A national survey of practice patterns in the noninvasive diagnosis of deep venous thrombosis

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Purpose: **Recent studies have recommended unilateral venous duplex scanning for the diagnosis of deep venous thrombosis (DVT) in patients who are unilaterally symptomatic. Vascular laboratory accreditation standards, however, imply that bilateral leg scanning should be performed. We examined whether actual practice patterns have evolved toward limited unilateral scanning in such patients.**

Methods: **A questionnaire was mailed to all 808 vascular laboratories in the United States that were accredited by the Intersocietal Commission for the Accreditation of Vascular Laboratories (ICAVL). To encourage candid responses, the questionnaires were numerically coded and confidentiality was assured.**

Results: **A total of 608 questionnaires (75%) were completed and returned. Most of the respondents (442; 73%) were either community-hospital or office-based laboratories, and the remaining 163 (27%) were university or affiliated-hospital laboratories. Most of the laboratories (460; 76%) had been in existence for 9 years or more, and 65% had been ICAVL–accredited in venous studies for 3 years or more. Board-certified vascular surgeons were the medical directors in 54% of the laboratories. Duplex ultrasound scanning was the diagnostic method used by 98% of the laboratories. In patients with unilateral symptoms, 75% of the laboratories did not routinely scan both legs for DVT. A large majority (75%) believe that bilateral scanning is not clinically indicated. Only 57 laboratories (14%) recalled having patients return with a DVT in the previously unscanned leg, with 93% of these laboratories reporting between one and five such patients. This observation correlated with larger volumes of venous studies performed by those laboratories ($P < .05$). Similarly, only 52 laboratories (12%) recalled having patients return with subsequent pulmonary emboli. Of these laboratories, only five reported proximal DVT in the previously unscanned legs of such patients. Of all these laboratories, therefore, only 1% (5 of 443) have potentially missed the diagnosis of a DVT that caused a preventable pulmonary embolus with such a policy. Among those laboratories that always perform bilateral examinations, 41% do so because of habit. Most (61%) of the laboratories that perform bilateral scanning would do unilateral scanning if it were specifically approved by ICAVL.**

Conclusion: **Three quarters of the ICAVL–accredited vascular laboratories perform limited single-extremity scanning for the diagnosis of DVT in patients with unilateral symptoms. This broad clinical experience suggests that this practice is widespread in selected patients. Clinical protocols should be established to provide guidelines for local laboratory implementation. (J Vasc Surg 1999;29:799-806.)**

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Venous thromboembolism, manifested as deep venous thrombosis (DVT) or pulmonary embolization, is a significant clinical problem. Acute DVT is responsible for more than 600,000 hospitalizations each year and a 1-year mortality rate of 21%.[1-4] Because of its accuracy and noninvasive characteristics, duplex ultrasound scanning has become the diagnostic test of choice for the detection of DVT. Although venography historically was performed only on the symptomatic leg, ultrasound scan examinations routinely have been performed on both legs because of easy patient acceptance and the finding

Table I. Geographic distribution of responses

Region	*No. of responses (%)*
South	177 (29%)
Midwest	173 (29%)
East	164 (27%)
West	90 (15%)
Unidentified	4 (<1%)
TOTAL	608

Table II. Laboratory location

Location	*No. of responses (%)*
Community hospital	262 (43%)
Private office	180 (30%)
University-affiliated teaching hospital	95 (16%)
University hospital	68 (11%)
Mobile laboratory	3 (<1%)

that there was a high incidence rate of unsuspected thrombi in the contralateral limb.[3,5,6] More recently, however, studies have shown that contralateral thrombi were rarely of any clinical significance.[7-9] It has been proposed that, in patients with unilateral symptoms, only the symptomatic extremity should initially undergo examination.[7-10] This study was performed to investigate the actual practice patterns in the noninvasive diagnosis of DVT in the United States in regards to bilateral versus unilateral duplex scanning.

MATERIALS AND METHODS

A one-page, multiple-choice questionnaire (Appendix) was mailed on December 15, 1997, to all the vascular laboratories that were accredited by the Intersocietal Commission for the Accreditation of Vascular Laboratories (ICAVL). The questionnaires were numbered sequentially to ascertain those responding and to assure confidentiality. A follow-up request was sent to the nonresponders at 2 weeks and again at 1 month after the initial mailing. The answers to the questions were compiled and analyzed in a blinded fashion. Some responders did not provide an answer to all the questions.

The responses on the completed questionnaires were entered into a relational database (Approach 3.0, Lotus Corp, Boston, Mass). The data subsequently were analyzed with Excel 95 software (Microsoft, Redmond, Wash). The data are expressed as the mean ± the standard error of the mean. Statistical analysis was performed with the SigmaStat statistical program (Jandel Scientific, San Rafael, Calif). The Mann-Whitney test or the *t* test were used for continuous data, and the Fisher exact test or the χ^2 test were used for dichotomous data. A *P* value of less than .05 was considered to be statistically significant.

RESULTS

Of the 822 laboratories that were accredited by the ICAVL at the time of the study, 808 were within the United States, six were located in Puerto Rico, and eight were in Canada. Of those in the United States, 608 (75%) returned a completed questionnaire. These laboratories form the basis of this report. The geographic distribution was nearly evenly divided between the south, the midwest, and the east regions of the country (Table I). The most responses were from Pennsylvania (53; 9%), New York (44; 7%), Ohio (40; 7%), and California (38; 6%). This regional and state distribution mirrored the distribution of accredited laboratories reflecting a representative response to the questionnaire. Most of the respondents [442; 73%] were either community-hospital or office-based laboratories and the remaining 163 (27%) were university or university-affiliated teaching hospital laboratories (Table II). Most laboratories (460; 76%) had been in existence for 9 years or more. A total of 87% of the laboratories had been ICAVL–accredited in venous studies for 1 year or more, and 65% (376 of 577) had been accredited for 3 years or more.

Most of the laboratories were busy, with 54% (321 of 594) performing more than 2000 total yearly vascular examinations and only 19% (116) performing less than 1000 studies. The number of examinations performed specifically for the diagnosis of acute lower extremity DVT exceeded 500 cases per year for 57% of the laboratories (334 of 590), while 18% performed less than 250 studies each year. Of these studies, 20% or less were performed as an emergency after-hours procedure in 87% (500 of 576) of the laboratories. Duplex ultrasound scanning was the predominant method (98%; 582 of 593) that was used for the noninvasive diagnosis of DVT. Board-certified vascular surgeons were the medical directors in more than half of the laboratories surveyed (Table III). Almost half of the laboratories (49%; 289 of 589) had only one or two full-time vascular technologists employed, and 16% had five or more.

In patients who were symptomatic with unilateral leg symptoms, 75% of vascular laboratories (443 of 590) did not routinely scan both legs for DVT. Laboratories that performed unilateral scans were larger, with 32% (139 of 431) having four or more

vascular technologists as compared with only 21% (33 of 158) among those performing bilateral scanning ($P < .01$). Associated with this observation, the laboratories that always performed bilateral scans did a lesser total number of vascular examinations, with 27% (42 of 158) performing less than 1000 per year. Only 17% (74 of 436) of unilateral scanning laboratories did such a low number of examinations ($P = .01$). There were no significant differences between the laboratories that performed bilateral or unilateral studies when examined in terms of the region of the country (Table I), the location of the laboratory (Table II), the specialty of the medical director, or the number of years that the laboratory had been in existence or had had ICAVL accreditation in venous studies.

Most of the laboratories (68%; 292 of 429) that performed unilateral scanning did so more than half of the time (Table IV). The decision for unilateral examination was made most frequently by the referring physician (Table V). More than half of the laboratories (59%; 254 of 428) had a written protocol or criteria for patient selection in determining which ones should undergo unilateral scanning. The principal reasons quoted for unilateral scanning were a belief that bilateral scanning was not clinically indicated (75%; 315 of 420)—that it was more cost effective (14%; 59)—or for research purposes (11%). Three quarters of these laboratories have performed unilateral scanning for more than 5 years (74%; 306 of 416).

Only 14% of the laboratories (57 of 394) recalled having any patient return with an acute proximal DVT in the previously asymptomatic unscanned leg within 1 month of the unilateral examination. Most of these laboratories (93%; 53 of 59) reported between one and five such patients. The subsequent detection of contralateral DVT correlated with larger volumes of venous studies performed by those laboratories ($P < .05$). Similarly, 15% of the laboratories (52 of 362) recalled having patients return with subsequent pulmonary emboli (PE) within 1 month of the unilateral duplex scanning of the lower extremity. Of these laboratories, only five reported a proximal DVT in the previously unscanned contralateral limb of such patients. Of all the laboratories that performed unilateral scanning, therefore, only 1% (5 of 443) have potentially missed the diagnosis of a DVT that may have been associated with a preventable PE with such a policy.

Of the 25% of the laboratories (147 of 590) that always performed bilateral examinations in patients who were symptomatic with only unilateral leg symptoms, 41% did so because they have always done it that way, 57% believe that it is dangerous to only scan one side, 6% fear litigation, and 3% do so for research purposes. Most of the laboratories (61%) that currently perform bilateral lower extremity venous scanning would perform unilateral scanning if specifically approved by ICAVL.

Table III. Laboratory medical director

Specialties	*No. of responses (%)*
Vascular surgeon	336 (54%)
Radiologist	130 (21%)
Surgeon	84 (13%)
Internal medicine/cardiology	48 (8%)
Neurologist	18 (3%)
Other	9 (1%)
TOTAL	625

DISCUSSION

To prevent thrombus extension and pulmonary embolization, early and accurate diagnosis of DVT is necessary for the timely initiation of anticoagulation therapy. Signs and symptoms suggestive of DVT are inadequate, and, even when highly suspected, DVT is confirmed only 25% of the time.[11] Venous duplex scanning combines the advantages of a totally noninvasive, relatively inexpensive method with a sensitivity of up to 93% and a specificity of 98% in the diagnosis of DVT.[5,12] Clinician acceptance of this diagnostic technique has been so encompassing that it has been questioned whether the threshold for duplex scanning use has been lowered too far because so few of the examinations confirm the presence of DVT.[13]

Before the availability of ultrasound scan imaging, venography had only been performed on the symptomatic leg because of its invasiveness and the development of subsequent phlebitis in a small number of patients. Examinations limited to the symptomatic limb during that time period do not appear to have been associated with clinically inadequate treatment of patients with venous thrombosis. The introduction of noninvasive ultrasound scan methodology allowed both legs to be scanned without any additional risks to the patient. This also provided the opportunity to compare the findings on one side with the contralateral limb. Such routine bilateral examinations uncovered a high incidence rate of contralateral DVT, even in limbs that were completely asymptomatic, that ranged from 17% to 32%.[3,5,6,11] During this same time period, the widespread acceptance of noninvasive vascular diagnostic

Table IV. Frequency of unilateral scanning

Proportion of studies	*No. of responses (%)*
<25%	82 (19%)
25% to 50%	55 (13%)
51% to 75%	88 (21%)
76% to 99%	165 (39%)
100%	39 (9%)
TOTAL	429

Table V. Decision maker on unilateral scanning

Decision maker	*No. of responses (%)*
Referring physician	280 (63%)
Vascular technologist	179 (40%)
Medical laboratory director	71 (16%)
Laboratory physician	30 (7%)
Combination	104 (23%)
TOTAL	443

studies and associated proliferation of vascular laboratories led to the formation of the ICAVL. With the objectives of encouraging and documenting competency in vascular studies, ICAVL accreditation was sought by many laboratories. The requirements for accreditation in venous duplex ultrasound scanning defined a complete study as one that included both lower extremities.[14] The high prevalence of bilaterality in lower extremity DVT, in association with accreditation requirements, contributed to the perception that bilateral venous scanning should be routinely performed.[12,6,12]

The initial studies that documented a high incidence rate of bilateral DVT, however, did not separately examine the subgroup of patients who were symptomatic nor define the acuity of the unsuspected contralateral DVT in individual patients to determine whether such findings would have affected patient management. Because anticoagulation therapy is systemic, the contralateral DVT would be treated just as effectively as the identified thrombus. To examine the clinical relevance of the contralateral limb in patients who were unilaterally symptomatic, we previously reported on our experience with 2530 patients.[7,9] Although we found bilateral DVT in 28% of these patients, no patient with a normal symptomatic side had contralateral proximal acute DVT. Contralateral DVT occurred only in the presence of an abnormality in the symptomatic leg. Therefore, no patient would have been denied appropriate clinical treatment if only unilateral venous scanning would have been done. In addition, we found that a unilateral ultrasound scan study decreased the total scanning time by 21% and had the potential of increasing reimbursement by approximately 9%.[7] We concluded that unilateral scanning should be the technique of choice in patients who were symptomatic. Several other studies, which total 1709 patients, also support this viewpoint that clinical patient management would not be deleteriously affected if unilateral studies were performed in these circumstances.[8,10,15,16]

With an overall 75% response rate that was evenly distributed from all regions of the country and all types of vascular laboratories, our survey is fairly representative of national practice patterns in the United States today for the ultrasound scan diagnosis of DVT. A large number of university and university-affiliated hospital laboratories responded, but most were community-hospital or office-based laboratories (Table II). Reflecting the qualities necessary to successfully attain ICAVL accreditation, most laboratories have been in existence for 9 years or more. The laboratories were fairly busy, with more than half of them performing more than 2000 total vascular studies each year and more than 500 duplex ultrasound scans for the diagnosis of DVT. Emphasizing the extensive nationwide replacement of indirect physiologic techniques, fully 98% of the laboratories used duplex scanning as the method of choice in DVT diagnosis. The results from this survey confirm that there is widespread implementation of unilateral scanning in patients who are symptomatic in only one leg. Fully 75% of all the surveyed vascular laboratories do not routinely examine both legs in this situation. Two thirds perform unilateral scanning more than half the time (Table IV). Although laboratories that performed unilateral scanning were larger (employing more technologists) and the laboratories that always performed bilateral scanning did a smaller total number of vascular examinations each year, there was otherwise an even distribution across all laboratory types in the performance of unilateral scanning. There were no differences between university and community-hospital/private laboratories, regions of the country, specialty of the medical director, or the number of years that the laboratory had been in existence or had had ICAVL accreditation in venous studies.

Consistent with the results from published studies, three quarters of the laboratories that performed unilateral scanning believed that bilateral examinations were not clinically indicated and 14% believed that it was more cost effective to perform unilateral examinations. Interestingly, most of these laboratories have been performing unilateral scanning for more than 5 years. This would antedate all of the

published studies that recommended such a policy. The survey, however, did not attempt to measure whether there was an increase in frequency with which unilateral scanning has been performed that may have been influenced by the published series. Usage patterns also appear to have been affected by referring physicians who were most frequently the decision makers in determination of a unilateral examination (Table V). The fact that vascular technologists made the determination on unilateral scanning 40% of the time presumably reflects the availability of a written protocol or patient selection criteria in 59% of the laboratories.

There are inherent and acknowledged limitations to a survey that is made on the basis of the respondents' memories. Such an instrument cannot accurately report on recurrent DVT or PE nor on patients who are lost to follow-up. Surveys cannot define the accuracy of the diagnosis of DVT by individual laboratories nor their quality assurance programs. Nonetheless, it is worthy to note that only 14% of the laboratories recalled seeing patients return with a contralateral DVT in the unscanned leg. This is well within the range of bilaterality found in prior published studies.[3,6-9,12,13] The questionnaire did not attempt to question the circumstances of such events and whether they were of any clinical significance. Presumably, however, they were not significant because these laboratories would not have otherwise been expected to continue with a protocol of unilateral scanning if the medical director had documented recurrent deleterious outcomes. Along similar lines, 15% of the laboratories recalled having patients return with PE. However, on examination in the vascular laboratory, contralateral DVT in the unscanned limbs of these patients was reportedly found in only five of these 52 instances for an incidence rate of 10%. It is unknown how many of these patients also had concomitant symptomatic side DVT. However, to put these reports in perspective, of all the 443 laboratories that performed unilateral scanning, there was only a 1% incidence rate (5 of 443) of potentially missed DVT that caused preventable PE. In addition, such an incidence rate, if accurate, is well within the 6% recurrent thromboembolic event rate for patients undergoing anticoagulation therapy for DVT.[17] Even bilateral scanning is unlikely to prevent all patients with DVT from having PE. Although the limitations of such a retrospective survey in this context are recognized, these numbers lend support to published clinical data that show the safety of unilateral scanning in selected patients.

Among the vascular laboratories that always perform bilateral venous scanning, 41% continue to do so out of habit and most are not yet convinced of the clinical safety of unilateral examinations. However, 61% would perform unilateral scanning if such a protocol were specifically approved by ICAVL. The accrediting body does not prohibit such practices and recognizes that they "may be appropriate for specific indications" and suggests that the laboratory "should have a clinical algorithm" for unilateral examinations.[14] They do not, however, elucidate which indications are appropriate nor what algorithm would be acceptable. Almost half of the laboratories describe no written protocols or criteria in place for unilateral scanning. In the laboratories with such documentation, it is unknown how precise they are and from what clinical evidence they are derived. Importantly, we have noted a wide variability in who makes individual patient examination decisions. There is, therefore, an obvious need to establish evidence-based guidelines for local laboratory implementation. We believe that it would be beneficial and appropriate for ICAVL to support the development of such laboratory guidelines. In our prior reports, we had made some suggestions describing which symptomatic patients would be appropriate for unilateral scanning for the diagnosis of acute DVT.[7,9]

In summary, we have found that three quarters of ICAVL–accredited vascular laboratories perform limited unilateral venous studies in patients who are symptomatic and have been doing so for a number of years. Such a broad, under-reported clinical experience suggests that this practice is widespread in selected patients. Clinical protocols should be established that can provide guidelines for local vascular laboratory implementation.

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DISCUSSION

Dr Ron Savrin (Cleveland, Ohio). This was a fascinating study, and I think we are all indebted to you at Hershey for getting and presenting these data.

A look at this abstract prompted me to go back and look at our own results because we are one of those few laboratories that continue to do bilateral scanning and I am not quite sure why. I looked back at our last 1000 consecutive patients on whom we performed venous duplex scanning, and we had an overall incidence rate of deep venous thrombosis (DVT) of about 12% or 12.5 %, which is pretty much the normal rate. Fifteen of those 1000 patients had DVT in an asymptomatic limb, and that number seemed high. Eight of those 15 patients had bilateral DVT, so those would have been picked up had we done unilateral scanning. But seven patients had DVT only in the asymptomatic leg, which was quite a surprise to us. When we looked at those seven patients, we found that five of the seven were thought to have pulmonary embolism. Now, we all understand that this is not the diagnostic procedure of choice for patients who are suspected of having pulmonary embolism. What I wonder, on the basis of what you have collected there, with the data and the kind of information we have, is whether we should continue to do bilateral scanning in patients in whom pulmonary embolism is a suspected diagnosis and whether we should continue to do bilateral scanning in patients who are at "high risk," such as those patients who have long-term periods of time in the intensive care unit or multiple trauma patients and reserve unilateral scanning for the rest of the population.

Dr John Blebea. Thank you for your comments. It is an open question whether initially one should or should not do lower extremity venous studies for patients who are suspected of having pulmonary embolus (PE) before a ventilation-perfusion scan or angiogram. The overall incidence rate of DVT in this patient group in our prior experience was only 12%. Our feeling is that there is a role for duplex scanning of the lower extremities in patients suspected of PE, but how that fits in with the timing of a ventilation-perfusion scan or a pulmonary angiogram is debatable. Our questionnaire, however, excluded such patients. It focused on patients with unilateral lower extremity symptoms and did not address patients suspected of having a PE or other asymptomatic high-risk patient groups.

In reference to your experience with seven patients and DVT on the contralateral asymptomatic side, although you did not tell us whether those DVT were proximal or distal, seven patients out of 1000 is less than 1%. Especially in patients who are asymptomatic, this is below the sensitivity and specificity duplex scanning. In addition, five of those seven patients apparently were referred because of concern for PE, not because they

had lower extremity symptoms, and would thus not have been included in this study.

Dr Sergio X. Salles-Cunha (Toledo, Ohio). I like to do bilateral studies. It takes only 5 minutes to do femoral popliteal scanning in the other leg. The reason is that if a patient has thrombosis on the right leg, most likely that patient will come back with thrombosis in the left leg in the future. How will I know if the new thrombosis is acute, chronic, or a mixture if I have not scanned the patient before? Is there any use to know that that leg was either thrombosed or healthy in the first event? Is there any use for that information in the second event?

Dr Blebea. Generally speaking, the answer is no. Unless you see rather specific clot characterizations to indicate that it is chronic in nature, even if the patient had previously undergone scanning, the clinician is probably still going to treat that patient if he is newly symptomatic. Even if DVT previously had been documented, most laboratories do not map out the extent of thrombosis to such a degree that a second episode, if it is not completely characteristically chronic in appearance, cannot exclude a new event as superimposed upon acute thrombosis. In few circumstances will it be of clinical importance that the asymptomatic leg was not scanned.

Dr Mark Mattos (Springfield, Ill). My question is, can we afford in today's litigious society, even to miss one contralateral, proximal, asymptomatic DVT? What is your cut off for missing clot on the other side? Is it 1%, 10%?

Dr Blebea. That is a good question. We asked people on the questionnaire why they continued to perform bilateral scanning. Many laboratories do so because they have always done it that way, but only 6% continue because they are afraid of potential litigation.

In addition, on the basis of our prior retrospective and prospective studies, this practice appears to be safe and efficacious. Even with bilateral scanning, we miss more than 1% of DVT because duplex ultrasound scanning, no matter how much we love it, is not 99% accurate no matter how you do it or who does it. This study also illustrates that unilateral scanning in patients who are symptomatic is a widespread practice and that recommendations and criteria should be more clearly established so that legal concerns do not force us to do studies that are not clinically useful. We should treat patients the way they should be treated rather than out of fear of litigation.

Please see the related commentary by Hirsch et al on pages 939-40.

APPENDIX. Questionnaire

DIAGNOSIS OF LOWER EXTREMITY DEEP VENOUS THROMBOSIS

(Please circle your response)

1. Where is your vascular laboratory located?
   University hospital Univ. affiliated teaching hospital Community hospital Private office Mobile
2. How many full-time vascular technologists are employed in your lab?
   1 2 3 4 >5
3. How many years has your vascular lab been in existence?
   <1 1 - 2 3 - 4 5 - 6 7 - 8 9 - 10 >10
4. How many years has your lab been ICAVL-accredited in venous studies?
   <1 1 - 2 3 - 4 5 - 6 7 - 8 9 - 10 >10 years
5. Which best describes your laboratory's medical director?
   Board-certified vascular surgeon Surgeon Radiologist Neurologist Internal medicine/cardiology Other
6. What is the total number of vascular examinations performed by your laboratory each year?
   <500 501 - 1000 1001 - 2000 2001 - 3000 3001 - 4000 4001 - 5000 >5000
7. How many examinations each year are done specifically for the diagnosis of acute lower extremity DVT?
   <250 251 - 500 501 - 1000 1001 - 1500 1501 - 2000 2001 - 2500 >2500
8. What percentage of these examinations are emergency, after-hours studies?
   <10% 11 - 20% 21 - 30% >30%
9. Are all studies to diagnose acute lower extremity DVT performed with duplex sonography? Yes No
   If No, what percentage are done with impedance plethysmography?
   <25% 25 - 50% 51 - 75% 76 - 99% 100% If 100%, you have completed the survey. Thank you.
10. For the patient with unilateral symptoms do you <u>always</u> scan both legs? If Yes, please go to question 18
    Yes No
11. What percentage of patients with only unilateral leg symptoms undergo only a unilateral leg scan?
    <25% 25 - 50% 51 - 75% 76 - 99% 100%
12. Do you currently have a written protocol or criteria for patient selection for unilateral scanning? Yes No
13. Who decides whether a unilateral or bilateral duplex examination is performed?
    Referring physician Medical director Laboratory physician Vascular technologist
14. What is the principle reason for performing unilateral scanning in patients with unilateral symptoms?
    Bilateral scans not clinically indicated More cost effective Research purposes
15. How many patients per year who have had unilateral duplex scans have returned to your hospital within 30 days with acute proximal contralateral DVT in the previously unscanned leg? None 1 - 5 6 - 10 >10
16. How many patients per year with initially normal unilateral duplex scans have returned to your hospital within 30 days with a pulmonary embolism (proven by pulmonary angiogram or high-probability V/Q)?
    None 1 - 5 6 - 10 >10
    If any, did the patient's previously unscanned leg have a proximal DVT on subsequent duplex exam for PE? Yes No
17. How many years has your laboratory been performing unilateral studies for patients with unilateral symptoms?
    <1 1 2 3 4 5 >5
18. (Only for laboratories that <u>always</u> perform bilateral scans) What is your principle reason for always performing bilateral duplex scanning in patients with unilateral symptoms?
    Have always done it this way Dangerous to scan one side only Fear of litigation Research purposes
19. (Only for laboratories that <u>always</u> perform bilateral scans) Would you be willing to perform unilateral scans in symptomatic patients with unilateral leg symptoms if such a protocol were approved by ICAVL? Yes No

Thank you for your participation!