CSVS

THE COLLEGE AND SOCIETY
FOR CLINICAL VASCULAR SCIENCE
Great Britain and Ireland

Education

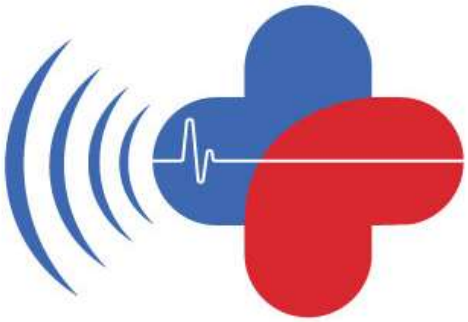
Guidelines for Practical Exam Assessors

For Assessors only

Version 4.1

August 2025

Doc Ref ED-003



Education

Guidelines for Practical Exam Assessors

For Assessors only

Version 4.1

August 2025

Doc Ref ED-003

Version Number	Change	Author	Date
4.1	Formatting changes	Author: Education Committee Approval: CSVS Exec Committee	August 2025

Purpose

The purpose of this document is to provide confidential guidance to practical exam assessors to ensure uniform interpretation and consistent scoring of candidates taking the CSVS practical examination.

Introduction

A similar document (but without the answers in Section D) is available to all CSVS members to demonstrate the marking system.

This document should be read alongside the **"Practical Exam Scoring Sheet"** document.

These guidelines were developed by an CSVS Working Party and the CSVS Education Committee and updated by the CSVS Education Committee.

Skills Section A

If you mark 'No' for any of the Skills please make notes explaining why with specific reference to these guidelines.

Skill 1: Does the patient fulfil outlined criteria?

The patient should fulfil the criteria as set out in the accreditation document. These are as follows:

Carotid & vertebral artery duplex patient:

- The scan must be a diagnostic referral for a carotid duplex investigation.
- The patient must be >50yrs with appropriate carotid territory symptoms.
- The patient must be a new referral with no previous carotid duplex report available.

Lower limb arterial duplex patient:

- The scan must be a diagnostic referral for a full-leg (aorto-ankle) lower limb arterial duplex. If the referral is just for a limited duplex (e.g. femoro-popliteal duplex) then the referrer's and patient's approval must be sought to extend examination to full leg for purposes of the exam.
- The patient must have suspected significant arterial disease. For the purposes of the examination this could include relevant symptoms with non-palpable pulses, monophasic signals on hand held Doppler, a resting ABPI ≤0.8 or a post-exercise ABPI of ≤0.6 which must be established prior to booking the patient for the exam.
- The patient must be a new duplex referral with no previous lower limb arterial duplex report available.

Lower limb venous duplex patient:

- The scan must be a diagnostic referral for a varicose vein duplex.
- The patient must have significant visible varicosities.
- The patient must be a new duplex referral with no previous lower limb venous duplex report available.

Please also see the accreditation document (appendices 3,4,5,6) for the expected scope of the examinations.

Skill 2: Does the candidate correctly identify the patient?

Patient should be identified by full name AND either date of birth or address. If the candidate needs prompting, 'No' should be circled on the score sheet but assessors should ensure that the patient's identity is confirmed for safety.

If the candidate fails to identify the patient and/or needs prompting, the internal assessor can remind the candidate about confirming the patient's identity before the next scan. This should be a simple reminder of the candidate's usual practice of confirming the patient's identity when they are not nervous due to the exam.

Skill 3: Does the candidate clearly obtain informed consent and give clear instructions where appropriate?

The candidate should explain the procedure to the patient and give clear instructions where appropriate, answering any questions fully and adapting their approach to reflect the communication needs of the patient. Consent can be verbal or implied (i.e. through following instructions)

Candidate should mention most of the following things:

- ultrasound/cold gel/sound waves
- no needles/non-invasive/not painful/no injections
- approximate length of scan
- which part of the body/blood vessels will be scanned
- which items of clothing to be removed
- lie on bed/sit on couch

If the patient interrupts the candidate and demonstrates that they are familiar with ultrasound or have read a patient information leaflet and understand what the test entails, it is acceptable for the candidate not to explain the procedure further.

The candidate should not need to be prompted to obtain informed consent and give instructions to the patient; if the candidate needs to be prompted they should be given a 'No' mark on the exam score sheet.

<u>Skill 4:</u> Is the candidate competent in the use of B-Mode?

In order to demonstrate this skill, the candidate should optimise the image by utilising and updating the following controls throughout the scan:

- Overall gain
- Focal zone number
- Focal zone position
- Depth
- TGC
- Calipers

This list of B-Mode controls is not exhaustive; the candidate may alter the B-mode image using additional machine controls.

a) **Gain** should be set so that detail of structures can be seen i.e. outline and composition of plaques, thrombus, but image should not be 'over-gained' resulting in a loss of contrast resolution.

b) **Focal zone(s)** should be adjusted throughout the scan so that they are placed at the region of interest. *

c) **Multiple focal zones** MAY be used for improving image quality as long as the adverse effect on temporal resolution does not compromise the diagnostic capability of the scan.

d) **Depth** should be adjusted correctly to image the necessary structures with the minimum depth required*.

e) **TGC** should be adjusted to compensate for attenuation due to depth and enhancement artefacts.

f) **Calipers** should be placed correctly for obtaining measurements in accordance with scan protocol.

*unless machine specifications won't allow this.

Bear in mind that everyone likes a different type of image (i.e. softer vs. high contrast); as long as the necessary structures are examined and identified and the correct conclusion is reached from the scan the candidate should not be marked down for using a softer/higher contrast image than the assessor would use.

This is an important criterion: if the candidate shows that their lack of competence in using B-Mode ultrasound may cause them to make a misdiagnosis in any of the three modalities they should be given a 'No' mark on the score sheet. In giving the 'No' mark the assessor should believe that the candidate's incompetence in adjusting the B-Mode controls is gross enough that it may result in a misdiagnosis either on exam day or in the future.

<u>Skill 5:</u> Is the candidate competent in the use of colour flow imaging?

In order to demonstrate this skill, the candidate should optimise the image by utilising and updating the following controls throughout the scan:

- Colour box size
- Colour box steering
- Colour gain
- Colour scale (PRF)
- Appropriate use of the colour function

This list of colour flow controls is not exhaustive; if the situation arises advanced colour controls (persistence, write priority etc.) may be used by the candidate. If these controls are not needed during the scan then the assessor may note them down for discussion in Section D of the exam.

a) Is the **colour box** large enough to examine the segment of vessel in question but small enough to prevent excessively slow frame rates?

b) Is the **colour box steered** in the appropriate position to maximise colour filling and definition of the velocity profile in the vessel?

c) Is the **colour gain** high enough to fill the patent vessel but low enough to prevent colour noise over the image?

d) Has a **scale/PRF** been selected which will enable the candidate to detect disease?

e) Is the colour being used **when and where** necessary?

This is an important criterion: if the candidate shows that their lack of competence in using colour flow ultrasound may cause them to make a misdiagnosis in any of the three modalities they should be given a 'No' mark on the score sheet. In giving the 'No' mark the assessor should believe that the candidate's incompetence in adjusting the colour controls is gross enough that it may result in a misdiagnosis either on exam day or in the future.

<u>Skill 6:</u> Is the candidate competent in the use of spectral Doppler?

In order to demonstrate this skill, the candidate should optimise the image by utilising and updating the following controls throughout the scan:

- PW gain, filter and frequency
- PW steering
- Scale and baseline
- Measurements with calipers
- Angle correction of PW cursor
- Sample volume size
- Appropriate use of PW Doppler

This list of PW Doppler controls is not exhaustive. Other PW controls which are not used during the scan can be discussed in Section D of the exam.

a) Are the **gain, filter and frequency** set properly to allow all parts of the waveform to be clearly defined without blurring of the waveform into an over-gained background or filling in of the spectral window?

b) Is the **PW steered** to maximise the strength of the Doppler signal?

c) Are the **scale and baseline** set so that the entire waveform appears on the spectral tracing and takes up as much of the tracing as possible?

d) Are the **calipers** placed correctly when measuring waveform parameters (PSV etc…)?

e) Has the **PW cursor** been correctly **angled** (≤60 degrees, to angle of blood flow)?

f) Has the **sample volume** been set in the correct place in the vessel and is it large enough to sample venous flow and small enough to sample arterial flow (without filling in the spectral window)?

g) Is the PW Doppler being used **when and where** necessary?

This is an important criterion: if the candidate shows that their lack of competence in using PW Doppler ultrasound may cause them to make a misdiagnosis in any of the three modalities they should be given a 'No' mark on the score sheet. In giving the 'No' mark the assessor should believe that the candidate's incompetence in adjusting the PW Doppler controls is gross enough that it may result in a misdiagnosis either on exam day or in the future.

Note: *Prompting the candidate in Skills 4, 5 and 6 of Section A:*

Obviously, the candidate needs to demonstrate competency in these skills and fluency with ultrasound machine controls over all 3 scans in order to pass the practical exam. If the assessor feels that controls are not being used where necessary or are not being used correctly they may ask the candidate if they are happy with the image: 'Are you happy with the image brightness?' if the gain or TGC control has not been touched or 'Are you happy with the colour scale setting?' if they would like to ensure that the candidate thinks they have correctly adjusted this control.

A prompt to utilise or adjust controls should be used as a measure to mitigate any 'nervous paralysis' that may have overtaken the candidate – the candidate should not be prompted several times, the prompts are not to be used in order to compensate for the candidate's forgetfulness or inability to correctly adjust machine controls.

<u>Skill 7:</u> Does the candidate make pertinent changes to patient positioning?

The candidate should ask the patient to position themselves and alter their position as necessary, for example:

- If the patient's mobility is limited the candidate could perform parts of the scan with the patient seated where a more mobile patient would have been asked to stand (e.g. venous insufficiency), and adjust the bed position and their own scanning position to accommodate this. The candidate should only alter their scanning position if this will not increase his/her risk of injury.

- Where vessels are not being imaged clearly in the usual scanning position (i.e. adductor canal with the patient supine or facing the candidate), the candidate should attempt to re-position the patient in order to obtain better images (ask the patient to adopt a prone or decubitus position, or turn around if standing).

The candidate should not be prompted to try and change the patient's position in order to obtain better images – if they fail to ask the patient to change their position they should be marked 'No' on the score sheet for this skill.

<u>Skill 8:</u> Does the candidate recognise any minor limitations or technical difficulties of the examination?

If the candidate is competent in this skill they can fully utilise all machine controls, different scanning and patient positions, different diagnostic parameters (waveforms, velocities, colour flow profiles, blood pressure, clinical signs and symptoms) to form a diagnosis from a difficult scan without being falsely confident.

The candidate must strike the correct balance between:

a) Being under confident, hiding behind minor limitations, therefore producing an inconclusive scan.

b) Mistaking a major limitation for a minor limitation and therefore giving an overconfident result.

Minor limitations could be bowel gas which obscures a very short segment of an iliac artery where the candidate has demonstrated no change in PW waveform immediately proximal and distal to the obscured segment, no plaque in that iliac artery and confirmed that the patient is not symptomatic distal to the obscured segment of artery. The candidate should report with a high degree of confidence that there is no significant stenosis in that iliac artery and should NOT give the impression that this minor limitation was insurmountable and therefore the scan is inconclusive – this would be hiding behind a minor limitation. ***Has the candidate used everything at their disposal in an effort to form a diagnosis from the scan findings?***

The candidate should demonstrate that they can perform a DIFFICULT scan, which does not have any major limitations and come to a conclusion.

If there were no limitations to the scan, the candidate should be awarded a 'Yes' mark on the score sheet.

Skills Section B

If you mark 'No' on the score sheet for any of the Skills please make notes explaining why with specific reference to these guidelines.

Skill 1: Can the candidate correctly identify and discuss anatomy?

Questions regarding anatomy should be relevant to the scan: PFA and ECA have many branches which need to be memorised for the theory exam but knowledge of these are not critical to performing an accurate scan on practical exam day.

Please refer to appendix 3, 4, 5 and 6 of the accreditation document for the major arteries and veins which the candidate must be able to identify (or tell you where they should be if they are absent) on the practical exam day. Anatomical variants should be known and if they are not seen on the scan the candidate should be able to discuss them. Main examples of anatomical variants are listed below.

Most Common Anatomical Variants:

Core Modality 1: Carotid duplex

- Aortic arch – e.g. brachiocephalic and left CCA sharing the same origin, left vertebral artery directly coming from the aortic arch instead of the left subclavian artery or common origins of the CCAs
- Usually the ICA has a dorsolateral position, however it can be dorsal, dorsomedial, ventromedial or medial
- Circle of Willis – there are at least 9 anatomical variations
- Dominant vertebral artery

Core Modality 2: Peripheral arterial duplex

General:

- Course of the arteries
- Level of bifurcations
- Presence or absence or certain branches
- Possible paired arteries (rare)

Lower Limb:

- High PFA origin
- Duplication of the SFA
- High popliteal bifurcation/trifurcation (high ATA origin)
- ATA arising from the peroneal artery
- Absence of the PTA
- Hypoplasia or aplasia of the ATA

Upper Limb (although this will not be scanned):

- Aortic arch – e.g. brachiocephalic and left CCA sharing the same origin, left vertebral artery directly coming from the aortic arch instead of the left subclavian artery
- An accessory (duplicated) brachial artery

- High radial / ulnar artery origin – e.g. from the axillary artery or proximal brachial artery
- Low origin of the ulnar artery e.g. 5-7cm below the elbow joint

Core Modality 3: Peripheral venous duplex

Many variants but the most common are listed below:

Lower Limb:

- Bifid systems – e.g. FV (approximately 20-25%), popliteal (approximately 20-25%), GSV and SSV
- Many variations in the ATVs, PTVs and peroneal veins confluences and courses
- Absence of deep venous systems – e.g. Klippel Trenaunay Syndrome
- Position/absence of the SPJ
- Variations in Giacomini vein/thigh extension vein confluences e.g. Giacomini into the LSV or thigh extension into the deep system
- Upper Limb (although this will not be scanned):
- Absence of superficial veins
- Confluence of the radial/ulnar veins at the level of the axilla

Knowledge of anatomical terms (medial/lateral, anterior/posterior, proximal/distal) should be tested and demonstrated on exam day.

The candidate may be nervous and your first questions may be regarding anatomy so if the candidate makes what appears to be silly mistake (i.e. identifying SFA as PFA or FV) the question should be repeated or the candidate should be asked to confirm what they've said.

<u>Skill 2:</u> Can the candidate identify and discuss any vascular pathology/absence of vascular pathology?

The ability to correctly identify and discuss pathology/absence of pathology forms the basis of the diagnostic conclusion of the scan. Assessors should ask themselves if they would have reported the same vascular pathology/absence of **vascular** pathology. If you feel that there is vascular pathology on the scan which the candidate has failed to recognise or has characterised incorrectly, for the patient's safety this should be brought to the attention of the candidate – the patient may need to be re-scanned if they have already left the department.

The candidate should not be prompted to correctly identify vascular pathology/absence of vascular pathology. They must do this independently in order to demonstrate that they can scan at the level expected of an Accredited Vascular Scientist. If they fail to identify vascular pathology/absence of vascular pathology they should be marked 'No' for this skill.

<u>Skill 3:</u> Can the candidate arrive at the correct conclusion from their observations?

This skill follows on directly from Skill 2. Once the patient has identified pathology they should use all the facilities of the ultrasound machine and information at their disposal to arrive at the correct conclusion from the scan:

For example:

- Candidate correctly **identifies** that the CFA is almost completely occluded (skill 2). Candidate notes echolucent thrombus which has a 'tail' that moves on pulsation, patient's symptoms of sudden pain and paralysis in that limb, clinical finding of absent pulses in that limb. Candidate therefore **arrives at the correct conclusion** that this is likely to be an acute embolic near-occlusion (skill 3).

- Candidate correctly **identifies** partially occlusive echogenic thrombus in the FV (skill 2). Candidate notes small calibre of FV, large, incompetent collateral deep vein adjacent to the FV, reflux around the thrombus and patient's symptoms of ipsilateral leg swelling for the past 2 years, with no sudden onset of new pain or increased swelling and therefore **arrives at the correct conclusion** that these are chronic post-thrombotic changes in the FV (skill 3).

- Candidate **identifies** a large plaque at the ICA origin and peak systolic velocities above the normal limit defined by their carotid criteria protocol (skill 2). Candidate **concludes** that there is an ICA stenosis of x% in line with the ipsilateral ICA waveforms, velocity criteria of their carotid protocol and state of the contra-lateral carotid arteries (skill 3).

In order to pass the AVS practical exam the skill of drawing correct conclusions from the vascular pathology identified must be demonstrated. Assessors should ask themselves if they would have come to the same conclusions from the vascular pathology identified on the scan, and should ensure that the candidate does not simply report the pathology identified without drawing a conclusion to which the assessor would have come.

If you feel that the candidate has not come to the correct diagnostic conclusions based on the scan findings for the patient's safety this should be brought to the attention of the candidate – the patient may need to be re-scanned if they have already left the department.

The candidate should not be prompted to draw the correct conclusions from the scan, they must do this independently in order to demonstrate that they can scan at the level expected of an AVS accredited vascular scientist. If they fail to come to the correct conclusion(s) from the scan findings they should be marked 'No' on the score sheet for this skill.

<u>Skill 4:</u> Can the candidate clearly and accurately report findings and conclusions?

Does the report convey all the necessary diagnostic information clearly, including measurements, emphasising pathology? The conclusion of the report should state pathology and conclusions without being bogged down in measurements.

If the report doesn't reflect the conclusions mentioned by candidate in discussion with assessors, assessors should double-check the report with candidate to ensure that the candidate hasn't forgotten to include information in the report due to rushing to produce the report for the assessors.

<u>Skill 5:</u> Can the candidate recognise and report any serious limitations of the exam which might give a misleading result if they were unreported?

This ties in with Skill 8 of Section A. The candidate must demonstrate that they can differentiate between a minor limitation which is surmountable and a serious limitation to the

diagnostic capability of the scan which cannot be mitigated or overcome despite manipulating machine controls, patient positioning, their own positioning and use of all other diagnostic parameters. A serious limitation is one that if it were unreported, would give the referring clinician a false degree of confidence in the result and might prevent them from ordering additional tests to confirm scan findings. The candidate should note any serious limitations on the scan report.

The candidate should not be overconfident and form their conclusions on chance when they cannot glean clear observations and measurements from the scan due to serious limitations.

For example:

- A calcified plaque causing shadowing over the ICA origin and proximal ICA, combined with turbulent waveforms in the mid ICA but flow velocities within normal limits should not be reported as 'no significant stenosis': the diagnostic capabilities of the scan have been severely handicapped by the large calcified plaque and due to turbulent waveforms it is not possible to confidently rule out significant stenosis.

- Obesity is a serious limitation if it completely prevents views of the iliac arteries, even when triphasic waveforms are found in the groin – if the iliac segment were reported as 'normal' due to the triphasic waveform in the groin, and the limitation was not noted on the report, the referring doctor could be misled into thinking that these segments had been visualised and stenosis and aneurysmal disease had been ruled out.

The candidate should demonstrate that they can perform a DIFFICULT scan, which does not have any major limitations and come to a conclusion. However, they must recognise when the limitations are so serious that after they have utilised all diagnostic parameters of ultrasound and manipulated the transducer and patient positioning in an effort to overcome limitations that they cannot confidently arrive at a diagnostic conclusion and this must be conveyed to the referring clinician in the scan report.

If there were no serious limitations to the scan, the candidate should later be asked to describe an example of a serious limitation and how it might affect the scan. In this case the candidate can be awarded a 'Yes' mark on the score sheet.

Skills Section C

Mark ‘0’ for if the skill is not demonstrated.
Mark ‘1’ for an incomplete or partial demonstration of the skill.
Mark ‘2’ for a complete and correct demonstration of the skill.

Skill 1: Does the candidate take a relevant clinical history, apply it to the scan and adapt if necessary?

Details regarding the patient’s history may be written on the referral but the candidate should still take this information as a history from the patient. Be considerate that the patient may not always be a “straightforward” historian or have different communication needs and the candidate may need to adapt as necessary. The history will obviously be different for the 3 scans.

History for **lower limb arterial duplex** should include questions on:

- Where the patient has symptoms
- When the patient has symptoms (during what activity, or specific time of day/night)
- How long the patient has been having symptoms
- Are the symptoms relieved by anything
- If pain is on walking how far can the patient walk
- Have the symptoms become worse recently
- Any history of back problems
- Any previous treatment for these symptoms

History for **lower limb venous duplex** should include:

- Visual examination of the leg(s) for location and distribution of varices, done in adequate lighting
- Where the patient has symptoms
- When the patient has symptoms (during what activity, or specific time of day)
- How long the patient has been having symptoms
- Are the symptoms relieved by anything
- Have the symptoms become worse recently
- Any previous treatment for these symptoms
- Any previous history of venous thrombosis
    - If so, have they had previous trauma, immobility, pregnancy, recent operation, period of inactivity, clotting disorder, punctures/cannulation of vein, DVT medication (if so, stopped when?)
- The candidate should be knowledgeable about congenital venous malformation syndromes such as Klippel-Trenaunay and should be alert for these if the patient has had varicose veins or lower limb swelling since childhood

History for **carotid duplex** should include questions on:

- What symptoms the patient has had (relating to their referral for carotid duplex)
- How often the patient has had the symptoms and how long ago
- Have they fully recovered from their symptoms

- Previous carotid endarterectomy or stenting

Adapting the scan based on patient history:

If the scan requested appears to be completely inappropriate to the patient's symptoms (i.e. the requested scan would be unlikely to show pathology – scanning of the arterial system when the patient has varicose veins), the candidate may decide to perform a different scan, with confirmation from their internal assessor. If this means that a core modality scan is not available that day, this section of the practical would need to be performed on a separate occasion.

<u>Skill 2:</u> Does the candidate present a professional and considerate manner toward patients?

The candidate should be courteous towards patients and make them as comfortable as possible without compromising positioning necessary for a good scan. The candidate should present an attitude of confidence in order to make the patient feel relaxed and treated with respect and dignity at all times.

The candidate should not receive any prompting to present a professional and considerate attitude – if they fail to do this they should receive a '0' mark.

<u>Skill 3:</u> Has the candidate selected an appropriate transducer and preset?

The preset should match the scan. If the candidate chooses to scan on a preset not named for the scan they are performing, they should explain to the assessors why they are doing this.

Nerves may be a factor if the candidate fails to select the correct preset before the scan: the candidate should be prompted once they have been scanning for a minute or two with the inappropriate preset: i.e. 'are you happy with the preset?'. The candidate should then either change the preset or explain why they using a preset not named for the scan they're performing; they should receive a score of '1'. They should only need to be prompted once; if they select the wrong preset again without an explanation they should be given a '0'.

<u>Skill 4:</u> Is the technique appropriate to the examination?

The scanning technique should reflect the particular scan being performed. For example, when performing a venous scan the patient should either be standing or in the reverse Trendelenburg position. The transducer position should also be correct, for example medial thigh when scanning the upper thigh FV. When scanning the SFA in an arterial scan, it would be inappropriate to scan solely in transverse section and not in longitudinal section.

<u>Skill 5:</u> Does the candidate inform the patient of the result or advise them who will do so?

If the candidate fails to inform the patient of the result or advise them who will do so, the internal assessor should do this in order to uphold good patient care and the candidate should receive a '0' mark on the score sheet. The fact that the internal assessor has had to speak to the patient about their results in front of the candidate

should jog the candidate's memory so hopefully they will not forget this on the next scan.

<u>Skill 6:</u> Does the candidate recognise the significance of their observations in terms of patient management?

The candidate must be able to demonstrate knowledge of what action they should take in the event of chronic or acute scan findings.

If on exam day scan findings are chronic and therefore do not require the candidate to seek urgent medical attention for the patient, the candidate should be asked what they would do in an urgent scenario: i.e. if the candidate were to find fresh thrombus in the CFA, a AAA 5.5cm or larger in diameter, fresh thrombus in the popliteal vein or a significant ICA stenosis in a symptomatic patient what would they do? The candidate must demonstrate that they would have the confidence and assertiveness to contact the referring doctor, surgical registrar, on-call clinician etc. in line with their local protocols in order to obtain urgent medical attention for their patient.

Conversely, the candidate should demonstrate that they don't overreact to scan findings which indicate chronic disease: if the candidate found echogenic thrombus in a narrowed superficial femoral vein with adjacent deep collaterals the candidate must demonstrate that they would have the confidence in their diagnosis of chronic thrombus and would NOT panic and seek unwarranted urgent medical attention for their patient.

In addition to understanding when to seek urgent medical attention for their patient and when to send the patient home for routine outpatient follow-up, the candidate should demonstrate knowledge of possible treatment options for peripheral vascular disease including:

- medical vs. surgical management,
- carotid endarterectomy,
- angioplasty,
- stenting,
- bypass grafts,
- exercise programmes for claudicants
- superficial venous ablation,
- superficial venous ligation and stripping,
- anti-coagulation.

If the candidate can fully describe, without prompting, the correct action they should take in the event of various scan findings (not just what they have found on today's scan), and can describe possible treatment options, they should be given a '2' score on the score sheet.

If the candidate can describe what action should be taken in the event of various scan findings but cannot fully describe possible treatment options for various scan findings, or needs prompting to describe treatment options, they should be given a '1' score on the score sheet.

If the candidate cannot describe, or incorrectly describes, the action they should take in the event of chronic or acute scan findings they should be given a '0' score even if they demonstrate good knowledge of treatment options for various scan findings.

Skill 7: Does the candidate note any relevant incidental observations from the scan?

The key word is 'relevant'. As this is an assessment of vascular ultrasound competency the candidate does not need to demonstrate competency in general ultrasound.

Incidental observations relevant to vascular ultrasound include:

- Baker's cyst
- Oedema
- Seroma
- Vessel tortuosity
- Large or vascularised lymph nodes
- Obvious mass near a vessel

The examiner can use their judgement in terms of how many points to award – for example, if a candidate notes an echolucent area in the popliteal fossa but does not mention the possibility of a Baker's cyst, 1 point instead of 2 could be awarded.

If there are no relevant incidental observations seen during the scan the candidate should receive a '2' score.

Skill 8: Does the report include documentation of relevant measurements, waveforms, plaque characteristics etc…?

Assessors should defer to sample reports from the candidate's lab and local protocols. The level of information regarding waveforms, velocity measurements, plaque characterisation that is included on the scan report varies hugely from lab to lab. The candidate should report according to local protocol, HOWEVER, the report should include an estimate of the degree of stenosis (if significant) for peripheral arterial and carotid scans and in addition should document the waveform shape(s) at an appropriate level in peripheral arterial scans. A complete report should be produced that includes documentation of all significant vascular pathology (diagrams, if included, should not be left blank if pathology is observed).

Skills Section D

For Skills 1&2:

The candidate must score a minimum of 3 in skills 1 and a minimum of 3 in skills 2, as well as scoring 15 overall, to pass Skills Section D.

For Skills 3-7:

Mark ‘0’ for No, the candidate cannot discuss this topic accurately and appropriately.
Mark ‘1’ for an incomplete or partial discussion of the topic or after prompting.
Mark ‘2’ for yes, thorough and correct discussion of the topic without prompting.

Skill 1: Can the candidate describe 5 machine controls and explain how to use them?

Assessors should choose these controls after the scans have been completed; preferably controls which have not been used during the scan should be chosen, however this can be at the assessor’s discretion (for example when a candidate uses a large range of controls during the scan).

Candidates should be able to describe the following controls without prompting:

- Persistence
- Pre-processing
- Post-processing
- Filters
- B-mode gain
- Colour gain
- PW Doppler gain
- Output power
- TGC
- Scale/PRF
- Sweep speed
- Focus
- Sample volume size/gate
- Compression/edge enhancement/dynamic range
- Priority
- Power Doppler/colour angio
- Frame rate
- Zoom
- Harmonics
- Invert
- Angle correction (cursor)

Skill 2: Can the candidate discuss 5 actions they could take to minimise the risk of cross infection relating to infection control in the vascular lab?

The candidate should mention most of the following:

- Cleaning probes between every patient – with appropriate cleaning agents
- Hand washing before and after each patient
- Probe covers for infectious patients
- PPE (personal protective equipment) e.g., gloves, aprons etc for infectious patients

- Cleaning of scanning couch and machine
- Uniforms
- No jewellery and hair off the collar
- Deep cleaning of the whole room after infectious patients
- Be aware of local infection control protocols
- Scan highly infectious patients at the end of the patient list

<u>Skill 3:</u> Can the candidate discuss the advantages of ultrasound compared to other imaging modalities?

The candidate should mention most of the following:

- Non-invasive
- Inexpensive
- No associated known morbidity risks
- No inpatient stay required
- No ionizing radiation
- No contrast required
- Not painful/well tolerated

<u>Skill 4:</u> Can the candidate discuss alternative imaging modalities for the scans they have just performed?

Alternative imaging to a **lower limb venous duplex**:

Venogram: Candidate should be able to discuss that a venogram requires a venous puncture, utilises ionizing radiation and contrast material, can be painful and is not 100% accurate especially for diagnosing calf DVT. Tourniquets may be using for venous insufficiency venograms.

Alternative imaging to a **lower limb arterial duplex** or **carotid duplex**:

Angiogram: candidate should be able to discuss that this is invasive, carries morbidity risk for false aneurysm, arterial thrombosis, and embolism (stroke), uses radiation and possibly nephrotoxic contrast material therefore not suitable for people with compromised renal function, is expensive, is not 100% accurate especially in low-flow states (distal to occlusion), cannot be used to diagnose aneurysmal disease, may not have multiplanar views therefore eccentric stenotic disease may be over- or underestimated. No haemodynamic data obtained. Digital subtraction angiography uses large volumes of contrast and may suffer from patient movement artefacts. Angiography does not suffer from artefacts caused by calcification or bowel gas, as duplex does.

CT Angiogram: requires venous puncture, radiation and contrast but can be used to diagnose aneurysmal disease and endoleaks (not 100% accurate), artefacts can be caused by calcification but provides multiplanar views.

MRA: gadolinium has documented side-effects, can be unpleasant due to the patient being in a very confined space, artefacts from some metallic components but not from calcification, lack of precision in measuring degree of narrowing and limitation due to tortuous vessels.

<u>Skill 5:</u> Can the candidate discuss work related injuries associated with ultrasound and how to reduce the risk of them?

The candidate should mention most of the following:

- Repetitive strain injury from repetitive scanning movements/holding positions
- Machine and all movable components of ultrasound machine should be moved as much as possible to minimise need to twist neck especially when performing lower limb venous scans
- Patient should be as close to the operator as possible to minimise stretch or reach
- Type of scan could be varied throughout the scanning session to minimise repetitive movements
- Ultrasound operator could perform muscle stretches to ease muscle tension
- Height adjustable chair and height adjustable scanning bed and possibly supports for arm/wrist could be used
- Occupational health could be asked to visit lab to make suggestions
- Clean up gel to avoid slipping over

<u>Skill 6:</u> Can the candidate discuss what the physical risks or hazards for patients undergoing vascular ultrasound examinations including bio-effects?

The candidate should mention most of the following:

- Risk of slipping on gel
- Tripping on ultrasound leads or machine power cable
- Risk of falling or fainting
- Mechanical and thermal indices (cavitation and heating)

<u>Skill 7:</u> Can the candidate describe lifestyle changes that might benefit a patient with significant vascular disease?

The candidate should mention most of the following:

- Smoking cessation advice
- Increasing exercise
- Dietary changes/cholesterol reduction
- Diabetic control
- Blood pressure reduction
- Substance abuse treatment
- Compliance with medication/best medical therapy
- Leg elevation and stockings in venous disease patients

<u>Skill 8:</u> Can the candidate describe how they would set up a scanning modality which their department does not currently practise?

The candidate should mention most of the following:

- Seek training from a lab which currently performs these scans
- Recognised training courses
- Contact key stakeholders who might use the service
- Consult textbooks, journals, CSVS guidelines for information
- Audit of initial results compared to gold standards
- Referral criteria

- Financial implications