Qual Life Res
DOI 10.1007/s11136-011-0008-3

Construction and international validation of CIVIQ-14 (a short form of CIVIQ-20), a new questionnaire with a stable factorial structure

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Accepted: 4 September 2011

Abstract
Background The factorial instability of the CIVIQ-20 social dimension in different populations has necessitated the development of a new stable questionnaire to interpret results from international studies.
Objective Construction of a stable and psychometrically validated questionnaire from CIVIQ-20.
Methods and major findings A prospective, international study was used to construct a stable CIVIQ scale and to validate its psychometric properties. An iterative process was implemented to eliminate the more unstable items (six), and the social and physical dimensions were combined. The resulting instrument comprised 14 items, split into three dimensions (pain, physical, and psychological), and was named CIVIQ-14. The stability of the CIVIQ-14 factorial structure was confirmed in Polish, Czech, Spanish, and French populations using principal component analysis and multitrait/multimethod analysis. Psychometric assessment demonstrated that CIVIQ-14 was reliable (intra-class coefficient >0.8; weighted kappa >0.8), valid (correlation coefficients between dimension scores and clinical severity scores between 0.3 and 0.6), and sensitive (effect sizes >0.6 for psychological dimension; >0.8 for the other dimensions).
Conclusion CIVIQ-14 is a reliable, valid, and sensitive instrument applicable to international studies of patients with chronic venous disease.

Keywords Chronic venous disease · CIVIQ · Health · Quality of life · Well-being

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Introduction

Several disease-specific quality of life instruments have been developed for use in patients with chronic venous disease (CVD), each with their own strengths and weaknesses [1]. Some address particular facets of venous disease. For example, the Charing Cross Venous Ulceration Questionnaire (CXVUQ) [2] and the Venous Leg Ulcer Quality of Life (VLU-QoL) questionnaire [3] were specifically designed for venous leg ulcer, while the Aberdeen Varicose Vein Questionnaire (AVVQ) addresses varicose veins only [4]. These last three tools are noted to be generally acceptable in the field, but inapplicable to a wider spectrum of venous disease. Other questionnaires such as the Venous Insufficiency Epidemiological and Economic Study (VEINES) [5], the Specific Quality of life and Outcome Response-Venous (SQOR-V) [6], and the 20-item ChronIc Venous Insufficiency quality of life Questionnaire (CIVIQ-20) [7, 8] consider CVD as a whole [1]. CIVIQ-20 was the first questionnaire in its category and appeared in the 1990s; the VEINES and the SQOR-V questionnaires were developed later. CIVIQ-20 measures quality of life in patients with the full spectrum of CVD except venous ulcer and was validated in its French version (source questionnaire) in a 3-year research program [7]. The development of CIVIQ-20 followed several phases as described in the initial publication [7]: item generation

Published online: 25 September 2011

(20 patients), item selection and reduction (150 patients), pre-testing (2,001 patients), and validation of the questionnaire (934 patients). The 188 items generated were grouped into five themes and presented to patients for selection and reduction. A 5-point Likert scale was used to rate the importance of leg problems. The recall period was the previous 4 weeks. An item tracking matrix documented changes, deletion of items, and reasons for such changes. Selected items were then submitted for factorial analysis. The final version was a 20-item self-administered questionnaire that explored four dimensions: psychological, physical, social functioning, and pain.

Internal consistency for each dimension (Cronbach's alpha >0.820 for three out of four factors) and reliability (Pearson's correlation coefficients for both the four-dimension subscales and the global score at 2-week intervals >0.940) was good. Convergence (Pearson's correlation coefficients between differences in clinical scores and in quality of life scores from 0.199 to 0.564 and statistically different from 0, $P < 0.001$) and responsiveness to change (>0.80) were also demonstrated.

Reliability, face, content, construct validity, responsiveness, and international psychometric validation of CIVIQ-20 were also assessed within the Reflux assEssment and quaLity of lIfe improvEment with micronized purified Flavonoid fraction (RELIEF) study [8].

Since then, CIVIQ-20 has been widely validated [8]. In contrast, the VEINES questionnaire has been studied and validated within a select research group only [1, 9], and the recent SQOR-V has not been widely used. Although developed in the 1990s, the construction of CIVIQ-20 meets the recent recommendations of the US Food and Drug Administration (FDA) with items referring to the four domains (pain, physical, social, and psychological functioning) identified through patient interviews, cognitive interviewing, and item selection based on the severity and importance of the complaints reported by the patients themselves [10]. CIVIQ-20 therefore reflects the patient's central values and incorporates patient preferences in its structure and the choice of its components, unlike the recent SQOR-V, which was defined solely by a committee of experts [6].

To our knowledge, of all the available specific scales, only CIVIQ-20 has undergone factor analysis to test its stability. However, international validation ran into a major obstacle when instability of the factorial structure of the questionnaire was identified, notably in its social dimension [8]. The RELIEF study suggested that the impact of CVD on patients' social life might vary and/or be expressed differently according to their culture. This observation, as well as the fact that CIVIQ-20 remains the most extensively validated tool in the field, justified the search for a new questionnaire, based on items from CIVIQ-20, with a more stable factorial structure.

Objective

The objective of the present analysis was to construct a short form of the CIVIQ-20 questionnaire—CIVIQ-14—with a stable factorial structure, and then to validate it in terms of reliability, content and construct validity, and sensitivity, using available databases.

Patients and methods

Description of available studies and related patients

In addition to the RELIEF study, two other studies in different populations were used to confirm the factorial structure of CIVIQ-14: the "306 randomized trial" and the "ALFIS/THALES" observational study.

RELIEF study

RELIEF was a prospective, multicenter, international study carried out in 18 countries from February 1997 to February 1999, the primary objective of which was to assess differences in the severity and evolution of CVD symptoms and signs over 6 months of treatment with a venoactive drug. The secondary objective of the RELIEF study was to measure the quality of life of patients before and after treatment [11].

Outpatients seeking healthcare related to venous disorders, presenting with either symptoms or signs of CVD, or a combination of both were assigned to the Clinical, Etiological, Anatomical, Pathophysiological (CEAP) classification, which categorizes affected legs into seven clinical classes designated C0s to C6. Patients assigned C0s (symptomatic legs without visible signs), C1 (telangiectases), C2 (varicose veins), C3 (venous edema), and C4 (skin changes) by the examining physician, over 18 years old, men or women, and of any ethnic origin were enrolled in the study. Patients were treated with a venoactive drug for 6 months and examined at the inclusion visit (Day 15), baseline (Day 0), Day 60, Day 120, and Day 180. Background information on the characteristics of consulting patients was recorded including age, sex, weight, height, duration of CVD, use of bandaging, and family history.

The following clinical endpoints were reported at each study visit:

1. Symptoms usually attributable to CVD, such as sensation of swelling, cramps, and leg heaviness. These three symptoms were allocated a severity score by using a 4-point scale (0 = absent, 1 = mild, 2 = significant, 3 = severe).
2. Pain, evaluated by using a 10 cm visual analog scale (VAS). The scale ranged from 0 (no pain) to 10 cm (intolerable pain).

3. Displayed signs (the most severe), using the basic CEAP clinical classification, as well as edema (leg circumference in cm), and localization of venous reflux (with a Pocket-Doppler).

Before each study visit, patients completed the self-questionnaire CIVIQ-20 in the waiting room. A secretary handed out the questionnaire and collected it once completed. No particular assistance was provided to patients. This strategy was chosen to avoid any interference from an investigator.

Clinical and quality of life results have been published elsewhere [8, 11]. A total of 4,048 patients completed CIVIQ-20 at least once, while 3,656 had usable quality of life assessments at each of the five planned visits.

To confirm the factorial stability of the new scale, sub-populations were retrieved from the RELIEF database including Polish ($N = 1{,}334$), Czech ($N = 506$), and Spanish ($N = 476$) cohorts.

"306 randomized trial"

The "306 trial" was a double-blind, randomized study on the efficacy of ruscus extracts in 397 French patients aged between 18 and 70 years with symptomatic CVD of more than 1 year's duration and who had been assigned a CEAP classification of C0 s to C2 [12].

"ALFIS/THALES" observational study

A study by ALFIS, a non-profit organization of laboratories and health firms targeted 230 French general practitioners (GPs) of the THALES epidemiological surveillance network to evaluate the quality of life of patients with CVD. From October to December 2002, adults with CVD were included if they had not been treated during the preceding month with a venoactive drug or if they were not wearing compression stockings. A total of 120 GPs recruited 291 patients who completed the CIVIQ questionnaire [13], which was then tested for stability.

Methods

CIVIQ-14 was developed in two phases. The first phase was the construction of CIVIQ-14 using an iterative process with international random samples from the RELIEF database. The stability of the new factorial structure was then confirmed in five different populations, that is to say in three of the subpopulations of the RELIEF study (Polish, Czech, and Spanish RELIEF cohorts), in addition to the "306" and ALFIS/THALES trial populations.

In a second step, a psychometric validation of CIVIQ-14 was performed, again using international samples from the RELIEF population.

International samples from the RELIEF study population

On the assumption that countries represented in the RELIEF study formed a random sample of all countries worldwide, resampling by the bootstrap method was used to neutralize country effects and to adjust results [14]. Quality of life is assumed to differ between countries (country effect) such that two patients from a given country in a multicenter study are likely to have a closer perception of quality of life than two patients from different countries. Five hundred bootstrap samples were reconstructed and used for factor analysis, the optimal number of samples recommended by users of this method [15].

Iterative process and construction of a stable instrument

To eliminate all items responsible for the factorial instability of CIVIQ-20, an index representing questionnaire instability was constructed, which was then tested on the 500 bootstrap samples from the RELIEF database. Six items were eliminated one by one in six successive steps.

The bootstrap technique was used to calculate the probability of each dimension being stable by counting the number of bootstrap samples in which all items of the dimension had their maximum "loading factor" on the same factor. Overall stability of the questionnaire could therefore be represented by the weighted mean (by number of items) of probabilities observed for each dimension:

$$S_E = 1/\mathrm{nb}_E \times \sum \mathrm{nb}_D P_D$$

where S_E is the stability of the questionnaire, expressed as a percent, nb_E is the total number of items contained in the questionnaire, nb_D is the number of items in the dimension D, and P_D is the probability of the dimension D being stable. Conversely, instability of the questionnaire is: $\mathrm{IS}_E = 100 - S_E$.

We then determined which item contributed the most to *overall instability* of the questionnaire, within unstable dimensions. The probability of the dimension being stable was calculated without these items. The item associated with the highest probability was the one which generated the greatest instability in its own dimension and therefore had to be eliminated. The IS_E was then recalculated for the questionnaire without the eliminated item.

- If IS_E decreased, the new item that contributed the most to residual instability was eliminated.
- If IS_E increased, we returned to the previous step, eliminating the second most unstable item. This process eliminated the least stable items, one by one, and was continued until IS_E was zero.

Confirmatory factor analysis assumes that the number of factors is specified beforehand. If, during the process of item elimination, a dimension contained no more than two items, we determined whether diminution of the number of factors further improved questionnaire stability.

Confirmation of the stability of the new instrument

Once the new stable scale had been constructed from all the countries in the RELIEF study, the structure was tested on five different populations to determine whether it was still stable, employing both factor analysis and multitrait/multimethod analysis [16].

Psychometric validation of the new structure

Several conditions have to be satisfied for a quality of life measurement to be valid: relevance, acceptability, content validity, reliability, construct validity, and sensitivity.

Relevance, acceptability, and content validity

These psychometric properties have been well documented through CIVIQ-20.

Reliability

Internal consistency analysis was conducted to determine whether the different items in a dimension were homogeneous. This was tested by calculating Intraclass Correlation Coefficients (ICC) [17], values of which ranged from 0 to 1 for each dimension of CIVIQ-14. If the value was greater than 0.8, internal consistency was deemed acceptable. A test–retest study was then performed to confirm that CIVIQ-14 was reproducible, i.e., that answers to the same questionnaire remained unchanged in clinically stable patients. Weighted kappa coefficients were calculated for answers given for each item by stable patients between D-15 and D0. A kappa value greater than 0.6 designated good reproducibility.

Construct validity

In order to validate the new scale as a discriminatory instrument [18, 19], Spearman's correlation coefficients between clinical severity scores (cramps, leg heaviness, sensation of swelling, and pain) and quality of life scores were calculated for each dimension. The parameters were considered convergent if the correlation coefficients were between 0.3 and 0.6.

Sensitivity

A sensitive indicator is one which detects minor changes in a patient's quality of life. We used the effect size [20], defined as the ratio of the mean score changes between D180 (after treatment) and D0 to the standard deviation of the scores on D0. Effect size was computed for scores in each dimension and the overall score of CIVIQ-14, for patients whose state of health improved. If values were greater than 0.8, sensitivity was assumed to be good.

The analyses were carried out by the Paris Network for Evaluation in Health Economics (*Réseau d'Evaluation en Economie de la Santé* [REES]) on an IBM-compatible computer using SAS software.

Results

Construction of CIVIQ-14

CIVIQ-14 was constructed in six successive steps.

Step 0: evaluation of the overall instability of CIVIQ-20 and identification of the most important contributors to this instability

The first step, termed zero here because it concerned the initial questionnaire, evaluated the overall instability of CIVIQ-20 and determined which items contributed the most to this instability. No dimension was stable in 100% of samples. The index of instability of CIVIQ-20 (IS_E) was 75.47%. When the item "remain standing for a long time" was eliminated from the pain dimension, the dimension comprising the three remaining items became stable in 100% of samples, whereas whenever this item was present, the probability of the dimension remaining stable fell to 55.20%. This was therefore the first item to be eliminated (step 1).

Table 1 Steps of item elimination

Step	Number of items	Number of dimensions	IS_E (%)	Most unstable item
0	20	4	75.47	Standing for a long time
1	19	4	66.25	Doing the housework
2	18	4	57.67	Traveling by car, bus, plane
3	17	4	52.24	Becoming tired quickly
4	17	3	46.76	Becoming tired quickly
5	16	3	30.85	Must always take precautions
6	15	3	7.56	Having difficulty in starting
7	14	3	0	–

Iterative process

Between step 0 and step 1, IS_E decreased from 75.47 to 66.25%, strengthening the choice of the eliminated item (Table 1). The item "doing the housework" contributed the most to residual instability and once this item was eliminated, the physical dimension became stable in 99.80% of cases, compared with 56.80% when the item was present. This item was therefore the second to be removed.

The process was repeated in the following order and the items: "traveling by car" (step 2), "becoming tired quickly" (step 3), "must always take precautions" (step 4), and "having difficulty in starting" (step 5) were eliminated. Table 1 illustrates the different steps involved in the construction of CIVIQ-14. As a result of this process, the social dimension no longer accounted for more than two items. As items in the social and physical dimensions were strongly correlated (correlation coefficients between 0.54 and 0.68 between the five items concerned), the social and physical dimensions were combined in the same dimension in step 3, which was named the physical dimension. This new physical dimension proved stable with a lower index of instability (IS_E) in the three-dimension structure than in the four-dimension one (46.76% vs. 52.24%).

After elimination of the six items at the end of step 6, the questionnaire contained 14 items in three dimensions (Table 2). There was no longer any residual instability and all the dimensions were stable in all (100%) of the samples. This stable 14-item questionnaire was named CIVIQ-14 and its structure is illustrated in Table 2.

Table 2 Stability of the 14-item questionnaire (CIVIQ-14)—step 6

Dimension	Item	Probability for the dimension to be stable without the six items responsible for instability (%)
Pain	Pain in the legs	100
	Impairment at work	100
	Sleeping poorly	100
Physical	Climb several floors	100
	Squat/kneel	100
	Walk at a good pace	100
	Going to parties	100
	Perform athletic activity	100
Psychological	Feeling nervous	100
	Impression of being a burden	100
	Embarrassed to show legs	100
	Easily becomes irritable	100
	Impression of being disabled	100
	Having no desire to go out	100

Factorial validity of CIVIQ-14 in different populations

Five different populations were selected to confirm the 14-item structure created from the 500 bootstrap data sets. These included the three most representative countries from the RELIEF study in terms of number of patients, i.e., Poland (1,334 patients), the Czech Republic (506 patients), and Spain (476 patients). In addition, the "306 trial" and the "ALFIS observational study" were used to validate the structure in French patients. The structure of CIVIQ-14 in these populations was validated using multitrait/multimethod and factor analyses [16]; results are provided in Table 3. For each of the selected populations, CIVIQ-14 was stable in at least one of the two analyses.

Validation of CIVIQ-14 using psychometric criteria

Relevance and acceptability

As CIVIQ-14 was directly derived from the items of CIVIQ-20 [7, 8], the relevance and acceptability of CIVIQ-14 were assured. Indeed, the acceptability of CIVIQ-20 was good as assessed by the response rates to each of the questions and by the number of questionnaires completed in the RELIEF study. All 4048 patients in the study completed CIVIQ-20 at least once; only 53 did not complete it at baseline and were removed from the database. Out of the 3,995 patients with a usable baseline questionnaire, 91.5% ($n = 3{,}656$) had five usable quality of life assessments (one assessment at each of the five planned visits), and 99.0% ($n = 3{,}956$) had at least one other usable CIVIQ-20 after baseline. A recent study has confirmed such acceptability [21].

Content validity

The content validity of CIVIQ-20 has been verified in 14 linguistic versions using forward/backward methodology. However, the confirmation of the cultural relevance of the questionnaire's content has raised some difficulties. For instance, in Eastern Europe, not all people use a car, so the question "how much difficulty did you have in traveling by car" was supplemented by "traveling by bus." Certain French words have no equivalent in any other language, for instance "gêne" (trouble, discomfort), "piétiner" (to stand about), and "bricoler" (do it yourself [DIY]). Other items such as "to travel (car, bus, plane)," "to do the housework," and "must take precautions" created specific translation problems. Most translation difficulties were a result of the deliberately colorful style of the French version and were solved by modifying the ways in which some questions were expressed in order to adapt the questionnaire to different cultural contexts. The majority of difficulties encountered in the cross-cultural validation were

Table 3 Multitrait/multimethod and factor analyses of five populations using CIVIQ-14

Base	*N* patients	Multitrait/multimethod analysis	Factor analysis
Poland	1,334	P: 0.62–0.75; Ph: 0.68–0.74; Psy: 0.47–0.71	P: 0.55–0.65; Ph: 0.57–0.68; Psy: 0.49–0.70
Czech Republic	506	P: 0.50–0.61; Ph: 0.61–0.66; Psy: 0.36–0.63[a]	P: 0.46–0.61; Ph: 0.53–0.73; Psy: 0.35–0.71
Spain	476	P: 0.57–0.71; Ph: 0.61–0.75; Psy: 0.40–0.69	P: 0.55–0.74; Ph: 0.54–0.67; Psy: 0.12–0.71
ALFIS observational study	291	P: 0.60–0.72; Ph: 0.52–0.67[b]; Psy: 0.45–0.70	P: 0.58–0.72; Ph: 0.49–0.76[c]; Psy: 0.47–0.75
Phase III study no. 306	397	P: 0.39–0.56; Ph: 0.51–0.58; Psy: 0.36–0.60	P: 0.46–0.60; Ph: 0.52–0.65; Psy: 0.50–0.66

Multitrait/Multimethod: Internal consistence if item correlation with its own dimension >0.4 and higher than item correlation with other dimensions; *factor stability*: Item loading factor higher within its dimension than in the other dimension

P Pain dimension, *Ph* physical, *Psy* psychological dimension

[a] «Easily irritable» unstable

[b] «Going to parties» unstable

[c] Pain and physical dimensions combined

related to social items (going out in the evening, doing sport, traveling in a car), which are known to be difficult to grasp in cross-cultural validation processes, and have been partly avoided with the shortened version of CIVIQ.

Reliability

The mean values of Intraclass Correlation Coefficient calculated using the 500 bootstrap data sets were high for CIVIQ-14 : 0.88 (STD 0.02) for the pain dimension, 0.93 (STD 0.01) for the physical dimension, and 0.94 (STD 0.01) for the psychological dimension. These findings confirm that internal consistency was satisfactory. For each item measured at D-15 and D0 for stable patients [8, 11], the mean weighted kappa was greater than 0.8, indicating good reproducibility of the scale, as shown in Table 4.

Construct validity

Table 5 presents the mean Spearman's correlation coefficients between clinical severity scores and quality of life scores for each dimension. Coefficients were negative, as a higher quality of life score represented a better quality of life, whereas a higher clinical score represented a poorer state of health. The construct (convergent) validity results were just on the margin of demonstrating convergence (Table 5), which while not overly good, is not unexpected as clinical measures do not often correlate well with health-related quality of life measures. Ideally, the measure should have been correlated with other similar quality of life scales. As such, CIVIQ-14 was considered as fairly convergent.

Sensitivity

Sensitivity of CIVIQ-14 was evaluated in patients whose clinical symptoms (cramps, heaviness, sensation of swelling, pain) improved between Day 0 and Day 180 after treatment [8, 11]. The pain dimension of CIVIQ-14 showed wide sensitivity to change, whatever the criterion used (effect size between 1.31 and 1.47), as did the physical dimension and total score. The psychological dimension showed medium sensitivity to change (effect size between 0.61 and 0.69) as shown in Table 6.

Table 4 Mean weighted kappa coefficients for the 500 bootstrap subsets of stable patients for each item

Dimension	Item	Mean weighted kappa
Pain	Pain in the legs	0.81
	Impairment at work	0.81
	Sleeping poorly	0.82
Physical	Climbing several floors	0.85
	Squat/kneel	0.86
	Walking at a good pace	0.85
	Going to parties	0.85
	Perform athletic activities	0.85
Psychological	Feeling nervous	0.86
	Impression of being a burden	0.84
	Embarrassed to show legs	0.87
	Easily becomes irritable	0.85
	Impression of being disabled	0.86
	Having no desire to go out	0.85

In the RELIEF database, the number of patients who were clinically stable between Day 15 and Day 0 (stable patients) was 2,946

Discussion

The empirical methodology used to reduce the number of items and create CIVIQ-14 with a stable factorial structure was based on the inherent logic of factor analysis: scale instability is maximal when the projection of items from

Table 5 Mean Spearman's correlation coefficients for 500 samples (bootstrap) between dimensions of CIVIQ-14 and four quantified clinical scores in the RELIEF study [95% confidence interval]

Dimension	Swelling $N = 3{,}250$[a]	Heaviness $N = 3{,}147$[a]	Cramps $N = 3{,}075$[a]	Pain (VAS) $N = 3{,}714$[a]
Pain	−0.35	−0.43	−0.36	−0.52
	[−0.38; −0.32]	[−0.46; −0.40]	[−0.39; −0.32]	[−0.56; −0.49]
Physical	−0.34	−0.34	−0.27	−0.40
	[−0.39; −0.29]	[−0.37; −0.29]	[−0.32; −0.19]	[−0.44; −0.37]
Psychological	−0.30	−0.32	−0.26	−0.33
	[−0.35; −0.24]	[−0.36; −0.27]	[−0.31; −0.22]	[−0.39; −0.29]
Total	−0.38	−0.40	−0.33	−0.46
	[−0.42; −0.33]	[−0.43; −0.36]	[−0.37; −0.26]	[−0.51; −0.43]

VAS visual analog scale

[a] Patients with the symptom in the original RELIEF database

the same dimension never results in the same factor. Conversely, if all the dimensions are stable, the scale instability is null. Moreover, a dimension with a few items is more stable than a dimension containing a high number of items. As a consequence, scale stability was the average of dimension stability, weighted by the number of items in the dimension. The six most unstable items from CIVIQ-20 were removed and the four-dimension structure was modified to avoid a social dimension comprising only two items. The combination of items from the social and physical dimensions was successful as the stability of the new physical dimension was not reduced.

To consider country effects and therefore avoid bias, the bootstrap technique was used to resample the countries, on the assumption that they initially formed a random sample. This adjustment takes into account the influence of the selected countries and will detect any variation in results, with variability corrected by adjusting 95% confidence intervals. Using this technique, CIVIQ-14 was found to be a valid tool for assessing quality of life in an international setting.

Factorial validation of CIVIQ-14 showed that, for each population tested, at least one of the analyses concluded that CIVIQ-14 was stable. Although the items "easily becomes irritable" and "going to parties" proved unstable with multitrait/multimethod analysis for the Czech Republic and the "observational study" databases (see Table 3), the structure was not called into question as this instability was not repeated in any other databases. Furthermore, despite a lack of differentiation between the pain and physical dimensions in the Spanish questionnaire, we remained confident of its structure as the multitrait/multimethod analysis produced good results for this population. According to psychometric theory, a structure is valid when factor analysis performed on samples of different populations makes it possible to find the same dimensions. This condition was verified with CIVIQ-14 with factorial stability demonstrated in several populations (Czech, French, Polish, and Spanish) indicating that the instrument may be used in multicenter international trials.

Psychometric validation of CIVIQ-14 was also adequate. Furthermore, the good acceptability of CIVIQ-20 [8] should be further improved with the shortened CIVIQ-14. CIVIQ-14 is derived from CIVIQ-20, a patient-reported outcome instrument produced following the recommendations of Guyatt et al. [19, 22] and the FDA [10]. Similar to CIVIQ-20, the new scale reflects the patient's central values and incorporates patient preferences in its structure.

CIVIQ-14 has some limitations. The correlation of CIVIQ-14 with domains of a generic scale such as SF-12 or SF-36 has not yet been studied. CIVIQ-20 was designed to assess treatment effectiveness in the context of clinical trials [7, 8]. The responsiveness and sensitivity to change of CIVIQ-14 will require more extensive verification in longitudinal studies assessing treatment effects. CIVIQ-14 is currently being used to measure the quality of life of patients with CVD in the Vein Consult Program, which is being conducted in collaboration with the Union

Table 6 Mean effect size in the 500 bootstrap subsets of improved patients after a 6-month treatment for each dimension score and the global score of CIVIQ-14

Symptom (N improved patients[a])	Pain dimension	Physical dimension	Psychological dimension	Total
Cramps (2,374)	1.47	0.93	0.69	1.07
Heavy legs (3,014)	1.38	0.88	0.67	1.02
Sensation of swelling (2,310)	1.41	0.94	0.69	1.06
Pain (2,334)	1.31	0.81	0.61	0.95

Improvement was defined as a decrease of one class for cramps, heavy legs, and sensation of swelling; for pain, it was defined according to a change in score (10-cm visual analog scale) of at least 2.5 cm

[a] The number of improved patients was taken from the original RELIEF database, and not from reconstituted bootstraps

Internationale de Phlébologie in 20 countries worldwide [23]. CIVIQ-14 has been shown to be sensitive to the duration of hospital stay and to the number and type of interventions [23]. The frequency of lost work days paralleled the CEAP stage. Extensive use of CIVIQ-14 on new populations in this vast detection program should consolidate its construct and psychometric validity.

CIVIQ-14 does not measure cost-effectiveness or disease burden. Although correlations between costs and CIVIQ-14 scores have been found, the questionnaire is not designed to predict who will benefit the most from treatment or to draw up patient waiting lists [24].

CIVIQ-14 consists of 14 items in three domains: pain (3 items), physical (5 items), and psychological (6 items). The scores of CIVIQ-14 range from 0 (excellent quality of life) to 100 (terrible quality of life) and can be calculated for each of the three dimensions and overall. With the construct validity and psychometric properties of CIVIQ-14 established, further work will focus on the ability of CIVIQ-14 to assess treatment effects in multinational, longitudinal studies.

Acknowledgments We thank Les Laboratoires Servier for their financial support of the present analysis and for the decision to submit the present manuscript for publication.

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