Structural validation of the Chronic Venous Insufficiency Questionnaire-14 (CIVIQ-14) : A confirmatory factor analysis

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INTRODUCTION

Chronic venous insufficiency (CVI) is a circulation disorder that does not allow the arteries to transport blood to the heart in sufficient proportions. It appears mostly in the legs, presenting as edema or ulcers, and can be accompanied by varicose veins or thrombosis. Due to its high prevalence and to its impact on management costs, CVI is considered a major public health issue. However, as non-identified, its impact on quality of life (QoL) is often underestimated. A quality of life, the CVI-20, was developed with the particular aim to estimate CVI's impact on patients' QoL. This questionnaire consists of 20 items distributed within 4 dimensions: " Pain", "Physical", "Psychological", and "Social". Following its construction, its psychometric properties were evaluated and international translations were validated. However, the CVI-20 questionnaire had an insufficient factorial validity when applied to different populations. To solve this problem, data from the RELY on chronic venous insufficiency study were used to build a shorter and more stable version of the scale: the CVI-14 questionnaire. This new tool in 14 items distributed in 3 dimensions: "Pain", "Physical" and "Psychological". Structural validity and psychometric properties of the CVI-14 questionnaire were then evaluated using one randomized controlled trial (the 306 study) and two observational studies (RELST and ALTS/THALES). The present analysis aims to support factorial structure of the psychometric framework and the structural validation of the CVI questionnaire, using data extracted from an international observational study: the VEN CONSULT PROGRAM (VC). To do this, an exploratory and a confirmatory factor analyses were performed, along with the assessment of internal consistency, construct and clinical validity.

METHODS

The vein Consult Program

- Observational and interventionnal study on chronic venous disease (CVD)
- By September 2012, 138,722 patients from 21 countries had been screened.
- Opportunity screening at GP’s office, eventually followed by specialist addressing.
- Quality of life questionnaire for patients distributed with COV
- Analyses were preceded by multiple imputation for missing data and bootstrapping re-sampling for country effects.

Exploratory Factor Analysis

- Aiming to assess factorial validity of the CVI-14 questionnaire and to study the questionnaire's dimensionality.
- ETA performed using various rotation.
- Factorial validity: (Probability over 500 bootstrap) for an item to be stable and its dimension, and the probability to dimensionality.
- Dimensionality: explained variance criteria, with a 100% threshold.

Confirmatory Factor Analysis

- Used to validate the original 3-dimension of the CVI-14 questionnaire.
- Allowed for comparison of models generated by the ETA dimensionality analyses.
- 6 Indicators were used to assess goodness-of-fit: Model Chi², Root Mean Square Approximation (RMSEA), Adjusted Goodness-of-Fit Index (AGFI), Standardized Root Mean Square Residual (SRMR), Normed Fit Index (NFI) and Comparative Fit Index (CFI).

Factorial stability

- We assessed the probability for the items to be stable using 500 bootstrap samples, i.e. the probability for the item to be linked with the right dimension.

Dimension

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Item</th>
<th>Prob (at 500 bootstrap)</th>
<th>Prob (100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td></td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Physical</td>
<td></td>
<td>99,4%</td>
<td>100%</td>
</tr>
<tr>
<td>Psychological</td>
<td></td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Social</td>
<td></td>
<td>99,4%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Construct validity

- MTM analysis confirmed the construct validity of CVI-14.

Convergent validity: correlations between items and dimensions were superior to 0,5.
- Discriminant validity: each item was most correlated to its own dimension score.

Clinical validity

- Strong internal consistency was demonstrated.
- Convergent validity: country-specific Cronbach阿尔phas were superior to 0,8 for every dimension.
- Construct validity: each dimension showed a convergent and discriminant validity.

Software

- All statistical analyses were performed with SAS 9.3.

RESULTS

Factorial validity

- All statistical analyses were performed with SAS 9.3.
- Fit Index (AGFI), Standardized Root Mean square Residual (SRMR), Normed-Fit Index (NFI) and Comparative-Fit Index (CFI).
- Four of the 6 considered goodness-of-fit indices produced during the analysis confirmed the 3-dimension model to be acceptable.

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Country-specific analysis

- Additional analyses were performed in France, Hungary, Russia and Ukraine.

Country-specific properties

- Convergent and discriminant validity of the short version of the CIVIQ scale, the CIVIQ 14 questionnaire.

CONCLUSION

The aim of this study was to confirm the factorial structure of the short version of the CIVIQ questionnaire. Quality of life data from 67,148 patients were collected across 21 countries, as part of the VEN CONSULT PROGRAM international study. These data were mobilized in order to analyze the factor structure of the short version of the CIVIQ scale, the CIVIQ 14 questionnaire. Having replaced missing data via multiple imputations and bootstrapping re-sampling, an exploratory factor analysis was performed in order to test the factorial stability of the CVI-14 questionnaire and its dimensionality. Its probability to be stable was calculated to be 100%, as leading factors showed stability to their respective dimensions. Dimensionality led us to the conclusion that both the two and three dimension model could be considered for CVI-14. A confirmatory factor analysis was realized, first to assess the goodness-of-fit of the 2 dimension model, then to identify the best model. The 4 of the 6 considered goodness-of-fit indices produced during the analysis confirmed the 3-dimension model to be acceptable. Conclusively, with the 2-dimension model, only one out of 6 indicators met its threshold. Thus, CFA led us to consider that a 2-dimension approach for the CVI-14 questionnaire could not be considered. In addition, two psychometric properties of the CVI-14 questionnaire were evaluated and validity. Precision was used in assessing Cronbach阿尔phas. Internal consistency, a reliability component, was demonstrated both overall and using country-specific data. Construct and clinical validity were assessed using multi-method item and correlation analyses, respectively. MTM demonstrated both convergent and discriminant validity of each dimension, and clinical validity of the score of the source to be associated with the CVI-14 score.

VEN CONSULT PROGRAM data allowed us to validate the factorial structure of the CIVIQ questionnaire, as well as its reliability and validity.