

Educational efficacy of an onsite training course in improving theoretical and practical skills in nailfold videocapillaroscopy among first-year rheumatology trainees: experience from the Italian Society of Rheumatology Inaugural Residential Program

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Abstract

Objective. Nailfold videocapillaroscopy (NVC) is a key imaging technique for assessing microcirculation in patients with Raynaud's phenomenon and is essential for the diagnosis of scleroderma-related diseases and monitoring of systemic sclerosis. Few studies have evaluated structured NVC training programs, and none have investigated their impact on medical residents. This study aimed to assess skill acquisition during the First Residential NVC Course promoted by the Italian Society of Rheumatology for first-year rheumatology trainees, held in Rome on May 29-30, 2025.

Methods. Trainees from 14 Italian regions participated in a 2-day program. Day 1 consisted of frontal lectures, while day 2 focused on hands-on training and interactive image interpretation. All participants completed a theoretical test and a self-evaluation of competence before and after the course. On the second day, trainees undertook an image interpretation test and filled out a satisfaction questionnaire.

Results. A total of 82 trainees attended the course; 86.6% reported no prior theoretical knowledge of NVC, whereas 62.2% had performed at least one examination. Significant improvements were found in 13 of the 15 theoretical questions. Self-perceived competence increased, with 62.2% of participants reporting an improvement from 'poor' to 'adequate'. The mean score on the image interpretation test was 89.3%, and overall satisfaction was high (mean rating of 3.77/4).

Conclusions. This intensive residential course enhanced theoretical knowledge, self-perceived competence, and practical interpretation skills among first-year trainees. Given the central role of NVC in current rheumatology training standards, early structured exposure should be considered an essential component of postgraduate education.

Key words: nailfold videocapillaroscopy, rheumatological diseases, education and training.

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Introduction

Nailfold videocapillaroscopy (NVC) is a safe and reliable imaging technique widely used to evaluate microcirculation in patients with Raynaud's phenomenon and connective tissue diseases (CTDs) (1, 2).

In systemic sclerosis (SSc), the recognition of the scleroderma pattern is part of the 2013 American College of Rheumatology/European League Against Rheumatism classification criteria (3), and in clinical practice this technique plays a key role both in diagnosis and disease and treatment monitoring (4-6).

Moreover, NVC has been proven to be a valuable tool in the management of idiopathic inflammatory myopathies (IIM). In particular, the presence of scleroderma-like patterns seems to be discriminatory between IIM patients and SSc patients, and it has been suggested that NVC could be a biomarker for organ involvement and follow-up (7, 8). A scleroderma-like pattern is also present in about 30% of patients affected by mixed CTD, but its role as an outcome predictor is still to be understood (9).

Capillary abnormalities have been found in patients affected by other CTDs, specifically systemic lupus erythematosus (10), undifferentiated CTD (11), anti-phospholipid syndrome (12), and Sjögren syndrome (13). Despite being less specific, they might be worth a longitudinal NVC evaluation, since endothelial damage might play a role in their pathophysiology (14).

Moreover, frequent capillary abnormalities have been identified in psoriatic arthritis and rheumatoid arthritis, including enlarged and tortuous capillaries, angiogenesis, microhemorrhages, and even capillary loss (15, 16).

Finally, recent data indicate that NVC is increasingly applied to conditions involving endothelial dysfunction, including diabetes mellitus, interstitial lung disease, pulmonary arterial hypertension, and hematological disorders, although findings are not yet standardized (17). An international survey demonstrated that NVC was the most widely used tool among rheumatologists dealing with microcirculation of CTDs, both in clinical practice and research settings (18). Therefore, a comprehensive training in the recognition of scleroderma patterns and scleroderma-like patterns, as well as in distinguishing normal NVC findings, is considered essential for all rheumatologists and is incorporated into the core specialist-training curriculum across Europe (19). A survey conducted among members of the Scleroderma Clinical Trials Consortium in the United States showed that nearly 75% of specialists had received informal training or were self-taught (20). This further underscores a strong need for formal NVC education.

In recent years, several NVC courses have been designed for both junior and senior rheumatologists; nevertheless, the evidence supporting their effectiveness is limited (21-24).

Since 2004, European Alliance of Associations for Rheumatology Education has supported an annual intensive training program in NVC and, more recently, has introduced an online course on NVC and microcirculation (<https://esor.eular.org/>). Within Italy, NVC training has constituted a mandatory component of the ministerial rheumatology residency program for more than a decade. In 2025, the Italian Society of Rheumatology (SIR) launched its first Residential Course in NVC, designed as an on-site program to be offered annually to first-year rheumatology residents as part of their formal educational pathway. The present study aimed to assess the effectiveness of this initiative in strengthening residents' theoretical knowledge and practical competencies on NVC.

Material and Methods

Study population

As the course promoter, SIR invited all the first-year rheumatology trainees to participate in a 2-day, on-site course. For the interested first-year trainees' pre-registration was required. The opening course was held in Rome on May 29-30, 2025.

Course design

The faculty, serving as both lecturers and tutors, consisted of SIR members acknowledged for their national and international expertise in the field. As illustrated in Figure 1, the educational program comprised: a) a series of live theoretical lectures, lasting approximately three hours, delivered on the first day of the course (the complete program can be found in *Supplementary Table 1*); and b) three practical sessions, including: i) a live demonstration on healthy subjects conducted at the conclusion of the first day; ii) hands-on training sessions with volunteer patients affected by CTDs, lasting nearly two hours on the second day. Participants were organized into small groups to maintain a faculty-to-learner ratio of 1:7-8, thereby ensuring close supervision and individualized instruction. Models displaying a range of capillaroscopic patterns, including normal findings, were distributed across multiple NVC stations. Each group rotated through the stations, spending a minimum of 20 minutes at each one before proceeding to the next. Every trainee was afforded the opportunity to operate the NVC equipment and acquire images independently; iii) an interactive session comprising imaging presentations, followed by group discussions lasting approximately two hours on the second day.

Study design

This study (CAPSIR_9) was conceived and coordinated by the Study Group on Capillaroscopy of the SIR, as all faculty members serving as lecturers and tutors are affiliated with this group. The primary endpoint was to assess improvements in NVC competencies by comparing the number of correct answers in a theoretical test administered before and after the course (see point "a" in the paragraph below). Secondary endpoints included: (i) a comparison of self-perceived confidence in NVC before and after the course, (ii) an evaluation of practical NVC skills at the conclusion of the training, and (iii) a final appraisal of overall course satisfaction (see points "b", "c", and "d" in the paragraph below).

Data collection

Prior to the beginning of the course, on the first day, participants were provided with a detailed briefing on both the course content and the study design. Demographic data, including gender, age, and center affiliation, were collected, along with information regarding previous theoretical and practical NVC experience. In addition, informed consent was obtained for the potential citation of participants' names in subsequent publications.

Pre- and post-course assessments of participants' knowledge and confidence in NVC included:

- i. a questionnaire consisting of 15 multiple-choice questions (*Supplementary Table 2*). Each question had five answer options, with only one correct. Six questions assessed knowledge of NVC methodology, reporting and usefulness (Q1, Q2, Q3, Q4, Q6, Q15), and nine questions assessed knowledge of NVC parameters and patterns (Q5, Q7, Q8, Q9, Q11, Q12, Q13, Q14). The correct answers to each question were not provided to the trainees until the post-course test was completed.

- ii. a self-assessed evaluation of the perceived theoretical knowledge on NVC, examined through a single question.
- Additional data, collected only on the second day, comprised:
- i. an interactive session designed to assess image analysis skills, during which participants answered 49 multiple-choice questions developed by faculty members and delivered *via* a QR code-based application.
 - ii. a post-course satisfaction survey evaluating multiple dimensions of the training program, using a 4-point Likert scale (1 = 'very little'; 4 = 'very much') (*Supplementary Table 3*).

Statistical analysis

Categorical data are presented as absolute and relative frequencies, while continuous variables are expressed as mean and standard deviation.

Changes in the proportion of correct answers on the written theoretical evaluation test were analyzed using McNemar's test. To

control the increased risk of type I error due to multiple comparisons, false discovery rate (FDR) correction was applied. Bowker's test of symmetry was used to assess changes in the distribution of responses to the pre- and post-course self-evaluation question A $p < 0.05$ was considered statistically significant. All statistical analyses were performed using RStudio software (version 4.4.3).

Results

A total of 82 first-year rheumatology trainees participated in the course, including 39 males (47.5%) and 43 females (52.4%). The participants were affiliated with training centers across 14 different Italian regions, with the highest number coming from rheumatology training programs located in Lombardy ($n=16$; 19.5%) (Figure 2). The mean age of the participants was 27.7 ± 2.45 years. Among them, 71 trainees (86.6%) had never previously attended a theoretical course specifically dedicated to NVC, while

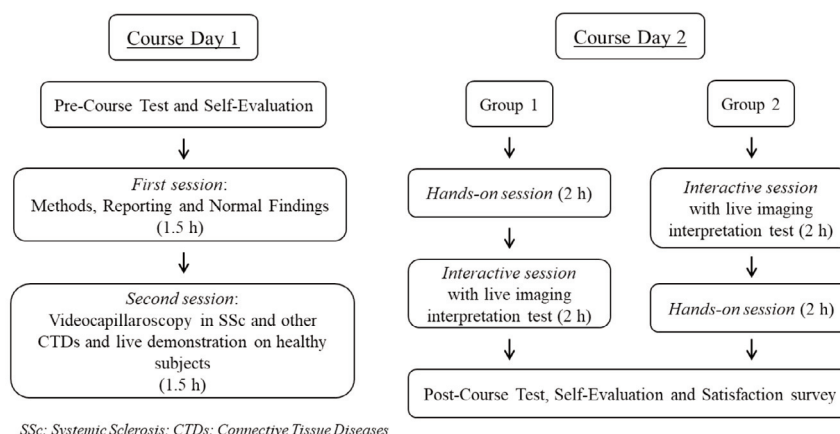


Figure 1. Course flow chart.

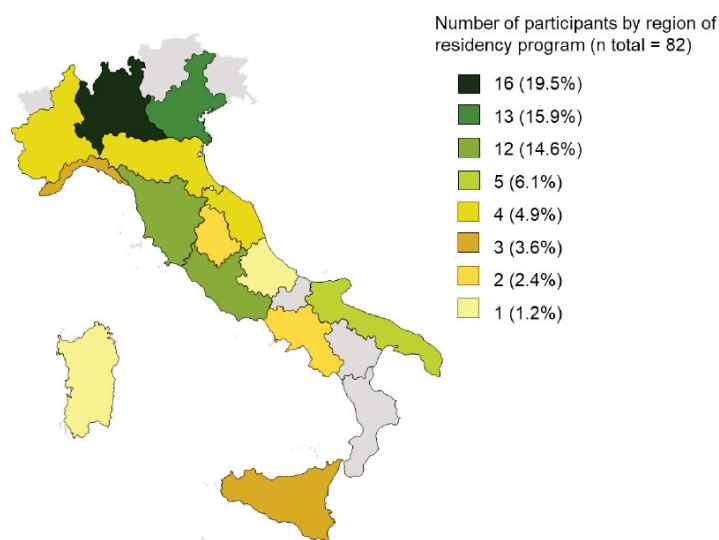


Figure 2. Distribution of participants from different training program regions.

31 (37.8%) had never personally performed a NVC examination.

Pre- and post-course written examination and self-evaluation

The written examination was composed of 15 questions. The percentage of pre- and post-course correct answers is shown in Figure 3 (see also *Supplementary Table 4*). Before the course, fewer than 50% of participants answered correctly to three questions (Q6, Q8, Q13), and fewer than 75% answered correctly to four questions (Q2, Q7, Q12, Q14). The remaining eight questions were correctly answered by more than 75% of participants, with no items scoring below 25% correct responses.

After the course, correct response rates improved significantly for 12 of the 15 questions (McNemar test, FDR-adjusted $p < 0.05$). In particular, the largest absolute improvement was observed for Q6 (31.7% to 92.7%, $p < 0.001$). Substantial gains were also recorded for Q7 (71.9% to 100%, $p < 0.001$) and Q12 (70.7% to 97.5%, $p < 0.001$). Questions Q8 (46.3% to 68.3%, 0.002) and Q13 (40.2% to 64.6%, $p < 0.001$), which had low baseline performance, also showed notable increases. In the post-course test, all questions had corrected response rates above 50%, with only Q8 and Q13 remaining below 75%. For the other 13 questions, correct responses exceeded 90%.

Global self-assessed confidence regarding theoretical knowledge significantly increased following course attendance (Bowker’s test, $p < 0.001$). Before the course, none of the participants rated their knowledge as excellent, while 7.3% reported no knowledge, 70.7% poor, and 21.9% satisfactory knowledge. After the course, all participants reported at least some level of knowledge, with 6.1% rating it as poor, 79.2% as satisfactory, and 14.6% as excellent.

A detailed analysis of individual transitions across categories revealed that most trainees who initially reported no or poor knowledge shifted to satisfactory or excellent levels after the course. Among those with no baseline knowledge, the majority improved to poor or satisfactory levels. Likewise, most participants with poor pre-course confidence progressed to satisfactory or excellent levels post-course, while nearly half of those who initially reported satisfactory knowledge reached the excellent category by the end (Figure 4 and *Supplementary Table 5*).

Imaging interpretation test

The imaging interpretation test consisted of 49 multiple-choice questions. Overall, the mean percentage of correct responses in the live assessment of imaging interpretation skills was 89.3%. Performance varied according to question type: the highest accuracy was observed in two-choice questions (96.5%), followed by three-choice (83.9%), five-choice (83.0%), and four-choice questions (82.4%).

Satisfaction

The satisfaction survey indicated a high overall satisfaction, with a mean score of 3.77 out of 4. Participants rated the extent to which their expectations were met with a mean of 3.66. Additional evaluated aspects included content relevance (mean 3.76), expected learning outcomes (mean 3.79), and materials provided (mean 3.61). Figure 5 depicts the percentage distribution of responses to the satisfaction survey across the 4-point Likert scale.

Discussion and Conclusions

NVC is a non-invasive tool with a key role in the diagnosis and follow-up of SSc and other “scleroderma-related” diseases. It provides valuable information for monitoring disease progression and supporting therapeutic decisions. Accordingly, NVC is now considered an essential component of the rheumatologist’s core curriculum, and in recent years, several educational and training initiatives on NVC have been successfully implemented worldwide.

The first Italian NVC course for first-year residents in rheuma-

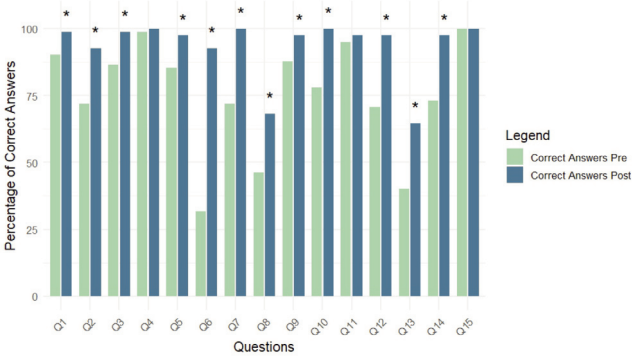


Figure 3. Percentage of correct answers pre- and post-course attendance in the theoretical test.

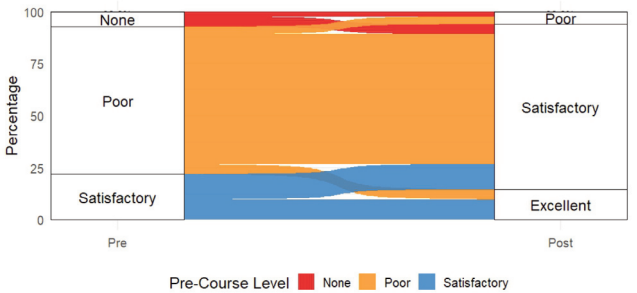


Figure 4. Sankey plot showing the transition of pre- and post-course self-assessed theoretical knowledge among first year trainees, expressed in percentage (Bower test, $p < 0.001$).

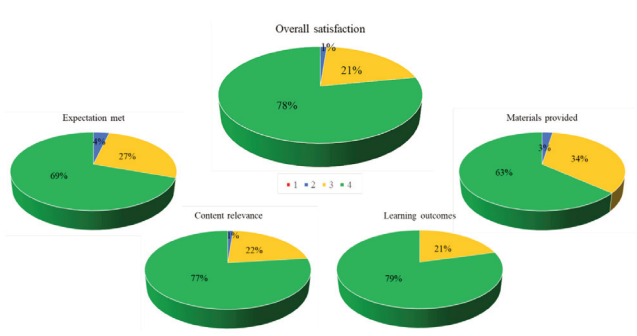


Figure 5. Distribution of satisfaction survey responses.

tology was highly appreciated by participants and, as shown in this study, proved to be successful in both objective and subjective pre- and post-course evaluations. The results demonstrated a significant overall increase in the percentage of correct answers on the written test after the course, confirming an improvement in theoretical knowledge.

This finding was also observed for the two questions with the lowest percentage of correct answers prior to the course. Although the proportion of correct responses for these items remained below 75%, it increased by at least 20%, thereby confirming the course's effectiveness in enhancing not only well-established concepts but, more importantly, less familiar topics.

Prior to the course, none of the participants rated their knowledge as excellent, and nearly 80% reported poor or no knowledge. By the end of the course, more than 90% of trainees assessed their NVC knowledge as satisfactory or excellent. This improvement in self-perceived knowledge was consistent with the objective test results. A further indicator of the course's effectiveness was the acquisition of imaging interpretation skills: participants correctly answered more than 89% of the questions in the live interactive test.

The course was also highly rated, with a mean satisfaction score of 3.77 out of 4. Several aspects were positively evaluated, including fulfillment of trainees' expectations, the relevance of the content, the clarity of learning objectives, and the quality of the materials provided.

Among these, the use of a smartphone-based delivery application was of particular interest. This modern, user-friendly, and reliable system allowed participants to answer questions *via* QR code and enabled tutors to rapidly assess knowledge acquisition, further enhancing overall satisfaction.

Other relevant organizational aspects included close and personalized supervision by faculty members, small-group hands-on sessions, and rotation through multiple practical stations with patients to be examined. This latter feature enabled residents to perform and interpret NVC images from both healthy and pathological volunteers, thus covering almost all possible NVC patterns. All these elements represent key teaching and learning strategies.

This differs from videocapillaroscopy training courses that have been the subject of previous studies. In 2023, an international Nailfold Capillaroscopy Online Training workshop was the focus of a study evaluating participants' ability to distinguish scleroderma from non-scleroderma patterns using the Fast Track algorithm (24). The results showed good inter- and intra-rater agreement; however, the more practical aspects involved in performing the capillaroscopy examination were not addressed, given the online format of the course. The participants did not perform the examination on live patients and therefore could not interpret images in a real-life setting and face the challenges of a more realistic simulation.

The homogeneous level of expertise among participants and sample size also represent a strength of this course compared to other training programs described in previous studies. In 2012, a pilot study tested the efficacy of an intensive training program involving four rheumatologists with different levels of experience (22), whereas in 2009, the efficacy of a self-taught course was evaluated by following the learning curve of a single specialist trainee with no prior experience in capillaroscopy (21).

Both studies demonstrated that the training programs were effective, but further confirmation was needed. It should also be noted that participants of the first Italian NVC course came from all Italian rheumatology training programs, reflecting the general baseline knowledge of first-year rheumatology residents across the

country. Interestingly, nearly 38% of trainees had never personally performed a NVC examination, despite this being a mandatory skill for rheumatologists according to the national training guidelines.

Considering that these participants are first-year residents who will likely perform NVC in the coming years, it would be reasonable to establish a regular annual NVC theoretical and practical course at the beginning of the training program.

Besides, the approach of this NVC course is fully consistent with the SIR's goal of offering annual specialized courses to all Italian rheumatology trainees, aimed at strengthening both theoretical and practical mandatory skills through the involvement of national and international experts.

To reach a broader audience, it may be advisable to develop a hybrid format, with theoretical lectures delivered online (either live or pre-recorded), while necessarily including an in-person component to allow participants to perform hands-on capillaroscopy. It could also be interesting to compare these two methods to evaluate their effectiveness in skill acquisition as well as to plan a long-term reevaluation to measure skill-acquisition retention and application in clinical practice. Finally, an upcoming improvement of the course will be interactive discussion of real clinical cases in order to highlight how the participants' performance can translate into clinical decision-making.

In conclusion, adequate NVC training should be regarded as an essential component of the rheumatologist's educational portfolio. A dedicated course could help Italian academic rheumatology schools to train young fellows not only to perform NVC but also to accurately interpret images and related reports in their daily clinical practice.

References

1. Cutolo M, Smith V. Detection of microvascular changes in systemic sclerosis and other rheumatic diseases. *Nat Rev Rheumatol* 2021; 17: 665-77.
2. Smith V, Ickinger C, Hysa E, Snow M, Frech T, Sulli A, et al. Nailfold capillaroscopy. *Best Pract Res Clin Rheumatol* 2023; 37: 101849.
3. Van den Hoogen F, Khanna D, Fransen J, Johnson SR, Baron M, Tyndall A, et al. 2013 classification criteria for systemic sclerosis: an American College of Rheumatology/European League against Rheumatism collaborative initiative. *Arthritis Rheum* 2013; 65: 2737-47.
4. Smith V, De Keyser F, Pizzorni C, Van Praet JT, Decuman S, Sulli A, et al. Nailfold capillaroscopy for day-to-day clinical use: construction of a simple scoring modality as a clinical prognostic index for digital trophic lesions. *Ann Rheum Dis* 2011; 70: 180-3.
5. Cutolo M, Herrick AL, Distler O, Becker MO, Beltran E, Carpentier P, et al; CAP Study Investigators. Nailfold videocapillaroscopic features and other clinical risk factors for digital ulcers in systemic sclerosis: a multicenter, prospective cohort study. *Arthritis Rheumatol* 2016; 68: 2527-39.
6. Trombetta AC, Pizzorni C, Ruaro B, Paolino S, Sulli A, Smith V, et al. Effects of longterm treatment with bosentan and iloprost on nailfold absolute capillary number, fingertip blood perfusion, and clinical status in systemic sclerosis. *J Rheumatol* 2016; 43: 2033-41.
7. Piette Y, Reynaert V, Vanhaecke A, Bonroy C, Gutermuth J, Sulli A, et al. Standardised interpretation of capillaroscopy in autoimmune idiopathic inflammatory myopathies: a structured

- review on behalf of the EULAR study group on microcirculation in Rheumatic Diseases. *Autoimmun Rev* 2022; 21: 103087.
8. D'Oria M, Gandin I, Riccardo P, Hughes M, Lepidi S, Salton F, et al. Correlation between microvascular damage and internal organ involvement in scleroderma: focus on lung damage and endothelial dysfunction. *Diagnostics* 2022; 13: 55. 36611347.
 9. Todoroki Y, Kubo S, Nakano K, Miyazaki Y, Ueno M, Satoh-Kanda Y, et al. Nailfold microvascular abnormalities are associated with a higher prevalence of pulmonary arterial hypertension in patients with MCTD. *Rheumatology* 2022; 61: 4875-84.
 10. Ingegnoli F, Ughi N, Riccieri V, Stefanantoni K, Cracowski JL, Gutierrez M, et al. Distribution of nailfold videocapillaroscopy parameters in systemic lupus erythematosus and their association with disease activity: an international blinded case-control analysis on behalf of the EULAR study group on microcirculation in rheumatic diseases. *RMD Open* 2025; 11: e005772.
 11. García-González M, Rodríguez-Lozano B, Bustabad S, Ferraz-Amaro I. Undifferentiated connective tissue disease: predictors of evolution into definite disease. *Clin Exp Rheumatol* 2017; 35: 739-45.
 12. Bernardino V, Rodrigues A, Lladó A, Panarra A. Nailfold capillaroscopy and autoimmune connective tissue diseases in patients from a Portuguese nailfold capillaroscopy clinic. *Rheumatol Int* 2020; 40: 295-301.
 13. Melsens K, Leone MC, Paolino S, Elewaut D, Gerli R, Vanhaecke A, et al. Nailfold capillaroscopy in Sjögren's syndrome: a systematic literature review and standardised interpretation. *Clin Exp Rheumatol* 2020; 38: 150-7.
 14. Hysa E, Pizzorni C, Sammorì S, Gotelli E, Cere A, Schenone C, et al. Microvascular damage in autoimmune connective tissue diseases: a capillaroscopic analysis from 20 years of experience in a EULAR training and research referral centre for imaging. *RMD Open* 2023; 9: e003071.
 15. Prioteasă OG, Bobircă A, Anghel D, Groșeanu ML, Bojincă VC. Nailfold videocapillaroscopic changes in patients with psoriatic arthritis: a systematic review. *Biomed Rep* 2025; 23: 130.
 16. Angeloudi E, Anyfanti P, Dara A, Pagkopoulou E, Bekiari E, Sgouropoulou V, et al. Peripheral nailfold capillary microscopic abnormalities in rheumatoid arthritis are associated with arterial stiffness: results from a cross-sectional study. *Microvasc Res* 2023; 150: 104576.
 17. Mansueto N, Rotondo C, Corrado A, Cantatore FP. Nailfold capillaroscopy : a comprehensive review on common findings and clinical usefulness in non-rheumatic disease. *J Med Invest* 2021; 68: 6-14.
 18. Ingegnoli F, Ughi N, Dinsdale G, Orenti A, Boracchi P, Allanore Y, et al. An international SURvey on non-iNvaSive tecHniques to assess the mIcrocirculation in patients with RayNaud's phEnomenon (SUNSHINE survey). *Rheumatol Int* 2017; 37: 1879-90.
 19. Cutolo M, Smith V, Sulli A. Training in capillaroscopy: a growing interest. *J Rheumatol* 2012; 39: 1113-6.
 20. Snow MH, Saketkoo LA, Frech TM, Stever JR, Lebedoff N, Herrick AL, et al. Results from an American pilot survey among Scleroderma Clinical Trials Consortium members on capillaroscopy use and how to best implement nailfold capillaroscopy training. *Clin Exp Rheumatol* 2019; 37: 151.
 21. De Angelis R, Cutolo M, Salaffi F, Restrepo JP, Grassi W. Quantitative and qualitative assessment of one rheumatology trainee's experience with a self-teaching programme in videocapillaroscopy. *Clin Exp Rheumatol* 2009; 27: 651-3.
 22. Gutierrez M, Bertolazzi C, Tardella M, Becciolini A, Di Carlo M, Dottori M, et al. Interreader reliability in assessment of nailfold capillary abnormalities by beginners: pilot study of an intensive videocapillaroscopy training program. *J Rheumatol* 2012; 39: 1248-55.
 23. Rodriguez-Reyna TS, Bertolazzi C, Vargas-Guerrero A, Gutiérrez M, Hernández-Molina G, Audisio M, et al. Can nailfold videocapillaroscopy images be interpreted reliably by different observers? Results of an inter-reader and intra-reader exercise among rheumatologists with different experience in this field. *Clin Rheumatol* 2019; 38: 205-10.
 24. Ng SA, Tan WH, Saffari SE, Low AHL. Evaluation of nailfold capillaroscopy online training using the fast track algorithm. *J Rheumatol* 2023; 50: 368-72.

Online supplementary material

Supplementary Table 1. Course program.

Supplementary Table 2. Pre- and post-course questions and answers in the theoretical test.

Supplementary Table 3. Post-course satisfaction survey.

Supplementary Table 4. Pre- and post-course comparison of the percentage of correct answers in the theoretical test.

Supplementary Table 5. Pre-course and post-course changes in trainees' self-assessment of theoretical knowledge.

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Contributions: all authors made substantial contributions to the acquisition of data. Ilaria Bisconti, Martina Favretti, Valeria Riccieri: data analysis and interpretation. Valeria Riccieri, Francesca Ingegnoli: conception and design of the work. Ilaria Bisconti, Martina Favretti, Francesca Ingegnoli, Valeria Riccieri: draft of the work. All authors: data acquisition, critical revision for important intellectual content, approval of the final version to be published. All the authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Informed consent: informed consent was obtained for the potential citation of participants' names in subsequent publications.

Patient consent for publication: no patients data were recorded for this study.

Availability of data and materials: the datasets used and/or analyzed during the current study are available upon reasonable request from the corresponding author.

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