI and the two subscales (Time and Difficulty) of the OCBS support the convergent validity of the ZBI. In a previous study of 238 caregivers of dementia patients,²² convergent validity was reported by

examination of the association between the ZBI and the Burden Assessment Scale ($r = 0.73$, $P < 0.0001$), a well validated scale that measures objective and subjective caregiver burden.

The known hypothesis that caregivers with a higher level of burden have higher level of depressive symptoms was supported, providing evidence of construct validity of the ZBI. This finding is consistent with results from prior studies in which there was a significant relationship between caregiving burden and depressive symptoms in caregivers of patients with HF,^{4,7} HIV-infected individuals,³³ and mild cognitive impairment.³⁴ This particular finding suggests that the ZBI is a valid measure in caregivers of patients with HF, because similar validity has already been demonstrated in caregivers of patients with other chronic conditions.

Our factor analysis did not support the previously reported unidimensionality of the ZBI. Instead, we identified four factors, consistent with many previous studies (Table 1). In family caregivers of patients with brain injuries, Siegert et al¹⁵ identified two factors: personal strain and role strain. The same two factors also were reported in caregivers of patients with dementia.³⁵ Three factors (i.e., embarrassment/anger, patient's dependency, and self-criticism) were identified in caregivers of patients with dementia in two studies.^{19,20} Three following factors also were identified in study of caregivers of patients with Alzheimer's disease and related disorders: the effect of caregiving on the social and personal lives of caregivers; psychological burden, and feelings of guilt.¹⁸

Although we identified more factors than in other populations, our factors were conceptually similar to factors identified in previous studies.^{15,18,20,21,35} Different studies may produce a different number of factors because providing care for patients with different conditions requires different levels of caregiving involvement. Furthermore, the types of relationships between patients and caregivers may in part explain this phenomenon. Regardless, the variability in factor dimensions across studies supports using only the ZBI total score rather than attempting to use subscale scores based on factor dimensions.

This study was the first comprehensive examination of the ZBI psychometric properties in caregivers of patients with HF. Because the ZBI was developed for caregivers of patients with dementia, there was a concern that the instrument may not measure caregiver burden specific to HF.¹⁶ Specifically, there was concern that items related to cognitive and behavioral impairment common in patients with dementia would not apply to caregivers of patients with HF. However, we found that all items contributed to internal consistency reliability. Our finding is consistent with evidence that decreased cardiac function is associated with impairment of multiple cognitive domains in up to 74% of patients with HF.³⁶ Further, many patients with HF experience moodiness, irritability, memory loss, difficulty concentrating and maintaining attention, confusion, and disorientation. Combined these data provided evidence that that ZBI is both psychometrically and conceptually appropriate for use in caregivers of HF patients

We acknowledge a potential limitation in generalizability. Our sample may not be representative of the whole population of HF caregivers because the majority were female

and Caucasian meaning that males and other ethnic groups of caregivers were under-represented.

Conclusions and Implications

This study provided psychometric support for the ZBI as a measure of caregiving burden in caregivers of patients with HF. We demonstrated strong support for reliability in this population, as well as convergent and construct validity. By factor analysis, the ZBI was shown to be a multidimensional scale but subscale scoring was not proposed or tested. Thus, we recommend that the ZBI total score should be used, rather than specific dimensions or subscales. In conclusion, the ZBI can be used by health care professionals in research and clinical settings to measure burden in caregivers of patients with HF

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Table 1

The reliability and dimensions of the Zarit Burden Index reported in the literature.

1 st author; year	Sample (N); patients population	Reliability alpha (α)	Consequences of caregiving	Patient's dependence	Exhaustion and uncertainty	Guilt or Self-criticism	Embarrassment/ anger or frustration	Psychological burden and emotional reactions	Personal strain	Role strain
Ankri; 2005 ¹⁸	N= 152; Dementia	--	1, 6,11, 12, 13,17	--	--	15,16, 20,21	--	4,5,9,18,19,22	--	--
Knight; 2000 ²⁰	N= 220 ; Dementia	.92	--	2,8, 14	--	20,21	4, 5, 6, 9, 10,11,12, 13,18	--	--	--
Seng; 2010 ²²	N= 238; Dementia	.93, (.89 [*])	--	--	--	--	--	--	--	--
Higginson ; 2008 ²³	N= 64; Cancer	.85	--	--	--	--	--	--	--	--
Siebert; 2010 ¹⁵	N= 222; Brain injury	--	--	--	--	--	--	--	1, 4, 5, 6, 9, 13, 14,16,18,19,	2,3,7,8,10,11, 12,15,17,22
Springate ; 2014 ²¹	N=206; Dementia	.90	2, 3,6, 9, 10, 12,11, 17, 18, 22,	--	--	5, 9, 20, 21	1, 4, 13, 14	--	--	--
Whitlatch ; 1991 ³⁵	N=113; Dementia	--	--	--	--	--	--	--	1,4,5,8, 9,14, 16,17,18,19, 20,21	2,3,6, 11,12,13
Hébert; 2000 ¹³	N= 312; Dementia	.92	--	--	--	--	--	--	17,18,9	13,11,12, 10,2,22, 6,7,3
Flynn Longmire ; 2011 ¹⁹	N= 175 Black &225 White; Dementia	.92 in Black, .93 in White	--	2, 8, 12, 14	--	20, 21	4, 5, 6,9, 10,11,13, 18	--	--	--

Legend: Numbers in the columns under each dimension indicate the item number from the Zarit Burden Index that falls under that dimension.

^{*} Test-retest reliability (n = 149)

Table 2

Characteristics of caregivers

Characteristics	Mean ± Standard Deviation or Number (%)
Gender, female	95 (76.6)
Age, years	56.4 ±14.4
Marital Status,	
Married/Cohabitant	99 (79.8)
Single/widow/divorced/separated	25 (20.2)
Ethnicity,	
Caucasian	113 (91.1)
African American	11 (8.9)
Education, high school	75 (60.5)
Employment,	
Full or part time outside home	42 (33.9)
Retired/homemaker	82 (66.1)
Financial status,	
More than sufficient to get the needs met	33 (26.6)
Sufficient to get the needs met	69 (55.6)
Insufficient to get the needs met	22 (17.7)
Hypertension	55 (44.6)
Diabetes	27 (21.5)
Days helping patient / week,	
7 days	87 (70.2)
Less than 7 days	37 (29.8)
Burden (ZBI),	15.8 ± 12.3
Have burden (ZBI ≥ 17)	51 (41.1)
Oberst Caregiving Burden Scale,	
Time spent on caregiving tasks	32.35 ±10.66
Difficulty of caregiving tasks	22.35 ±5.97
Depressive symptom (PHQ-9)	4.75 ±5.78
Have depressive symptoms (PHQ-9 >9)	21 (16.9)

Table 3

The ZBI mean scores and item-total correlations

No	Item	Mean	SD *	Item-Total Correlation *	Cronbach's α if item
1	Patient asks for more help than he/she needs	.823	.920	.561	.918
2	Not having enough time for yourself	.839	1.02	.741	.914
3	Stressed of fulfilling different responsibilities	.960	1.00	.693	.915
4	Embarrassed of patient behavior	.363	.740	.549	.918
5	Feel angry around patient	.410	.710	.637	.917
6	Negative effect on other relationships	.476	.770	.633	.917
7	Afraid of patient's future	1.87	1.10	.491	.920
8	Patient is too dependent	1.74	1.20	.531	.919
9	Feel strained around patient	.573	.820	.680	.916
10	Health affected by caregiving	.508	.880	.685	.916
11	Having inadequate privacy	.597	.970	.552	.918
12	Suffering in social life	.540	.960	.658	.916
13	Uncomfortable having friends	.258	.700	.548	.918
14	Patient expected you to be the only caregiver	.863	1.20	.583	.918
15	Feel financially stressed	.460	.86	.543	.918
16	Feel unable to take care of the patient much	.194	.500	.458	.920
17	Sense of losing control over life	.540	.890	.764	.914
18	Wish to leave caring of the patient	.137	.440	.474	.920
19	Feel uncertain of what to do	.427	.810	.482	.919
20	Feel should be doing more for the patient	1.23	1.10	.395	.922
21	Feel could do better for the patient	1.27	1.10	.447	.921
22	Feel burdened of caring	.670	.870	.639	.916

* SD: Standard Deviation,

** All correlations are significant at $p < 0.001$.

Table 4
Eigenvalue, percent of variance explained, and items loading into factors with Varimax rotation.

No.	Item	Factors			
		Consequences of caregiving	Patient's dependence	Exhaustion and uncertainty	Guilt and fear for patient's future
Eigenvalue		8.449	1.939	1.558	1.250
Percent of variance explained		40.234	9.235	7.418	5.954
11	Having inadequate privacy	.858	.157	.080	.203
12	Suffering in social life	.852	.097	.015	.096
2	Not having enough time for yourself	.630	.487	.210	.092
6	Negative effect on other relationships	.551	.287	.389	.053
17	Sense of losing control over life	.505	.355	.448	.305
5	Feel angry around patient	.489	.271	.358	.265
15	Feel financially stressed	.447	.171	.357	.185
3	Stressed about fulfilling different responsibilities	.491	.551	.185	.155
10	Health affected by caregiving	.460	.549	.304	.055
9	Feel strained around patient	.526	.530	.247	.052
8	Patient is too dependent	.109	.767	.040	.171
1	Patient asks for more help than he/she needs	.164	.766	.095	.072
14	Patient expected you to be the only caregiver	.246	.733	.159	-.004
16	Feel unable to take care of the patient for much longer	.076	.132	.791	.055
18	Wish to leave caring of the patient	.076	.132	.786	.055
13	Uncomfortable having friends	.302	.072	.693	.196
4	Embarrassed of patient behavior	.185	.515	.523	-.098
19	Feel uncertain of what to do	.011	.389	.496	.213
20	Feel should be doing more for the patient	.115	.003	.123	.905
21	Feel could do better for the patient	.180	.009	.170	.875
7	Afraid for patient's future	.176	.337	.111	.583