Adaptation and Psychometric Properties of the PACIC Short Form

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Care for patients with chronic conditions is one of the major challenges in future healthcare.[1] Patients with a chronic condition seek medical care more often than patients without a chronic condition. This may increase the cost of healthcare.[2,3] The Chronic Care Model (CCM), developed by Wagner et al, illustrates a multidimensional framework for improving the quality of chronic care based on 6 key dimensions: organization of healthcare, clinical information system, delivery system design, decision support, self-management support, and community resources.[4] The Patient Assessment of Chronic Illness Care (PACIC) is an instrument widely used to evaluate the quality and patient-centeredness of chronic illness care.[5] It has been developed to measure implementation of the CCM at the level of patients assessing the behavior of professionals and practice teams within their care.[5] It is a validated and reliable instrument for different chronic conditions[6-8] and has been translated into different languages.[9-11]

However, it was found that the development of the structure of the PACIC instrument implicates some methodological limitations.[12-14] The 20-item PACIC based on a 5-factor solution (patient activation, delivery system design/decision support, goal setting/tailoring, problem solving/contextual, and follow-up/coordination) was evaluated with a confirmatory factor analysis. Some research groups showed that this determination of factorial validity, including the distribution of items as well as the option of handling the responses as interval or ratio levels, is the main point of criticism.[13-15] Therefore, a PACIC short form with an adapted response scale was developed to evaluate patient assessment of receiving care congruent with the CCM.

The aim of this study was to translate and examine the psychometric properties of the PACIC short form among patients in Germany with a chronic illness.

METHODS

We performed an observational study in 11 general practices in Germany (8 located in the federal state of Baden-Württemberg, and 3 in the federal state of Thuringia). All practices were teaching sites for medical students of either the University Hospital of Heidelberg or the University Hospital of Jena.

Objectives: The Patient Assessment of Chronic Illness Care (PACIC) is a widely used instrument to evaluate the quality and patient-centeredness of chronic illness care based on the Chronic Care Model (CCM). It is a validated and reliable instrument which consists of 20 items. Additionally, a short form with 11 items was developed. The aim of this study was to translate this short form into German and examine the psychometric properties among patients with a chronic illness in Germany.

Study Design: Observational study design.

Methods: We performed a translation and cultural adaptation of the PACIC short form into German. The German version was externally validated with the 20-item PACIC. Cronbach α, descriptive statistics, and principal component analysis were used to assess psychometric properties.

Results: In total, 264 primary care patients completed the PACIC short form. The PACIC short form showed good convergent construct validity to the 20-item PACIC (Spearman rank correlation 0.82, $P < .001$) and high internal consistency (Cronbach α 0.87). Principal component analysis underlined the 1-dimensional structure of the instrument. No correlation between the mean overall score of the PACIC short form and the number of chronic conditions ($r = 0.068$; $P = .273$) was found.

Conclusions: The PACIC short form showed good to very good psychometric properties and reliable measures regarding patient assessment of receiving care congruent with the CCM. It is a less burdensome instrument which can be used for further research of patients with more than 1 chronic condition.

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Take-Away Points

This study looked at the psychometric properties of the German version of the Patient Assessment of Chronic Illness Care (PACIC) short form among patients with chronic illness.

■ A major challenge for future healthcare is the care of patients with chronic conditions.

■ Results showed that nearly 50% of respondents had more than 3 chronic conditions.

■ The PACIC short form is a reliable instrument with good psychometric properties and can be used for patients with more than 1 chronic condition.

Translation and Cultural Adaption

To adapt the PACIC short form we followed the Principles of Good Practice for the Translation and Cultural Adaptation Process by the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) task force[16] as follows: We received permission from the authors who developed the PACIC short form, Gugiu et al from Western Michigan University, to translate and adapt a German version of the instrument.[13] Two researchers (JS, TF) independently translated the English version of the PACIC short form 11-item scale into German. Divergent results were discussed during consensus meetings with a third researcher (KG). After a linguistic adaptation, no item was assumed to be completely inappropriate.

Recruitment and Data Collection

For recruiting practices we chose a convenience sample of teaching practices working either with the University Hospital of Heidelberg or the University Hospital of Jena. Within the practices of the participating general practitioners (GPs), patients 18 years or older, suffering from at least 1 major chronic condition (defined in accordance with the German Social Code Book V §62),[17] were asked to participate in the survey. Patients with severe cognitive impairment or significant language barriers were excluded from the study by the individual GP of the practice. Patients were asked to fill out a depersonalized paper-based questionnaire and to send it back to the study center. We provided a postage-free envelope but no further financial incentives for patients. Written informed consent was obtained from each participant. At each practice site in Baden-Württemberg, the questionnaire was given to 50 participating patients (45 patients in each of the 3 practice sites in Thuringia). The depersonalized paper-based questionnaire consisted of sociodemographic data, a list of 20 chronic conditions, the 20-item PACIC, and the PACIC short form. All participating practices were supported for recruiting patients with 50 €.

Measures

The PACIC short form consists of 11 items with an 11-point percentage scale ranging from 0% ("Never") to 100% ("Almost"). In addition to the PACIC short form, we measured sociodemographic data with a set of questions from a German standard questionnaire and patients were also asked to select their chronic conditions from a list of 20 conditions, which were used in previous evaluation studies on chronic illness care.[18] The sociodemographic data included questions regarding age, gender, marital status, and education (Table 1). We used the 20-item PACIC to assess convergent construct validity with the PACIC short form, which has been validated within multiple studies.[8-11,19] The items of the long version were scored on a 5-point Likert scale, ranging from "1" ("no/never") to full accordance "5" ("yes/always").

Statistical Analysis

All analyses were carried out using SPSS 18.0 software (SPSS Inc, Chicago, Illinois). The aim of the study was to assess psychometric properties of the PACIC short form and to examine the convergent construct validity with the 20-item PACIC. The reliability was assessed by using Cronbach's alpha, which indicates whether an item of a scale is appropriate for assessing the underlying concept of its scale.[20] Values for Cronbach's alpha range from 0 to 1; the closer they are to 0 the less the items are related to one another. Values above 0.60 are generally considered to indicate satisfying internal consistency and values above 0.80 indicate a high internal consistency. We performed principal factor analysis (eigenvalue >1, varimax rotation) and determined the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's test of sphericity. Convergent construct validity was assessed in terms of a Spearman rank correlation test between means of each item of the PACIC short form and the mean for the 20-item PACIC overall score, as well as between the mean score of the PACIC short form and the mean score of the 20-item PACIC. In this context, correlations often range between 0.2 and 0.6, rarely above; correlations between 0.40 and 0.60 are regarded as good correlations.[21] Frequency distributions and statistical moments were calculated as percentages of patients rating at each level of item. We determined means, standard deviations of means, and missing values on item level to identify potentially inadequate items. Finally, we examined with Spearman rank correlation test the relation between the mean overall score of the PACIC short form and the number of chronic conditions. An alpha level of $P \leq .05$ was used for tests of statistical significance.

Ethical Approval

The study was fully approved by the ethics committees of the medical faculties of the University of Heidelberg and the University of Jena.

RESULTS

In total, 264 out of 535 participants (49%) completed the PACIC short form. Details on sociodemographic characteristics and morbidity are given in Table 1. Almost every second participant (47.0%) has more than 3 chronic conditions. Hypertension (n = 184; 69.7%), back pain (n = 148; 56.1%), osteoarthritis (n = 113; 42.8%), and type 2 diabetes (n = 86; 32.6%) were the most frequently reported chronic conditions.

Factor analysis revealed a 1-dimensional structure of the PACIC short form with explained variance of R^2 = 48.15% (KMO 0.90, Barlett's test of sphericity P <.001). The factor loadings ranged between 0.52 and 0.85. The Spearman rank correlation coefficients ranged between 0.38 for item 6 of the PACIC short form and 0.78 for item 8 of the PACIC short form. For the mean overall scores of the short version and 20-item PACIC, the correlation was 0.82 (P <.001). Details on factor loadings and Spearman rank correlation are given in Table 2. Furthermore, the PACIC short form showed an internal consistency reliability of 0.87 (Cronbach α).

Frequency distributions and statistical moments of the PACIC short form are presented in Table 3. The participants tended to gravitate to both end points, 0% and 100%. The skewness of most of the items was within tolerable

■ **Table 1.** Patient Characteristics

Patient Characteristics	Respondents (n = 264)
Age, y (mean, range)	64.0 (21.0-97.0)
Male, %	48.5
Marital status, %	
Married	69.5
Education, %	
≤8 years school	51.6
>8 years school	48.4
Nationality, %	
German	99.2
Other	0.8
Prevalence of chronic conditions, %[a]	
1 chronic condition	7.2
2 chronic conditions	20.8
3 chronic conditions	24.6
>3 chronic conditions	47.3

[a]Multiple answers were possible.

■ **Table 2.** Factor Loading and Kaiser-Meyer-Olkin Measure for Each of the 11 Items of the PACIC Short Form

What percentage of the time was I...?[a]	Abbreviation	Factor Loading	Kaiser-Meyer-Olkin	Spearman Rank Correlation[b]
Given choices about treatment to think about	PACIC 1 S	0.66	0.90	0.57
Satisfied that my care was well organized	PACIC 2 S	0.64	0.92	0.50
Helped to set specific goals to improve my eating or exercise	PACIC 3 S	0.75	0.88	0.62
Given a copy of my treatment plan	PACIC 4 S	0.56	0.94	0.44
Encouraged to get to a specific group or class to help me cope with my chronic condition	PACIC 5 S	0.59	0.93	0.44
Asked questions, either directly or on a survey, about my health habits	PACIC 6 S	0.52	0.84	0.38
Helped to make a treatment plan that I could carry out in my daily life	PACIC 7 S	0.81	0.90	0.72
Helped to plan ahead so I could take care of my condition even in hard times	PACIC 8 S	0.85	0.87	0.78
Asked how many chronic conditions affect my life	PACIC 9 S	0.83	0.90	0.72
Contacted after a visit to see how things were going	PACIC 10 S	0.62	0.95	0.47
Told how many visits with other types of doctors, like an eye doctor or surgeon, helped my treatment	PACIC 11 S	0.71	0.92	0.61

PACIC indicates Patient Assessment of Chronic Illness Care.
[a]Possible score for each item between 0% and 100%.
[b]Statistical significance P <0.001.

■ **Table 3.** Frequency Distribution and Moments of the PACIC Short Form

Items[a]	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	M	SD	Skew	Kurtosis
PACIC 1 S	21.6	5.2	4.3	3.9	1.7	13.4	5.2	6.5	8.6	6.5	23.3	53.5	38.3	–0.2	–1.5
PACIC 2 S	1.2	1.2	2.4	3.6	2.4	10.3	1.6	7.9	10.3	16.6	42.7	80.1	25.4	–1.3	–0.8
PACIC 3 S	11.0	2.9	3.3	1.6	3.3	12.2	5.7	8.2	12.7	10.6	28.6	66.2	33.7	–0.8	–0.6
PACIC 4 S	21.2	2.4	1.6	1.2	1.6	3.6	1.6	2.8	4.4	9.2	50.4	68.5	41.4	–0.8	–1.1
PACIC 5 S	43.3	6.7	5.5	2.1	2.9	6.7	2.5	2.1	4.6	5.5	18.1	36.6	40.9	0.5	–1.4
PACIC 6 S	7.3	2.8	0.8	1.6	2.4	6.5	2.0	2.8	4.9	9.8	58.9	80.0	32.2	–1.5	0.9
PACIC 7 S	35.1	4.3	3.0	2.6	2.6	10.4	3.5	4.3	4.3	7.8	22.1	45.7	41.4	0.1	–1.7
PACIC 8 S	29.1	3.0	3.4	6.3	3.4	11.4	3.4	5.5	6.8	9.3	18.6	48.1	39.2	0.1	–1.6
PACIC 9 S	26.6	4.5	2.5	4.1	2.0	9.0	3.7	6.1	6.6	8.2	26.6	53.3	40.7	–0.2	–1.6
PACIC 10 S	38.5	4.1	3.7	2.0	2.0	7.4	1.2	3.3	5.3	4.5	27.9	45.5	43.5	0.2	–1.8
PACIC 11 S	15.2	2.8	2.8	2.0	2.0	4.8	4.4	5.2	7.6	7.6	45.6	69.4	38.0	–0.9	–0.8

M indicates mean; PACIC, Patient Assessment of Chronic Illness Care; SD, standard deviation.
[a]Each abbreviation defined in Table 2.

levels, tending to be fairly close to zero. A majority of the kurtosis values removed substantially from zero, which is acceptable.

Table 4 displays details on missing values on item level. We observed non-response rates which range from 4.2% and 12.5% on item level. The highest score of missing values showed item 7 of the PACIC short form with 33 non-responders (12.5%). The lowest score was shown among item 2 of PACIC short form with 11 non-responders (4.2%).

No correlation between the mean overall score of the PACIC short form and the number of chronic conditions ($r = 0.068$; $P = .273$) was found.

■ **Table 4.** Missing Analysis for Each of the 11 Items of the PACIC Short Form

Items[a]	No. responses	Missing values	
		No.	Percentage
PACIC 1 S	232	32	12.1
PACIC 2 S	253	11	4.2
PACIC 3 S	245	19	7.2
PACIC 4 S	250	14	5.3
PACIC 5 S	238	26	9.8
PACIC 6 S	246	18	6.8
PACIC 7 S	231	33	12.5
PACIC 8 S	237	27	10.2
PACIC 9 S	244	20	7.6
PACIC 10 S	244	20	7.6
PACIC 11 S	250	14	5.3

PACIC indicates Patient Assessment of Chronic Illness Care.
[a]Each abbreviation defined in Table 2.

DISCUSSION

The presented study describes good or even very good psychometric properties of the German version of the PACIC short form and shows reliable measures regarding patient assessment of receiving care congruent with the CCM. The results of our study found high internal consistency and good external validity of the 1-dimensional scale. Moderate missing rates, low floor, and ceiling effects on item level support these results.

Compared with the original version of the PACIC short form, the German version shows similar psychometric properties. The development of the original instrument based on data from 2 samples of patients with type 2 diabetes revealed an internal consistency of $\alpha = 0.95$ and $\alpha = 0.96$, respectively.[13] The high correlation between the mean scores of both PACIC versions shows that the short form of the PACIC reflects the 20-item PACIC sufficiently. Moreover, regarding the fact that the mean score of the PACIC short form and the number of chronic conditions do not correlate, we can conclude that the PACIC measurement is independent of the number of chronic conditions.[22] The development of a generic questionnaire to assess whether quality of care is in focus with the CCM is important for future studies focusing on the issue of multimorbidity.[23] The number and distribution of chronic conditions which we observed are comparable with other studies.[9,24,25]

Three items ("given choices about treatment to think about" [PACIC 1 S]; "helped to make a treatment plan that I could carry out in my

daily life" [PACIC 7 S]; and "helped to plan ahead so I could take care of my condition even in hard times" [PACIC 8 S]) had about 10% missing values. We could assume that these 3 items are not explicit enough, as there are 2 issues to assess in each question, and therefore they need reformulation.[26]

Two items, "choices about treatment" and "treatment plan," resulted in a relatively low response rate. From shared decision-making (SDM) studies in Germany we know that patient-doctor communication is an important subject for the individual patient's treatment preference.[27,28] Additionally, we know that there is a need to improve these SDM skills.[28] Lack of SDM skills might be a possible explanation for the low response rate of these 2 items. However, this study and the described German short form of the PACIC make a valuable contribution to the requirements of future research on chronic disease management in German-speaking countries. It is important to have valid and less burdensome instruments that could be included either as intervention elements or evaluation measures.

Strengths and Weaknesses

We included a convenient sample of patients from 11 general practices throughout 2 different federal states located in eastern and western Germany. Our results have to be interpreted against the background of potential selection bias due to a moderate participation rate. Moderate participation rates in paper-based questionnaires are very common especially in the case of absent [financial] incentives for the participants.[29] Additional, future research should include follow-up to increase the response rate. However, the wide range of ages, as well as numbers and types of chronic conditions, are comparable to other studies.[24,25] The number of valid questionnaires appears to be sufficient for robust equations of the psychometric properties of the PACIC short form. Due to the study design, test-retest reliability and responsiveness to change could not be determined and should be targeted in further research.

CONCLUSIONS

The PACIC short form is a reliable instrument with good psychometric properties. Additionally, the short version of the PACIC presented a less burdensome instrument compared with the 20-item PACIC to measure patient assessment of receiving care congruent with the CCM. This is essential for improving quality of care and focusing on a patient-centeredness approach. Furthermore, due to its generic nature, it offers the opportunity to be used for patients with more than 1 chronic condition. The availability of this instrument encourages further research in this field in German-speaking countries.

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