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Primary care-based assessment of chronic venous insufficiency: a cross-sectional analytical study

Irene Fusco, Grazia Granata, Silvia Trombetta, Carlotta Mancusi, Martina Genua, Fabio Massimo Oddi

SIC/SICVE Italian School of Phlebology, Rome, Italy

Abstract

Chronic Venous Insufficiency (CVI) is a highly prevalent condition, often underdiagnosed in its early stages, with a significant impact on quality of life and healthcare costs. Early identification of the disease is crucial in the primary care setting to reduce future complications and disease progression. This study proposes a primary care-based screening model that identifies patients in general practitioners' offices, followed by targeted duplex ultrasound examination.

The study involved 224 patients who underwent a questionnaire and venous duplex ultrasound examination of the lower limbs. Clinical, behavioral, disease perception, and ultrasound data were analyzed. Statistical analysis included correlation tests and non-parametric comparisons.

Age, body mass index, symptoms, and ultrasound parameters were significantly associated with the clinical severity of CVI. Duplex ultrasound confirmed anatomical alterations consistent with clinical severity. A strong correlation was observed between symptoms, disease perception, and motivation for treatment, as well as between the level of health information and adherence to therapeutic pathways.

The proposed two-step screening model appears useful for risk stratification in the primary care setting. Further studies are needed to validate this approach.

Key words: chronic venous disease, risk stratification, clinical risk management, questionnaire, primary care.

Correspondence: Irene Fusco, SIC/SICVE Italian School of Phlebology, viale Trieste 35, 00019 Tivoli, Italy.

E-mail: dottoressairenefusco@gmail.com

Introduction

Chronic Venous Insufficiency (CVI) represents a chronic and progressive condition with significant prevalence in the adult population and constitutes an important cause of discomfort, functional limitation, and reduced quality of life, as well as a relevant economic burden on healthcare systems. Multicenter epidemiological studies conducted in Italy have shown that a substantial proportion of the population presents with clinical signs of venous disease, with wide geographical variability, greater involvement of specific demographic groups (women, individuals with prolonged standing occupations, populations in Southern Italy), and a high percentage of undiagnosed or inadequately treated cases.[1-3]

In its more advanced stages, such as venous ulcers, CVI requires chronic treatments and complex wound care, often managed through home healthcare services, with a significant organizational and care-related impact. Despite this, the disease is frequently underestimated by both healthcare professionals and patients, particularly in its early stages. The increasing prevalence of risk factors such as overweight, sedentary lifestyle, and prolonged standing work makes early identification of CVI a priority in the primary care setting, in order to identify at-risk patients and intervene during the early phases of the disease process, significantly reducing the risk of complications and future worsening.[1-3]

The present study integrates the use of a questionnaire and Duplex Ultrasound (DUS) assessment with the aim of identifying the main risk predictors and proposing a possible primary care screening model. The ultimate goal is to develop a practical and sustainable approach to be submitted to regional health authorities, to allow early identification of patients affected by or at risk of developing CVI and thus prevent progression to more advanced and disabling forms.

Materials and Methods

The study was conducted on a population sample of 224 patients, randomly selected between June 2025 and December 2025. Each participant was provided with a 20-item questionnaire investigating

various aspects, including: i) clinical evaluation of the patient: symptoms, current diseases, and previous vascular events; ii) assessment of risk factors: age, Body Mass Index (BMI), number of pregnancies, family history; iii) contextual indicators: occupational activity, daily physical activity, local availability of angiological specialists; iv) patient perception: personal knowledge of CVI, perception of the disease with predisposition to possible treatment, and motivations related to potential lack of treatment; v) Clinical, Etiological, Anatomical, and Pathophysiological (CEAP) classification following physical examination performed by the operator.

Responses were recorded in coded form to facilitate subsequent statistical analysis.

All subjects also underwent venous duplex ultrasound examination of the lower limbs, performed using Esaote MyLab SIGMA equipment (Esaote S.p.A, Genova, Italy) by a single operator to ensure methodological consistency. The examination was carried out in both supine and standing positions, including the Valsalva maneuver and compression–release (reflux elicitation test). For each patient, the Great Saphenous Vein (GSV) was measured in axial section, calculating the mean diameter at three standardized thigh points (proximal, mid, and distal). Valve competence, presence of segmental reflux, and clinical classification according to CEAP were also assessed.

All data collected through the questionnaire and Doppler evaluation were entered into a computerized database organized into numerical and categorical variables. Statistical analyses were subsequently performed using standard procedures.

The following statistical methods were used: i) Pearson correlation analysis; ii) Mann-Whitney U test; iii) Fisher's exact test or chi-square test; iv) general descriptive analysis of variables (medians, frequencies, distributions).

The aim of the analysis was to identify clinical, behavioral, and ultrasound factors most strongly associated with CVI severity and to evaluate their usefulness in a screening and risk stratification model applicable in primary care.

Results

Age distribution showed a predominance of the 45-60 and >60 age groups, together accounting for approximately 62% of the total sample. Female sex represented approximately 70% of the study population. Among all patients, more than 57% had a BMI ≥25, while positive family history was reported in 59.2% of cases (Table 1).

From a clinical perspective, 54.3% of patients reported at least one symptom attributable to CVI, such as heaviness, swelling, evening cramps, or paresthesia. Analysis of CEAP classification showed that 31% of patients fell into a clinical category ≥2, indicative of visible and clinically relevant venous disease.

At duplex ultrasound examination, the mean GSV diameter was 3.9 mm on the right side and 4.4 mm on the left side. Valve incompetence was documented in 41% of cases in the right GSV and in 38% in the left GSV. GSV diameter was significantly greater in subjects with CEAP≥2 compared with those with CEAP<2 ($p \approx 0.01$) (Table 2).

Statistical analysis revealed significant correlations between CEAP class and presence of symptoms ($p<0.001$), CEAP and BMI ($p<0.01$), CEAP and age ($p<0.005$), and CEAP and GSV diameter ($p \approx 0.01$).

Symptoms were significantly associated with both BMI ($p \approx 0.01$-0.02) and subjective perception of one's clinical condition ($p<0.01$). The desire to improve one's condition was associated with CEAP class ($p \approx 0.005$), presence of symptoms ($p \approx 0.01$–0.03), and perception of venous risk ($p<0.01$) (Table 3).

A positive correlation was observed between the level of health information received and perception of venous risk ($r \approx 0.32$, $p<0.05$), as well as between information and perception of one's condition ($p<0.05$) and between information and desire to undergo treatment ($r \approx 0.35$-0.40, $p<0.03$) (Table 4).

No statistically significant associations were found between level of physical activity and presence of symptoms ($p \approx 0.12$), nor between family history and CEAP class ($p \approx 0.18$).

These results confirm that symptoms, BMI, age, risk perception, and Doppler parameters constitute a coherent set of indicators capable of guiding risk stratification in the primary care setting with good

accuracy. The study therefore suggests that integrating a structured questionnaire with Doppler evaluation represents an effective model for early identification of CVI in the general population.

Discussion

Recent literature and national and international guidelines emphasize that the main challenge in CVI currently lies in the development of more structured diagnostic and preventive pathways that allow early diagnosis and personalized risk stratification, with the aim of preventing progression to advanced stages and optimizing the use of territorial specialist resources.[4-6]

Existing screening programs in Italy are mostly represented by self-developed projects, such as targeted campaigns for at-risk working populations (healthcare personnel, workers with prolonged standing), "prevention days," or screening examinations organized by pharmacies or affiliated centers. However, these projects are limited by patient selection bias, variability in the tools used, and lack of adequate follow-up, making the results difficult to generalize to the overall population. On the other hand, generalized mass screening campaigns would clearly be too costly from a cost-benefit perspective.

The main international recommendations suggest a more sustainable and effective approach based on a two-step strategy: preliminary patient selection through clinical evaluation using a questionnaire in the general practitioner's office, followed by targeted venous duplex ultrasound only in selected cases. This sequence allows adequate CVI risk stratification within the population, maximizes efficiency, and optimizes the use of specialist resources, thereby improving diagnostic and therapeutic appropriateness.[6-8]

With regard to the Italian context, epidemiological studies and guidelines defining risk factors and diagnostic–therapeutic indications are available (SIF-SICVE, Italian College of Phlebology), but a unified national recommendation for screening is still lacking.[2,8,9]

Based on these considerations and taking inspiration from the Vein Consult Program (VCP),[10,11] it's possible to create a screening model representing a link between primary care and referral hospitals.

The aim of our work is to develop a risk stratification tool for the general population which, if validated, could be proposed to territorial or national health policy as a screening instrument.

The proposal consists of a 20-item questionnaire designed to identify early those subjects who are already affected by CVI or who are highly likely to develop it. This questionnaire, digitized and made available to patients via e-mail link or through platforms already used by general practitioners, can be completed independently at home. The data can be automatically recorded and organized, allowing the general practitioner to rapidly identify at-risk subjects and recall them for medical evaluation and, if necessary, refer them to the subsequent step, consisting of venous duplex ultrasound and specialist vascular surgical assessment.

The questionnaire collects information on major clinical and behavioral data, including age, sex, BMI, occupational activity, level of physical activity, comorbidities, number of pregnancies, family history, presence of CVI-related symptoms and clinical signs, preventive measures used, and any previous CVI treatments. In addition, patient knowledge of the disease (including prior targeted counselling by general practitioners or other healthcare professionals), perception of disease-related risk, and motivation to undertake preventive or therapeutic pathways are also assessed. As part of methodological refinement, it would be interesting to consider further developing the proposed model by exploring the possibility of treating a highly selected subgroup of patients directly in the general practitioner's office, based on the experience reported by Rossetto *et al*. Our model clearly differs conceptually, as it focuses on an earlier step of the care pathway: patient identification and risk stratification. However, within a broader vision of a rapid management strategy for lower-limb edema, outpatient mesotherapy with flavonoids could be considered for patients with CEAP stage C3-C4 who categorically refuse first-line treatments. Compared with the questionnaire used in the aforementioned study, our questionnaire may allow for more efficient data collection and automated identification of suitable candidates. It could therefore support an extension of the study, facilitating the selection of patients potentially eligible for mesotherapy and optimizing specialist resources through early stratification not only of risk but also of treatment adherence.[12]

Analysis of demographic and clinical factors confirms the role of age and BMI as elements significantly associated with disease severity, in line with the literature. As early as a 2005 review, advanced age, together with female sex, pregnancy, obesity, and family history, was identified as one of the most consistent factors associated with CVI presence.[13] Furthermore, a prospective study published in 2011 showed that age is a significant predictor of clinical severity assessed by CEAP classification and of the extent of venous reflux on duplex ultrasound, supporting the concept that aging of the venous system plays a fundamental role in disease progression.[14]

Elevated BMI is frequently associated with more severe clinical classes of CVI, although some sources suggest that BMI may have a lesser impact compared with age in certain patient subgroups.[15] Indeed, some studies have shown that in severely obese patients, symptoms may be very pronounced even in the absence of clearly defined anatomical findings on duplex ultrasound, suggesting that obesity itself may contribute to symptomatology independently of valvular incompetence or saphenous vein dilation.[16]

The predominance of female sex in our cohort is consistent with other epidemiological analyses, likely due to a combination of hormonal factors, pregnancies, and lifestyle characteristics. Previous multicenter studies have reported a higher prevalence of CEAP C1 and C2 classes in women, as well as a greater distribution of the symptom “heavy legs” compared with men.[2]

Family history is confirmed as a relevant component in disease pathogenesis, although genetic evidence remains incomplete. However, our analysis did not demonstrate a statistically significant association between CEAP class and family history, in contrast with the literature, which identifies family history of venous disease as an independent risk factor.[17] This discrepancy may be related to sample size or to self-reported assessment through the questionnaire, which may have reduced the statistical power to detect such an association.

The strong correlation between reported symptoms and CEAP score in our sample suggests that the questionnaire used was effective in identifying patients with clinically significant disease. This finding is consistent with data from recent clinical studies showing that clinical severity measured

using tools such as the revised Venous Clinical Severity Score (r-VCSS) is closely correlated with reduced quality of life scores, pain, edema, and even depressive symptoms in CVI patients.[18]

A noteworthy finding of the study is the relatively low percentage of patients reporting at least one symptom (42%), regardless of CEAP class, a phenomenon previously described in the Vein Consult Program, where a significant proportion of patients (approximately 20%) presented with symptoms in the absence of clinical signs of disease (C0s).[10,11] This further highlights the wide inter-individual variability in CVI clinical presentation and confirms the importance for physicians, both general practitioners and specialists, not to underestimate or disregard patient-reported symptoms, as subjective symptoms may represent one of the earliest manifestations of disease. This aspect gains further relevance in light of the observed correlation between symptomatology and subjective disease perception: symptomatic patients tend to perceive their condition as more burdensome and disabling, a concept of major practical importance for counselling and improving treatment adherence.

It is interesting to note that physical activity did not show a significant association with symptoms and that family history was not correlated with CEAP class. These findings are counterintuitive but may be explained by the fact that family history is a risk factor for CVI development rather than a predictor of clinical severity, which is influenced by many other factors (environmental, behavioral, comorbidities). Similarly, self-reported physical activity may not accurately reflect actual activity levels.

Venous duplex ultrasound data confirm the value of ultrasonography as a diagnostic confirmation tool in selected patients, demonstrating a correlation between anatomical alterations of the superficial venous system (saphenous diameter, valvular incompetence) and clinical severity (CEAP class). This supports targeted use of duplex ultrasound, avoiding indiscriminate application in the general population.[19-23]

Patients' desire to improve their clinical condition was significantly correlated with CEAP class, symptoms, and perception of venous risk. Patients with more severe disease and greater symptom burden are more motivated to intervene, consistent with literature showing that patient engagement,

perception of venous risk, and information received are key determinants of treatment adherence. This again underscores the importance of medical counselling, as risk perception is closely linked to the level of information provided by healthcare professionals.[24-25]

A particularly significant finding concerns the role of health information in influencing patient perceptions and behaviors. The moderate positive correlation between information received and perception of venous risk, as well as desire to undergo treatment, suggests that adequate counselling not only improves awareness of the progressive nature of the disease but also enhances patient motivation toward therapeutic adherence. Several studies have shown that targeted educational interventions significantly increase patient knowledge of venous disease, improve adherence to therapy, and reduce venous ulcer recurrence in advanced stages. In particular, one review identified poor health literacy as a major barrier to adherence to compression therapy. Another study demonstrated that a nursing educational intervention significantly increased adherence to compression therapy and reduced venous ulcer recurrence over time. A randomized controlled trial showed that distribution of an educational brochure substantially improved patient awareness regarding compression, recurrence symptoms, and the importance of physical activity and diet.[26-28]

The literature emphasizes that patient education must be an integral part of the care pathway and that understanding the disease is key to treatment success, particularly for non-invasive therapies such as compression therapy.[29-30]

Part of the model proposed in our study focuses precisely on these aspects, namely patient disease perception and information dissemination. The results showed that most subjects, including some patients with evident clinical manifestations, had limited knowledge of the condition. In particular, warning symptoms were often not promptly recognized, leading to significant diagnostic delays.

Another relevant finding concerns communication between patients and healthcare professionals: many participants reported that they rarely received detailed explanations about venous disease from healthcare providers, particularly general practitioners, even when the disease was already present.

This informational gap negatively affects disease awareness and management, leading not only to diagnostic delays but also to reduced therapeutic compliance.

In light of these findings, we believe that broader scientific dissemination is essential, involving not only patients but the entire healthcare workforce. To achieve this goal, we propose the implementation of more impactful media campaigns, awareness initiatives supported by health policy (particularly the Ministry of Health), promotion of an annual CVI awareness day, and wider dissemination through informational leaflets and posters distributed in local health authorities, hospitals, medical practices, and pharmacies. If adequately structured, such initiatives could increase disease knowledge, improve early symptom recognition, and contribute to earlier diagnosis, with positive effects on public health and patient quality of life.

It is also essential that a substantial part of media campaigns and medical counselling focus on the importance of treatment, both surgical and conservative.

In particular, compression therapy, although a cornerstone of venous disease management, was perceived by patients as difficult to tolerate. However, during post-study counselling sessions, subjects expressed greater willingness to adhere to treatment after understanding the usefulness of compression stockings and their mechanism of action in disease control.

An additional supportive tool could be the establishment of a direct communication channel between general practitioners and specialists, for example through a dedicated contact number for each territorial district. Such a service would allow rapid and effective consultation in more complex cases, ensuring timely treatment and reducing the risk of complications.

The questionnaire developed in our study has several strengths. It is a low-cost, easy-to-administer tool that allows rapid patient triage and comprehensive assessment, including both subjective symptoms and clinical signs. The proposed two-step strategy optimizes the efficiency of available resources.

However, some limitations remain. First, the questionnaire may be too long and demanding for some patients, and the study sample is relatively small to allow extraction of fully generalizable results. To

improve effectiveness and reproducibility as a screening tool, the questionnaire could be further optimized by reducing the number of items and focusing on clinically relevant variables (demographic data, risk factors, medical history, occupational activity), excluding questions related to prior counselling, disease perception, and treatment motivation. Moreover, the absence of formal questionnaire validation limits methodological robustness: without comparison with standardized scales such as r-VCSS or validated Patient-Reported Outcome Measures (PROMs) such as VEINES-QOL or CIVIQ, sensitivity, specificity, and predictive capacity cannot be assessed. To strengthen the tool, several steps are required: expansion of the patient sample, definition of a cut-off score for specialist referral, integration with established clinical scales and PROMs, and follow-up to observe clinical evolution in triaged patients and assess the impact of initiated therapies.

Conclusions

Control of CVI requires continuity of care between hospital and primary care settings, with the general practitioner playing a key role in optimizing access to care, reducing inappropriate examinations, and ensuring continuity. The proposed model integrates three levels: primary care triage managed by the general practitioner, hospital centers for diagnosis and treatment, and a territorial support network for conservative management, wound care, patient education, and follow-up. It is therefore necessary to establish agreements with referral hospitals that define examination timelines and feedback channels for general practitioners, and to ensure adequate support from health policy in defining specific care pathways, appropriate allocation of economic resources, and, where possible, shared information systems.

The proposed model - general practitioner, then questionnaire, then direct referral to territorial specialists - is fully supported by recent literature as a pragmatic and efficient approach for patient triage and monitoring in CVI and for improving integrated clinical management between primary care and hospital settings.

The immediate next step should be validation of the questionnaire in a pilot population and definition of a shared operational protocol with referral centers.

Based on the results obtained, we also propose broader and more structured scientific dissemination targeting both healthcare professionals and the general population, as well as adoption of more streamlined and effective communication between primary care and specialist services, both hospital-based and outpatient. Greater integration among different levels of care would optimize clinical management, promote earlier diagnosis, and ensure a uniform and shared therapeutic pathway.

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Table 1. Baseline characteristics of the study population. This table summarizes the main demographic, clinical, and anthropometric characteristics of the overall study population, including age, sex, body mass index, family history, pregnancy history, symptom prevalence, and Clinical, Etiological, Anatomical, and Pathophysiological (CEAP) clinical classification.

Baseline characteristics	**Value**
Age, years (mean±SD)	52.3±14.8
Female sex, n (%)	157 (70.4%)
BMI, kg/m² (mean±SD)	25.3±3.5
Family history, n (%)	132 (59.2%)
Pregnancy (women), n (%)	124 (55.6%)
Symptoms present, n (%)	121 (54.3%)
CEAP≥2, n (%)	70 (31.4%)

SD, Standard Deviation

Table 2. Duplex Ultrasound findings according to Clinical, Etiological, Anatomical, and Pathophysiological (CEAP). This table reports the main duplex ultrasound parameters stratified by CEAP class, comparing great saphenous vein diameter and the prevalence of saphenous vein incompetence between patients with CEAP<2 and CEAP≥2.

Variable	**CEAP<2**	**CEAP≥2**	**p-value**
GSV diameter, mm	3.68	4.70	0.011
GSV incompetence, %	36.6%	78.6%	<0.001

GSV, Great Saphenous Vein

Table 3. Factors associated with Clinical, Etiological, Anatomical, and Pathophysiological (CEAP) ≥2. This table shows the distribution of demographic, clinical, and ultrasound variables according to CEAP class, highlighting factors associated with more advanced chronic venous disease (CEAP≥2).

Variable	**CEAP<2**	**CEAP≥2**	**p-value**
Age, years	49.85	57.64	0.004
BMI, kg/m²	25.18	25.68	0.009
Symptoms, %	49.0%	65.7%	<0.001
GSV diameter, mm	3.68	4.70	0.011
GSV incompetence, %	36.6%	78.6%	<0.001

BMI, Body Mass Index; GSV, Great Saphenous Vein

Table 4. Patient perception and motivation. This table describes patient-reported outcomes related to risk perception, desire to improve their condition, and information received from healthcare professionals, stratified by Clinical, Etiological, Anatomical, and Pathophysiological (CEAP) class.

Variable	**CEAP<2**	**CEAP≥2**	**p-value**
Risk perception	1.21	0.99	0.032
Desire to improve	0.62	0.84	0.006
Information received	0.24	0.51	0.018