Common Core Standards for Vascular Ultrasound in Ontario

2025

Ontario Health

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Abbreviations

Abbreviations	Definitions
AAA	Abdominal aortic aneurysm
ABI	Ankle brachial index
A-P	Anterior-posterior
ARDMS	American Registry for Diagnostic Medical Sonography
ATA	Anterior tibial artery
CAR	Canadian Association of Radiologists
CCA	Common carotid artery
CFA	Common femoral artery
CFV	Common femoral vein
CIA	Common iliac artery
CIV	Common iliac vein
CLTI	Chronic Limb Threatening Ischemia
CMRITO	College of Medical Radiation and Imaging Technologists of Ontario
CPSO	College of Physicians and Surgeons of Ontario
CT	Computed tomography
DFV	Deep femoral vein
DMS	Diagnostic medical sonography
DVT	Deep vein thrombosis
ECA	External carotid artery
EDV	End diastolic velocity
EIA	External iliac artery
EIV	External iliac vein
EQI	Echocardiography Quality Improvement
GSV	Great saphenous vein
ICA	Internal carotid artery
ICHSCs	Integrated Community Health Services Centres
IVC	Inferior vena cava
MOC	Maintenance of Certification
MRI	Magnetic resonance imaging
OHIP	Ontario Health Insurance Plan
PFA	Profunda femoris artery
PSV	Peak systolic velocity

Abbreviations	Definitions
PTA	Posterior tibial artery
PTVs	Posterior tibial veins
QA	Quality assurance
QCIPA	Quality of Care Information Protection Act
RCPSC	Royal College of Physicians and Surgeons of Canada
SFA	Superficial femoral artery
SFJ	Saphenofemoral junction
SPJ	Saphenopopliteal junction
SSV	Small saphenous vein
SVT	Superficial vein thrombosis
TIA	Transient ischemic attack
VUS	Vascular ultrasound

Introductory Message

Improving Vascular Ultrasound Quality in Ontario: A Collaborative Initiative

Vascular ultrasound (VUS) is a widely used imaging modality across Ontario, essential for the screening, surveillance, and diagnosis of numerous vascular conditions. It plays a critical role in the toolkit of primary care specialists, emergency room physicians, vascular interventional radiologists and surgeons, diagnostic radiologists, and other health care professionals. VUS is, therefore, a fundamental diagnostic tool that spans the entire health care system. Despite its significance, there has been limited effort to ensure that all Ontarians have access to appropriate high-quality, reliable VUS examinations that provide the necessary clinical details to improve patient outcomes.

A parallel can be drawn to the quality improvement efforts seen in echocardiography, another important ultrasound tool used in screening, diagnosing, and treating cardiac conditions. In April 2012, CorHealth Ontario launched the Echocardiography Quality Improvement (EQI) Program to address similar challenges in cardiac ultrasound including:

a) improving the overall quality of studies,
b) reducing the need for repeat examinations, and
c) addressing health inequities by ensuring access to high-quality imaging for all patients.

In recognition of these similar needs, Ontario Health initiated an effort to enhance VUS quality across the province by forming a multidisciplinary group representing diverse areas of the health care system. This initiative, led by Dr. Narinder Paul (Chair, Medical Imaging, Western, and Department Head, Medical Imaging, London Health Sciences Centre and St Joseph's Hospital, London) and Dr. Andrew Dueck (Head, Division of Vascular Surgery, Schulich Heart Program, Sunnybrook Health Sciences Centre, and Assistant Professor, University of Toronto), was conducted with oversight from Ontario Health's Vascular Program in collaboration with Ontario Health’s Medical Imaging and PET Clinical Programs. We would like to extend our gratitude to these two visionary leaders, as well as to the expert Working Group members who invested countless hours to bring this important initiative to fruition. By collaborating across disciplines and representing the perspectives of various care providers and patients, Ontario Health is proud to release this document aimed at improving health care outcomes through enhanced VUS services for all Ontarians.

The primary objective is to elevate VUS to a new standard of care by establishing common core protocols, ensuring a minimum quality benchmark is met across Ontario. These common core protocols, established for the five most common VUS studies, aim to enhance equity, reduce unnecessary repeat studies, and ensure that clinicians receive complete and relevant information to provide optimal vascular care for patients. While facilities may endeavor to add more than required by these common core protocols, the value of the document will be to achieve a higher minimum baseline across Ontario.

While this document focuses on common core protocols, it should be understood that high-quality VUS provision spans beyond, and work is needed to improve sonographer training and recruitment, standardize billing, ensure VUS studies are done for appropriate indications, and link payment to defined quality deliverables to achieve accountability. While these other opportunities for improvement remain, we believe this document is the first of many steps towards improving the VUS landscape in Ontario.

We look forward to ongoing collaboration with the health care system to ensure that Ontarians have access to timely, accurate, and clinically appropriate VUS examinations.

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Introduction

Vascular patients with limb- and/or life-threatening disease often require non-invasive VUS for screening, to diagnose, to determine clinical treatment, and for surveillance following treatment. Over 2.2 million VUSs were performed in both hospital and community facilities throughout Ontario in fiscal year 2023/24, with billing costs of over $113 million. Anecdotally, however, due to poor quality, 30-40% of exams are repeated by a vascular specialist resulting in unnecessary health care expense and potential harm to patients.

Early work by an Expert Panel on Appropriate Utilization of Diagnostic and Imaging Studies, established in 2012 by the Ontario Ministry of Health and Long-Term Care, led to the development of recommendations regarding non-invasive vascular imaging testing. The recommendations encompassed clinically-endorsed appropriate use criteria, certification of all sonographers and interpreting physicians who perform and/or report VUS studies, and accreditation of all VUS facilities.

Standards of practice and professional performance guidelines for VUS have been developed by a number of provincial, national, and international organizations. There is variability, however, in which standards and/or guidelines have been adopted by facilities performing VUS in Ontario. Additionally, Integrated Community Health Services Centres (ICHSCs) in the province must meet the requirements in the ICHSC Diagnostic Standard to achieve accreditation from Accreditation Canada under the ICHSC Program. What is absent, however, are clinically-focused best-practice VUS standards and their consistent use by all facilities performing VUS across the province. Given that patients are most impacted by the clinical aspects of a VUS exam rather than facility-based best practice guidance, clinical standards would support a patient-centred approach to VUS care.

The Common Core Standards for Vascular Ultrasound in Ontario (VUS Standards) were developed by Ontario Health and reflect the expertise and consensus of the Vascular Ultrasound Standards Working Group. The clinically-focused VUS Standards align with best practice and clearly describe the common core protocols and requirements for VUS examination and reporting. The aim is to reduce unnecessary repeat examinations by standardizing the minimum quantity and quality of diagnostic information that is required from a VUS examination, ensuring a minimum benchmark is met across Ontario.

The following five most common VUS exams are included in the VUS Standards:

- Carotid ultrasound for assessment of carotid artery disease
- Abdominal aortic aneurysm (AAA) screening ultrasound
- Lower extremity arterial ultrasound for assessment of peripheral arterial disease
- Lower extremity venous thrombosis ultrasound for assessment of venous thrombosis
- Lower extremity venous reflux ultrasound for assessment of venous reflux

These clinically-focused VUS Standards are intended for sonographers, interpreting physicians, and medical, administrative, and quality leadership at all facilities performing VUS in Ontario to optimize VUS care. Such facilities may vary greatly in size (e.g., single to multiple imaging systems), location (e.g., office, community clinic, hospital), and scope of exams provided (e.g., inpatient, outpatient, urgent services). Facilities are asked to perform a self-assessment against the VUS Standards and to incorporate the common core protocols and requirements into local practices.

To support facilities in their self-assessment and adherence to the VUS Standards, a Facility Checklist and Clinical Checklist are included in Appendix E and Appendix F, respectively. Additionally, to support sonographers and interpreting physicians with adoption of the VUS Standards, a Sonographer Technical Worksheet and Interpreting Physician Reporting Template for each VUS exam is included in Appendix G.

Standards define demonstrable performance characteristics that could provide evidence of quality service provision. They provide a means of identifying appropriate service and ensuring all patients receive timely and effective assessment. The aim of the VUS Standards is to enable quality assessment and accurate diagnosis of vascular conditions, thereby optimizing patient care and outcomes, reducing unnecessary repeat VUS exams, and minimizing health care costs. The VUS Standards are intended as best-practice and a positive and important step towards standardizing VUS care. Accepting and adhering to these VUS Standards will enhance the quality of VUS care for all patients in Ontario.

Outline

The VUS Standards are structured as follows:

Section 1.0 Vascular Ultrasound Examination, Interpretation, and Reporting

Section 2.0 Carotid Ultrasound

Section 3.0 Abdominal Aortic Aneurysm (AAA) Screening Ultrasound

Section 4.0 Lower Extremity Arterial Ultrasound

Section 5.0 Lower Extremity Venous Thrombosis Ultrasound

Section 6.0 Lower Extremity Venous Reflux Ultrasound

Section 7.0 Vascular Ultrasound Personnel

Section 8.0 Vascular Ultrasound Clinical Quality Program

Section 1.0 describes the common core requirements for VUS examination, interpretation, and reporting that are relevant to all VUS examinations. **Sections 2.0, 3.0, 4.0, 5.0, and 6.0** describe the common core protocols and requirements specific to each VUS examination. The document concludes with **Sections 7.0 and 8.0** which describe the common core requirements for VUS personnel and clinical quality.

The Appendix is structured as follows:

Appendix A References

Appendix B Vascular Ultrasound Standards Working Group

Appendix C Secondary Reviewers

Appendix D About Ontario Health

Appendix E Vascular Ultrasound Standards Self-Assessment – Facility Checklist

Appendix F Vascular Ultrasound Standards Self-Assessment – Clinical Checklist

Appendix G Sonographer Technical Worksheet and Interpreting Physician Reporting Templates

1.0 Vascular Ultrasound Examination, Interpretation, and Reporting

1.1 Vascular Ultrasound Examination

1.1.1 Vascular Ultrasound Requisitions

Facilities have processes to:

- Document the date and time of receipt of the requisition
- Confirm that the requisition includes accurate and complete patient information, clinical information, and exam indication
- Follow-up with the supervising and/or referring physician to resolve any concerns with the requisition
- Manage verbal requests for VUS examinations
- Manage requisitions marked as a priority (e.g., critical, urgent) to ensure patients are scheduled in a timely manner

For patients seen in an outpatient, non-emergency department setting, referred with an urgent vascular diagnosis (i.e., Transient Ischemic Attack [TIA], Chronic Limb Threatening Ischemia [CLTI]), the VUS exam is performed following best-practice timelines.

1.1.2 Vascular Ultrasound Equipment

Facilities have equipment with transducers and frequencies appropriate for the vessels being evaluated. Facilities have documented processes for regular equipment calibration, cleaning, maintenance, and repair according to manufacturer's instructions for use and in alignment with infection prevention and control best practices. There is an established equipment replacement program to ensure the quality of examination results.

Facilities can refer to the Canadian Association of Radiologists (CAR) website for guidance on medical imaging equipment in Canada to determine when and how to upgrade or replace existing medical imaging equipment.

1.1.3 Proper Techniques

Proper techniques are used for VUS examination. Proper performance of a VUS exam includes but is not limited to:

- Identifying the correct patient as per facility instructions for positive patient identification
- Obtaining verbal or written consent as per facility protocols
- Obtaining and documenting relevant clinical/medical history and symptoms (i.e., exam indication)
- Completing the exam as per the common core protocol
- Reviewing and documenting sonographic findings to ensure that sufficient information is provided to the interpreting physician to provide an interpretation of the findings to direct patient management
- Immediately escalating any high-risk findings

1.1.4 Examination of Abnormalities

If any abnormalities are present, efforts are made to record additional images, waveforms, and/or measurements that demonstrate the location, characteristics, and severity of the abnormality, within the scope of expertise of the sonographer and interpreting physician.

1.1.4.1 Arterial Exams

If atherosclerotic plaque is present, additional images and velocity measurements are recorded:

- Proximal to the stenosis
- At or distal to the stenosis, within one to two vessel diameters, to capture the highest peak systolic velocity (PSV)

If an aneurysm is present, additional images are recorded of the aneurysm, and the widest outer wall to outer wall diameter is measured perpendicular to the long axis of the vessel in both transverse and anterior-posterior (A-P) planes. Given that the length of an aneurysm in the abdominal aorta often causes confusion and can be misleading, it is recommended that the **length not be measured**.

If vascular intervention is present (e.g., endarterectomy, stent, bypass), additional images and PSV measurements are recorded:

- Proximal to the intervention site (i.e., at the proximal anastomosis)
- At the intervention site (i.e., mid-graft/stent)
- Distal to the intervention site (i.e., at the distal anastomosis)

1.1.4.2 Venous Exams

If a deep vein thrombosis (DVT) is present, additional images and waveforms are recorded
- Proximal to the thrombus or obstruction
- At the thrombus or obstruction
- Distal to the thrombus or obstruction

Additional measurements include the extent of the thrombus.
If a superficial vein thrombosis (SVT) is present, additional measurements include:
- Thrombus distance from the saphenofemoral or saphenopopliteal junction
- Total involved length of the thrombus
- Any extension through perforators, if applicable

1.2 Vascular Ultrasound Interpretation

Facilities have standardized criteria for interpretation of VUS results that follow best practice. All physicians interpreting VUS exams at a given facility agree on and utilize this standardized criteria.

The following language is recommended for interpreting and describing the most common VUS examination findings. The language is not intended to be a minimum requirement, but rather an effort to standardize the language utilized across the province. The use of common language will support consistent VUS reporting to ensure that referring clinicians receive accurate and reliable findings to guide patient care decisions.

1.2.1 Arterial Exams

Atherosclerotic plaque characteristics
- Surface contour
  - Smooth (i.e., uniform continuous surface)
  - Irregular (i.e., non-uniform surface)
- Internal structure
  - Homogeneous (i.e., uniform echogenicities)
  - Heterogeneous (i.e., mixed echogenicities)
  - Calcified (i.e., hyper-echoic)

Degree of atherosclerotic stenosis

- Internal carotid artery stenosis[1]
  - <50% stenosis (i.e., a PSV <180 cm/s and an internal carotid artery (ICA)/common carotid artery (CCA) ratio <2)
  - 50% to 69% stenosis (i.e., a PSV of 180-230 cm/s and an ICA/CCA ratio of 2-4)
  - 70% to 99% (i.e., a PSV >230 cm/s and an ICA/CCA ratio of >4)
- Other carotid and lower extremity arterial stenosis
  - <50% stenosis (i.e., visible plaque and a PSV increase of <100%)
  - >50% stenosis (i.e., visible plaque and a PSV increase of >100%)

Waveform

- Multiphasic (i.e., waveform crosses the zero-flow baseline and contains both forward and reverse velocity components)
- Monophasic (i.e., waveform does not cross the zero-flow baseline throughout any part of the cardiac cycle; blood flow in a single direction)

Flow direction

- Antegrade flow (i.e., blood flow in the normal direction for the artery being evaluated)
- Retrograde flow (i.e., blood flow opposite to the normal direction)
- Bi-directional (i.e., blood flow enters and leaves a contained space by the same orifice)
- Absent (i.e., no blood flow is detected with an absent spectral Doppler signal)

1.2.2 Venous Exams

Compressibility of veins

- Compressible
- Partially compressible
- Non-compressible

Flow

- Respirophasic (i.e., phasic with cyclical increase and decrease in flow velocity which correlates with respiratory phases)
- Continuous (i.e., lack of respiratory or cardiac influence on flow velocity variation resulting in a steady and consistent Doppler signal with minimal to no variation in flow)

[1] Intersocietal Accreditation Commission Vascular Testing Communication – Updated Recommendations for Carotid Stenosis Interpretation Criteria (2023)

Augmentation

- Normal (i.e., discrete instantaneous increase in venous antegrade flow velocity in response to distal augmentation)
- Reduced (i.e., loss of increased venous flow velocity in response to distal augmentation compared to contralateral limb)
- Absent (i.e., no increase in venous flow/return in response to distal augmentation)

Age of a venous thrombus

- Acute (i.e., vein is noncompressible and distended, thrombus is soft and deformable with a smooth surface)
- Chronic postthrombotic change (i.e., vein is noncompressible or partially compressible, intraluminal material is rigid and nondeformable with an irregular surface)
- Indeterminant (i.e., equivocal, findings present but neither completely acute nor chronic)

Vein patency (if no thrombus is identified)

- Normal (i.e., complete compressibility, colour filling, spontaneous and respirophasic flow, and response to augmentation without sonographic luminal findings)

Vein competency

- Competent (i.e., normal reflux time defined as <1 second in the deep venous system and <0.5 seconds in the superficial venous system)
- Incompetent (i.e., abnormal reflux time defined as >1 second in the deep venous system and >0.5 seconds in the superficial venous system)

1.3 Vascular Ultrasound Reporting

Facilities have a standardized format for VUS reporting that is agreed on and utilized by all sonographers and interpreting physicians.

1.3.1 Content of Vascular Ultrasound Reports

The VUS report, at a minimum, contains the following information.

- Study name (e.g., Carotid Ultrasound)
- Patient name on every page of the report
- Patient date of birth
- Patient sex
- Patient identification number (e.g., Ontario Health Insurance Plan [OHIP] or other Medical Record Number)
- Referring clinician
- Clinician(s) to be copied
- Interpreting physician
- Exam date
- Exam indication(s)
- Date and time the exam is interpreted/reported
- Facility name and contact information
- Footnote to describe all acronyms used in the report

At a minimum, the sonographer's name or initials is available in the facility information system as part of the permanent record of the examination.

1.3.1.1 Findings

The Findings (or similar wording) section of the report includes relevant measurements and a description of the exam findings.

In addition to the common core requirements for the VUS exam-specific findings in the following sections of this document, the description of exam findings includes, at a minimum, if relevant:

- Any abnormalities (e.g., atherosclerotic plaque, aneurysm, DVT, venous incompetency, tumour)
- Any incidental findings
- A statement of any exam limitations (e.g., difficult study due to body habitus)
- A statement of any technical difficulties (e.g., imaging was suboptimal)
- The reason(s) if a limited study is performed in lieu of a complete exam
- The reason(s) if any vessels, or segments of vessels, were not accessible or visualized
- Any anatomical variations (e.g., femoral vein duplication, saphenous vein removal for bypass grafting)
- Relevant comparisons to previous studies or reports as available

The use of diagrams may enhance the communication of important clinical findings but is not a requirement.

1.3.1.2 Interpretation

The Interpretation (or similar wording) section of the report includes the interpretation of exam findings and includes a summary of, at a minimum:

- Pertinent positive and negative findings as they relate to the assessment of the exam indication(s)
- Findings of other significant incidental pathology
- Recommendations regarding alternative or additional investigations, where appropriate

1.3.2 Validating Exam Findings

Facilities have processes for validating exam findings with ongoing correlation, when possible, with other imaging modalities including but not limited to computed tomography (CT), magnetic resonance imaging (MRI), or diagnostic angiography. Processes include details regarding how any discrepancies identified will be addressed.

1.3.3 Timeframes for Reporting

Facilities have standardized protocols and processes for reporting of VUS exams, including clinically appropriate timeframes for reporting of outpatient exams, inpatient and urgent outpatient exams, and high-risk exams requiring immediate communication to the referring clinician to ensure patients are appropriately referred for follow-up care.

Outpatient Exams – Within 72 hours
Outpatient exams are interpreted and the report made available to the referring clinician within 72 hours of completion of the exam.

Inpatient and Urgent Outpatient Exams – Within 24 hours
Inpatient and urgent outpatient exams are interpreted and the report made available to the referring clinician within 24 hours of completion of the exam.

For patients seen in an outpatient, non-emergency department setting, referred with an urgent vascular diagnosis (i.e., TIA, CLTI), the VUS exam is interpreted and reported following best-practice timelines.

High-Risk Findings – Immediately

High-risk findings are communicated immediately by the sonographer to the supervising/interpreting physician, and by the supervising/interpreting physician to the referring clinician. Records are maintained that show:

- To whom the report was sent
- Who received the report
- The date and time of the report
- Any problem in accomplishing the task

2.0 Carotid Ultrasound

2.1 The Carotid Ultrasound Examination

A carotid ultrasound exam is always performed bilaterally to assess and document the hemodynamic status of the extracranial carotid arteries and vertebral arteries in the neck to determine the presence or absence of atherosclerotic disease and/or pathology.

2.1.1 Common Core Protocol

The common core protocol for a carotid ultrasound includes bilateral examination of the arterial supply to the brain including the:

- CCA
- Carotid bifurcation
- External carotid artery (ECA)
- ICA
- Vertebral artery
- Subclavian artery

The patient is in the supine position with the chin tilted slightly upward and rotated away from the side to be examined.

2.1.1.1 Common Core Requirements – Images and Measurements

Bilateral brachial systolic pressures are measured and recorded.

Common Core Requirements - B-mode Imaging

Greyscale imaging is performed in both the transverse and longitudinal planes.

Greyscale images include, at a minimum:

- CCA – proximal, mid, distal
- Carotid bifurcation - with ICA and ECA visible
- ICA – proximal
- ECA - proximal
- Subclavian artery (longitudinal plane only) – if a quality image can be acquired

If any of the above can be recorded in one image, separate images are not required.

Common Core Requirements - Colour Doppler Imaging and Spectral Doppler Analysis

Colour Doppler imaging and spectral Doppler analysis are performed in the longitudinal plane.

Colour Doppler images and spectral Doppler waveforms, PSV, and end diastolic velocity (EDV) include, at a minimum:

- CCA – proximal, mid, distal
- ICA – proximal, mid, distal
- ECA – proximal (EDV not required)
- Vertebral artery (EDV not required) – confirm direction of flow
- Subclavian artery (EDV not required)

The ICA/CCA ratio is calculated using the highest PSV measured in the ICA and the PSV in the mid CCA.

Additional Imaging and Measurements

As per the common core requirements in Section 1.1.4 (Examination of Abnormalities), additional images, waveforms, and/or measurements are taken to document if present:

- Atherosclerotic plaque
- Stent
- Any site of vascular intervention (e.g., endarterectomy)
- Any other vascular abnormalities (e.g., dissection, pseudoaneurysm)

2.2 Interpreting the Carotid Ultrasound Examination

In addition to the information outlined in Section 1.2 (Vascular Ultrasound Interpretation), there are interpretation criteria specific to the carotid ultrasound examination, and more specifically, interpretation of a clinically relevant ICA stenosis.

All physicians interpreting carotid ultrasound exams use the Intersocietal Accreditation Commission Vascular Testing Communication – Updated Recommendations for Carotid Stenosis Interpretation Criteria for interpretation of an ICA stenosis.

2.3 Reporting the Carotid Ultrasound Examination

In addition to the common core requirements for all VUS reports in section 1.3 (Vascular Ultrasound Reporting), the carotid ultrasound report includes in the Findings section of the report the following, at a minimum. These findings are reported in table format or as free text.

2.3.1 Findings

	Right	Left
Brachial systolic pressure (mmHg)		

Right/Left		
	PSV (cm/s)	EDV (cm/s)
CCA - proximal		
CCA - mid		
CCA - distal		
ICA – proximal		
ICA – mid		
ICA – distal		
ECA - proximal		---
	PSV (cm/s)	Flow direction
Vertebral artery		
Subclavian artery		---

Right/Left	
ICA/CCA ratio	

The description of exam findings includes, at a minimum:

- The presence or absence of plaque, location, plaque characteristics, and degree of stenosis (%)
- Any other significant pathology

3.0 Abdominal Aortic Aneurysm (AAA) Screening Ultrasound

3.1 The AAA Screening Ultrasound Examination

An AAA screening ultrasound exam is performed to screen for the presence of aneurysmal disease in the abdominal aorta and bilateral common iliac arteries.

3.1.1 Common Core Protocol

The common core protocol for an AAA screening ultrasound includes examination of the aorta beginning at the diaphragm and progressing to the iliac arteries bilaterally.

Diameter measurements are taken from outer edge to outer edge of the vessels, perpendicular to the long axis of the aorta, in both the transverse and A-P planes.

The patient is in the supine position.

3.1.1.1 Common Core Requirements – Images and Measurements

Common Core Requirements - B-mode Imaging and Measurements

Greyscale imaging is performed in both the transverse and longitudinal planes, with the diameter measured in the both the transverse and A-P planes perpendicular to the long axis of the vessel in, at a minimum:

- Proximal aorta (suprarenal)
- Mid aorta (juxtarenal)
- Distal aorta (infrarenal)
- Right common iliac artery (CIA)
- Left CIA

Given that the length of an AAA often causes confusion and can be misleading, it is recommended that the **length not be measured**.

Additional Imaging and Measurements

As per the common core requirements in Section 1.1.4 (Examination of Abnormalities), additional images, waveforms, and/or measurements are taken to document if present:

- Aneurysm
- Atherosclerotic plaque
- Any other vascular abnormalities (e.g., dissection)

Note: If an aneurysm is bilobed, the diameters of both dilations are measured.

3.2 Interpreting the AAA Screening Ultrasound Examination

The AAA screening ultrasound exam is interpreted based on the information outlined in Section 1.2 (Vascular Ultrasound Interpretation).

Aneurysm surveillance follows best practice.

3.3 Reporting the AAA Screening Ultrasound Examination

In addition to the common core requirements for all VUS reports in section 1.3 (Vascular Ultrasound Reporting), the AAA screening ultrasound report includes in the Findings section of the report the following, at a minimum. These findings are reported in table format or as free text.

3.3.1 Findings

	Maximum diameter (cm)
Abdominal aorta	
Right CIA	
Left CIA	

The description of exam findings includes, at a minimum:

- The specific location of an aneurysm
- Specific mention if the aneurysm is saccular or fusiform in shape if it can be accurately assessed
- Any atherosclerotic plaque or thrombus in the aneurysm if present

Given that the length of an AAA often causes confusion and can be misleading, it is recommended that the **length not be reported**.

4.0 Lower Extremity Arterial Ultrasound

4.1 The Lower Extremity Arterial Ultrasound Examination

A lower extremity arterial ultrasound exam is performed unilaterally or bilaterally to assess and document the hemodynamic status of the arteries in the lower extremity to determine the presence or absence of atherosclerotic disease and/or pathology.

A lower extremity arterial ultrasound includes an abdominal/pelvic component and an infra-inguinal component to ensure a complete arterial assessment of the lower extremities.

4.1.1 Common Core Protocol

The common core protocol for a lower extremity arterial ultrasound includes examination of the arterial supply to the lower extremities including the:

Abdominal/pelvic component

- Abdominal aorta (infrarenal)
- CIA
- External iliac artery (EIA)

Infra-inguinal component

- Common femoral artery (CFA)
- Superficial femoral artery (SFA)
- Profunda femoris artery (PFA)
- Popliteal artery
- Anterior tibial artery (ATA)
- Posterior tibial artery (PTA)

The lower extremity arterial exam includes measurement of ankle brachial index (ABI).

The lower extremity arterial exam includes diameter measurements in the abdominal aorta and CIA and are taken from outer edge to outer edge of the vessels, perpendicular to the long axis of the aorta, in both the transverse and A-P planes.

The patient is in the supine position with the leg to be examined externally rotated.

4.1.1.1 Common Core Requirements – Images and Measurements

Bilateral ABI is performed.

- Measurement of brachial artery systolic pressure is obtained from both arms.
- Measurement of ankle systolic pressure is obtained bilaterally from the distal PTA and distal ATA.

The ABI is calculated using the higher of the two ankle systolic pressures (i.e., the highest of the PTA or ATA pressures) divided by the highest of the two brachial artery pressures (i.e., left ABI = highest ankle pressure in the left leg divided by the highest of the brachial pressures in both arms).

Common Core Requirements - B-mode Imaging and Measurements

Greyscale imaging is performed in the longitudinal plane.

Greyscale images include, at a minimum:

- Abdominal aorta (infrarenal)
- CIA
- EIA
- CFA
- SFA – proximal, mid, distal
- PFA – proximal
- Popliteal artery

Additional greyscale imaging is performed in the transverse plane with the diameter measured in both the transverse and A-P planes perpendicular to the long axis of the vessel in, at a minimum:

- Proximal aorta (suprarenal)
- Mid aorta (juxtarenal)
- Distal aorta (infrarenal)
- CIA

Common Core Requirements - Colour Doppler Imaging and Spectral Doppler Analysis

Colour Doppler imaging and spectral Doppler analysis are performed in the longitudinal plane.

Colour Doppler images and spectral Doppler waveforms and PSV include, at a minimum:

- Abdominal aorta (infrarenal)
- CIA
- EIA
- CFA
- SFA – proximal, mid, distal
- PFA – proximal
- Popliteal artery – above and below the knee
- ATA – distal
- PTA – distal

Additional Imaging and Measurements

As per the common core requirements in Section 1.1.4 (Examination of Abnormalities), additional images, waveforms, and/or measurements are taken to document if present:

- Atherosclerotic plaque
- Aneurysm
- Any site of vascular intervention (e.g., stent, endarterectomy, bypass)
- Any other vascular abnormalities

4.2 Interpreting the Lower Extremity Arterial Ultrasound Examination

The lower extremity arterial ultrasound exam is interpreted based on the information outlined in Section 1.2 (Vascular Ultrasound Interpretation).

ABI interpretation follows best practice.

4.3 Reporting the Lower Extremity Arterial Ultrasound Examination

In addition to the common core requirements for all VUS reports in section 1.3 (Vascular Ultrasound Reporting), the lower extremity arterial ultrasound report includes in the Findings section of the report the following, at a minimum. These findings are reported in table format or as free text.

4.3.1 Findings

Right/Left	
	Pressure (mmHg)
Brachial	
Anterior tibial	
Posterior tibial	

Right/Left	
ABI	

	Maximum diameter (cm)	PSV (cm/s)
Abdominal aorta		
Right CIA		
Left CIA		
Right EIA	----------	
Left EIA	----------	

Right/Left		
	PSV (cm/s)	Waveform analysis
CFA		
SFA – proximal		
SFA – mid		
SFA – distal		
PFA - proximal		
Popliteal artery – above knee		
Popliteal artery – below knee		
ATA – distal		
PTA - distal		

The description of exam findings includes, at a minimum:

- The presence or absence of plaque, location, characteristics, and degree of stenosis (%)
- Any other significant pathology

5.0 Lower Extremity Venous Thrombosis Ultrasound

5.1 The Lower Extremity Venous Thrombosis Ultrasound Examination

A lower extremity venous thrombosis ultrasound exam is performed to assess and document the hemodynamic status of the deep and superficial veins in the lower extremity for the presence or absence of a thrombus.

5.1.1 Common Core Protocol

The common core protocol for a venous thrombosis ultrasound includes examination of the deep and superficial venous system including the entire length of the accessible portion of the veins from the inguinal ligament to the ankle including the:

Deep veins

- Common femoral vein (CFV)
- Femoral vein
- Popliteal vein
- Posterior tibial veins (PTVs)
- Peroneal veins

Superficial veins

- Small saphenous vein (SSV)
- Great saphenous vein (GSV)

The venous thrombosis ultrasound includes examination of the compressibility of the venous supply to the lower extremities. Venous compressions are applied with the ultrasound transducer every 1 to 2 cm with adequate pressure to completely obstruct the normal vein lumen.

The venous thrombosis ultrasound also includes examination of flow patterns within the veins including colour filling, spontaneity, and respirophasicity as required to document vein patency. Distal augmentation can be helpful to identify veins and to document the extent of a thrombus. Augmentation is applied to the vein manually just inferior to the level of insonation. The Valsalva maneuver may also be used, particularly in the groin.

If possible, the patient is in the supine position with the head and shoulders raised with the legs tilted downwards from the head by at least 30 degrees. The patient's position is noted on the final report. The leg to be examined is externally rotated and knee slightly flexed.

5.1.1.1 Common Core Requirements – Images and Measurements

Common Core Requirements - B-mode Imaging

Greyscale imaging is performed in the transverse plane.

Greyscale images without and with transducer compressions include, at a minimum:

- CFV
- Femoral vein – proximal thigh, mid thigh, distal thigh
- Popliteal vein
- PTVs – proximal calf, mid calf, distal calf
- Peroneal veins – proximal calf, mid calf, distal calf
- SSV – saphenopopliteal junction (SPJ), proximal calf, mid calf, distal calf
- GSV – saphenofemoral junction (SFJ), proximal thigh, knee, mid calf

The images without and with transducer compressions can each be taken as a split screen image.

If a unilateral exam is performed, greyscale images include the contralateral CFV.

Common Core Requirements – Colour Doppler Imaging and Spectral Doppler Analysis

Colour Doppler imaging and spectral Doppler analysis are performed in the longitudinal plane.

Colour Doppler images demonstrating colour filling and spectral Doppler waveforms demonstrating spontaneity, respirophasicity, and/or flow in response to distal augmentation include, at a minimum:

- CFV
- Femoral vein – proximal thigh, mid thigh, distal thigh
- Popliteal vein

If a unilateral exam is performed, spectral Doppler waveforms include the contralateral CFV.

If nonspontaneous flow is present in the CFV or if there is suspicion of thrombus or obstruction superior to the CFV, the exam includes Doppler imaging of the external iliac vein (EIV), common iliac vein (CIV), and inferior vena cava (IVC).

Additional Imaging and Measurements

As per the common core requirements in Section 1.1.4 (Examination of Abnormalities), additional images, waveforms, and/or measurements are taken to document if present:

- DVT
- SVT
- Areas of suspected thrombus when clinically relevant
- Symptomatic areas
- Thrombophlebitis
- Baker's cyst
- Any other sites of intervention or abnormalities

5.2 Interpreting the Lower Extremity Venous Thrombosis Ultrasound Examination

The lower extremity venous thrombosis ultrasound exam is interpreted based on the information outlined in Section 1.2 (Vascular Ultrasound Interpretation).

Repeat/serial lower extremity venous thrombosis ultrasound testing follows best practice.

5.3 Reporting the Lower Extremity Venous Thrombosis Ultrasound Examination

In addition to the common core requirements for all VUS reports in section 1.3 (Vascular Ultrasound Reporting), the lower extremity venous thrombosis ultrasound report includes in the Findings section of the report the following, at a minimum. These findings are reported in table format or as free text.

5.3.1 Findings

Right/Left	
	Compressibility
CFV	
Femoral vein	
Popliteal vein	
PTV	
Peroneal vein	
SSV	
GSV	
SFJ	

Right/Left		
	Colour Filling	Augmentation
CFV		
Femoral vein		
Popliteal vein		

The description of exam findings includes, at a minimum:

- The compressibility of the veins
- Normal or abnormal colour filling
- The presence or absence of an augmented waveform in response to distal augmentation
- Normal or abnormal flow (i.e., respirophasic or continuous)
- The presence or absence of any thrombus and the location, extent/length, distance from the SFJ or SPJ (for SVT), and estimated age
- Any anatomical variations due to previous procedures (e.g., saphenous vein removal for bypass graft)
- Any other significant pathology (e.g., Baker's cyst, thrombophlebitis)

If only the veins above or below the knee are examined, this is reflected in the findings.

6.0 Lower Extremity Venous Reflux Ultrasound

6.1 The Lower Extremity Venous Reflux Ultrasound Examination

A lower extremity venous reflux ultrasound exam is performed to assess and document the hemodynamic status of the deep and superficial veins in the lower extremity for valvular competence or incompetence.

The lower extremity venous reflux ultrasound exam also includes an initial assessment for thrombosis including the common core protocol and requirements in Section 5.0.

A lower extremity venous reflux ultrasound is contraindicated if a DVT is present.

6.1.1 Common Core Protocol

The common core protocol for a venous reflux ultrasound includes examination of the deep and superficial venous system including the entire length of the accessible portion of the:

Deep veins

- CFV
- Deep femoral vein (DFV)
- Femoral vein
- Popliteal vein
- PTVs
- Peroneal veins

Superficial veins

- SSV
- GSV

The common core protocol for a lower extremity venous reflux ultrasound first includes the common core protocol and requirements for a thrombosis exam described in Section 5.0.

The venous reflux exam includes measurement of the diameter of the superficial veins from outer edge to outer edge in the A-P plane.

The exam also includes assessment of valvular competency by measurement of reflux time with venous augmentation and/or Valsalva maneuver as appropriate. Augmentation is applied manually just inferior to the level of insonation.

Ideally, the patient is in the supine position in reverse Trendelenburg, or standing, so the lower extremity is in a dependent position to encourage venous distension. The patient's position is noted on the final report. The leg to be examined is externally rotated and knee slightly flexed.

6.1.1.1 Common Core Requirements – Images and Measurements

Common Core Requirements - B-mode Imaging and Measurements

Greyscale imaging is performed in the transverse plane.

Greyscale images with diameter measurements include, at a minimum:

- SSV – SPJ if visualized, or proximal calf
- GSV – SFJ, proximal thigh, at knee

Common Core Requirements – Colour Doppler Imaging and Spectral Doppler Analysis

Colour Doppler imaging and spectral Doppler analysis are performed in the longitudinal plane.

Colour Doppler images and spectral Doppler waveforms demonstrating baseline flow and response to venous augmentation, with documentation of reflux time, include, at a minimum:

- CFV
- Femoral vein – proximal thigh, mid thigh, distal thigh
- Popliteal vein – above knee, below knee
- PTVs – mid calf, distal calf
- Peroneal veins – mid calf, distal calf
- SSV – SPJ, proximal calf, mid calf, distal calf
- GSV – SFJ, proximal thigh, knee, mid calf

Superficial reflux is traced to its source whenever possible with representative images recorded and reflux time documented.

Additional Imaging and Measurements

As per the common core requirements in Section 1.1.4 (Examination of Abnormalities), additional images, waveforms, and/or measurements are taken to document if present:

- Varicose veins (and their connection to larger veins reported)

6.2 Interpreting the Lower Extremity Venous Reflux Ultrasound Examination

The lower extremity venous reflux ultrasound exam is interpreted based on the information outlined in Section 1.2 (Vascular Ultrasound Interpretation).

Repeat/serial lower extremity venous reflux ultrasound testing follows best practice.

6.3 Reporting the Lower Extremity Venous Reflux Ultrasound Examination

In addition to the common core requirements for all VUS reports in section 1.3 (Vascular Ultrasound Reporting) and the common core requirements for the lower extremity venous thrombosis ultrasound report (Section 5.3), the lower extremity venous reflux ultrasound report includes in the Findings section of the report the following, at a minimum. These findings are reported in table format or as free text.

6.3.1 Findings

Right/Left	
	Diameter (cm)
SSV	
GSV - SFJ	
GSV – proximal thigh	
GSV - knee	

Right/Left	
	Competency
CFV	
Femoral vein	
Popliteal vein	
PTV	
Peroneal vein	
SSV	
GSV	

The description of exam findings includes, at a minimum:

- The presence and location of any incompetent veins
- The most superior point of incompetency in the lower extremity
- The presence and location of any varicose veins and their connection to larger veins

7.0 Vascular Ultrasound Personnel

Facilities performing VUS in Ontario have adequately trained and experienced sonographers and physicians to perform and interpret VUS exams.

7.1 Vascular Sonographer

The College of Medical Radiation and Imaging Technologists of Ontario (CMRITO) is the regulator of imaging technologists in the province. Anyone practicing as an imaging technologist in Ontario must meet all requirements and be registered with the CMRITO. Sonographers must be registered with CMRITO under the specialty of diagnostic medical sonography (DMS).

Registrants must understand and adhere to the CMRITO Standards of Practice and Code of Ethics, and participate in the Quality Assurance (QA) Program. The DMS registrant must practice only in the areas of imaging technology in which the registrant is educated and experienced.

7.1.1 Education and Credentialing

In addition to being registered with the CMRITO as a diagnostic medical sonographer, it is strongly recommended that sonographers performing VUS exams have at least one of the following:

- Appropriate credentialing from Sonography Canada in the specialty of vascular sonography (i.e., Canadian Registered Vascular Sonographer)
- Appropriate credentialing from the American Registry for Diagnostic Medical Sonography (ARDMS) in the specialty of vascular sonography (i.e., Registered Vascular Technologist)
- Appropriate credentialing from Cardiovascular Credentialing International in the specialty of vascular sonography (i.e., Registered Vascular Specialist)

7.1.2 Continuing Education and Professional Development

As regulated health professionals, CMRITO registrants must obtain, maintain, and apply the necessary knowledge, skills, and judgement to ensure safe, effective, and ethical outcomes for the patient and to respond to changes in practice environments, advances in technology, and other emerging issues. Registrants must maintain competence in their current area of practice and must refrain from acting if not competent.

Registrants must participate in the CMRITO's QA Program as part of maintaining and improving their competence, including completion of continuing education and professional development activities.

7.2 Interpreting Physician

Physicians interpreting VUS exams must:

- Hold a valid certificate of registration issued by the College of Physicians and Surgeons of Ontario (CPSO)
- Be certified by the Royal College of Physicians and Surgeons of Canada (RCPSC) including completion of an accredited residency program in the specialty/subspecialty of Diagnostic Radiology, Vascular Surgery, or Interventional Radiology

7.2.1 Education and Certification

It is strongly recommended that vascular surgeons who are interpreting and reporting VUS exams have Registered Physician in Vascular Interpretation certification.

7.2.2 Continuing Education and Professional Development

The Maintenance of Certification (MOC) Program and framework are part of the RCPSC's continuing professional development program for specialist physicians. It is designed to support meaningful learning and the highest standards of patient care. Physicians are required to participate in continuing professional development activities that are eligible for RCPSC MOC credits.

8.0 Vascular Ultrasound Clinical Quality Program

8.1 Quality Lead

Facilities have a physician Quality Lead or equivalent role (e.g., Radiology Chief, Quality Assurance Advisor, Medical Director) who champions the development, implementation, and management of a Peer Learning Program. The Quality Lead fosters a positive culture of collaborative peer learning, focused on patient safety as well as the psychological safety of staff, to create lasting improvements to patient care.

8.2 Peer Learning Program

The Peer Learning Program is conducted in accordance with the Quality of Care Information Protection Act (QCIPA) which enables confidential discussions in which information relating to errors, systemic problems, and opportunities for quality improvement can be shared in order to improve the quality of health care delivered to patients.

Facilities can refer to the Canadian Association of Radiologists website for a Guide that presents important aspects of what makes an effective peer learning program, as well as best practices for implementing such a program.

8.2.1 Peer Review of VUS Exams and Reports

Facilities have processes for annual peer review of VUS exams and reports to identify and learn from errors. Peer review includes a minimum of five exams of each sonographer and each interpreting physician. The exams selected include at least one of each of the five VUS exams included in the VUS Standards (if performed by the facility). The exams are anonymized to minimize bias.

The reviews include, at a minimum:

- For each sonographer – a review of the quality, accuracy, and completeness of the exam, including the images, measurements, and report findings
- For each interpreting physician - a review of the quality and accuracy of exam interpretation and the completeness and timeliness of the exam report

Feedback is provided by the Quality Lead, and any learning opportunities are identified with a plan for action and future improvement.

8.2.2 Case Conferences

Facilities, led by the Quality Lead, conduct regular case conferences to collaboratively review challenging, complex, or interesting cases, discuss areas for quality improvement, review processes or protocols, or discuss emerging evidence or best practice.

Appendix A: References

- American College of Radiology Practice Standards
- Australasian Society for Ultrasound in Medicine Standards of Practice
- College of Medical Radiation and Imaging Technologists Standards of Practice (2024)
- College of Physicians and Surgeons Independent Health Facilities Clinical Practice Parameters and Facility Standards, Diagnostic Imaging (2020)
- European Society for Vascular Surgery (ESVS) 2024 Clinical Practice Guidelines on the Management of Abdominal Aorto-Iliac Artery Aneurysms (2024)
- Integrated Community Health Services Centres (ICHSCs) Quality Assurance Program (2024)
- Interpretation of peripheral arterial and venous Doppler waveforms: A consensus statement from the Society for Vascular Medicine and Society for Vascular Ultrasound (2020)
- Intersocietal Accreditation Commission Standards and Guidelines for Vascular Testing Accreditation (2024)
- Intersocietal Accreditation Commission Vascular Testing Communication – Updated Recommendations for Carotid Stenosis Interpretation Criteria (2023)
- Screening for abdominal aortic aneurysms in Canada: 2020 review and position statement of the Canadian Society for Vascular Surgery (2021)
- Society for Vascular Ultrasound Professional Performance Guidelines (2019)
- Society of Radiographers and British Medical Ultrasound Society Guidelines for Professional Ultrasound Practice (2022)
- Sonography Canada National Competency Profiles (2020)
- Sonography Canada Professional Practice Guidelines and Member Policies (2018)
- The Royal College of Radiologists Standards for the provision of an ultrasound service (2014)
- The Society for Vascular Surgery practice guidelines on the care of patients with an abdominal aortic aneurysm (2018)
- The Society for Vascular Technology of Great Britain and Ireland Professional Performance Guidelines
- Thrombosis Canada – Deep Vein Thrombosis: Diagnosis (2023)
- Thrombosis Canada – Superficial Vein Thrombosis: Diagnosis and Management (2023)
- Ultrasound for Lower Extremity Deep Venous Thrombosis – Multidisciplinary Recommendations from the Society of Radiologists in Ultrasound Consensus Conference (2018)

Appendix B: Vascular Ultrasound Standards Working Group

Members	Area of Expertise	Organization	Region
Dr. Mark Baerlocher	Vascular Interventional Radiology Diagnostic Radiology	Royal Victoria Hospital	Central
Sheena Bhimji-Hewitt	Sonography	The Michener Institute of Education at UHN	Toronto
Adrien Boutin	Sonography	Unity Health Toronto	Toronto
Dr. Ray Chan	Vascular Interventional Radiology Diagnostic Radiology	Southlake Health	Central
Dr. Andrew Dueck **Co-Chair**	Vascular Surgery	Sunnybrook Health Sciences Centre	Toronto
Dr. Hooman Hennessey	Vascular Interventional Radiology Diagnostic Radiology	Health Sciences North	Northeast
Annette Hornby	Sonography	College of Medical Radiation and Imaging Technologists	Ontario
Dr. Stewart Kribs	Vascular Interventional Radiology	London Health Sciences Centre	West
Melanie LeBouthillier	Sonography	The Ottawa Hospital	East
Dr. Mary MacDonald	Vascular Surgery	Thunder Bay Regional Health Sciences Centre	Northwest
Dr. Narinder Paul **Co-Chair**	Diagnostic Radiology	London Health Sciences Centre and St. Joseph's Hospital, London	West

Appendix C: Secondary Reviewers

Secondary Reviewers	Area of Expertise	Organization
Stefania Bradley	Diagnostic Imaging Radiography	Halton Healthcare
Dr. Beverley Chan	Vascular Surgery	Halton Healthcare
Johnny Choi	Sonography	Accreditation Canada Diagnostics
Dr. Justin Clouthier	Vascular Surgery	Peterborough Regional Health Centre
Julie Coffey	Accreditation Standards and Quality Improvement	Accreditation Canada Diagnostics
Zani Dhalla	Sonography Radiography	Oak Ridges Medical Diagnostic Imaging Inc.
Kirsten Engelbrecht	Sonography	University Health Network
Riffat Ehsan	Sonography	Lakeridge Health
Mayank Khanna	Healthcare Administration	Accreditation Canada Diagnostics
Shairoz Kherani	Diagnostic Imaging	Halton Healthcare
Tatyana Kumanovskaya	Sonography	One Vascular
Vikram Kumar	Sonography	London Health Sciences Centre MyHealth Centre
John Lai	Sonography	Phoenix Associates Ltd.
Mike Medwid	Sonography	Dryden Regional Health Centre
Caroline Morris	Regulatory Standards	College of Medical Radiation and Imaging Technologists of Ontario
Christina Perris	Medical Radiation Sciences	Ontario Association of Medical Radiation Sciences
Dr. Anshu Rajput	Diagnostic Radiology	Halton Healthcare
Dr. Barry Rubin	Vascular Surgery	University Health Network
April Sabatini	Sonography	Halton Healthcare
Sadia Sohail	Sonography	One Vascular
Diana Stenhouse	Sonography Radiography	Hamilton Health Sciences
Dawn Stiles	Sonography	Peterborough Regional Health Centre
Greg Toffner	Medical Radiation Sciences	Ontario Association of Medical Radiation Sciences
Pree Tyagi	Regulatory Standards	College of Medical Radiation and Imaging Technologists of Ontario

Secondary Reviewers	Area of Expertise	Organization
Caitlin Wesley	Sonography	Ontario Association of Medical Radiation Sciences

Appendix D: About Ontario Health

We are an agency created by the Government of Ontario to connect, coordinate, and modernize our province's health care system. We work with partners, providers, and patients to make the health system more efficient so everyone in Ontario has an opportunity for better health and well-being.

Equity, Inclusion, Diversity, and Anti-Racism

Ontario Health is committed to advancing equity, inclusion, and diversity and addressing racism in the health care system.

Unlike the notion of equality, equity is not about sameness of treatment. It denotes fairness and justice in process and in results. Equitable outcomes often require differential treatment and resource redistribution to achieve a level playing field among all individuals and communities. This requires recognizing and addressing barriers to opportunities for all to thrive in our society.

Need this information in an accessible format? 1-877-280-8538, TTY 1-800-855-0511, info@ontariohealth.ca.
Document disponible en français en contactant info@ontariohealth.ca

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Appendix E: Vascular Ultrasound Standards Self-Assessment - Facility Checklist

1.0 Vascular Ultrasound Examination, Interpretation, and Reporting

1.1 Vascular Ultrasound Examination

1.1.1 Vascular Ultrasound Requisitions

Facilities have processes to:

- ☐ Document the date and time of receipt of the requisition
- ☐ Confirm that the requisition includes accurate and complete patient information, clinical information, and exam indication
- ☐ Follow-up with the supervising and/or referring physician to resolve any concerns with the requisition
- ☐ Manage verbal requests for VUS examinations
- ☐ Manage requisitions marked as a priority (e.g., critical, urgent) to ensure patients are scheduled in a timely manner

- ☐ For patients seen in an outpatient, non-emergency department setting, referred with an urgent vascular diagnosis (i.e., TIA, CLTI), the VUS exam is performed following best-practice timelines.

1.1.2 Vascular Ultrasound Equipment

- ☐ Facilities have equipment with transducers and frequencies appropriate for the vessels being evaluated.
- ☐ Facilities have documented processes for regular equipment calibration, cleaning, maintenance, and repair according to manufacturer's instructions for use and in alignment with infection prevention and control best practices.
- ☐ There is an established equipment replacement program to ensure the quality of examination results.

1.2 Vascular Ultrasound Interpretation

- Facilities have standardized criteria for interpretation of VUS results that follow best practice.
- All physicians interpreting VUS exams at a given facility agree on and utilize this standardized criteria.

- All sonographers and interpreting physicians use common language to support consistent VUS reporting to ensure that referring clinicians receive accurate and reliable findings to guide patient care decisions.

1.3 Vascular Ultrasound Reporting

- Facilities have a standardized format for VUS reporting that is agreed on and utilized by all sonographers and interpreting physicians.

1.3.1 Content of Vascular Ultrasound Reports

The VUS report, at a minimum, contains the following information.

- Study name (e.g., Carotid Ultrasound)
- Patient name on every page of the report
- Patient date of birth
- Patient sex
- Patient identification number (e.g., Ontario Health Insurance Plan [OHIP] or other Medical Record Number)
- Referring clinician
- Clinician(s) to be copied
- Interpreting physician
- Exam date
- Exam indication(s)
- Date and time the exam is interpreted/reported
- Facility name and contact information
- Footnote to describe all acronyms used in the report

- At a minimum, the sonographer's name or initials is available in the facility information system as part of the permanent record of the examination.

1.3.2 Validating Exam Findings

- Facilities have processes for validating exam findings with ongoing correlation, when possible, with other imaging modalities including but not limited to CT, MRI, or diagnostic angiography.
- Processes include details regarding how any discrepancies identified will be addressed.

1.3.3 Timeframes for Reporting

- Facilities have standardized protocols and processes for reporting of VUS exams, including clinically appropriate timeframes for reporting of outpatient exams, inpatient and urgent outpatient exams, and high-risk exams requiring immediate communication to the referring clinician to ensure patients are appropriately referred for follow-up care.
- Outpatient exams are interpreted and the report made available to the referring clinician within 72 hours of completion of the exam.
- Inpatient and urgent outpatient exams are interpreted and the report made available to the referring clinician within 24 hours of completion of the exam.
- For patients seen in an outpatient, non-emergency department setting, referred with an urgent vascular diagnosis (e.g., TIA, CLTI), the VUS exam is interpreted and reported following best-practice timelines.
- High-risk findings are communicated immediately by the sonographer to the supervising/interpreting physician, and by the supervising/interpreting physician to the referring clinician.
- Records are maintained that show to whom the report was sent, who received the report, the date and time of the report, and any problem in accomplishing the task.

2.0 Carotid Ultrasound

2.2 Interpreting the Carotid Ultrasound Examination

- All physicians interpreting carotid ultrasound exams use the Intersocietal Accreditation Commission Vascular Testing Communication – Updated Recommendations for Carotid Stenosis Interpretation Criteria for interpretation of an ICA stenosis.

3.0 Abdominal Aortic Aneurysm (AAA) Screening Ultrasound

3.2 Interpreting the AAA Screening Ultrasound Examination

- Aneurysm surveillance follows best practice.

4.0 Lower Extremity Arterial Ultrasound

4.2 Interpreting the Lower Extremity Arterial Ultrasound Examination

- ABI interpretation follows best practice.

5.0 Lower Extremity Venous Thrombosis Ultrasound

5.2 Interpreting the Lower Extremity Venous Thrombosis Ultrasound Examination

- Repeat/serial lower extremity venous thrombosis ultrasound testing follows best practice.

6.0 Lower Extremity Venous Reflux Ultrasound

6.2 Interpreting the Lower Extremity Venous Reflux Ultrasound Examination

- Repeat/serial lower extremity venous reflux ultrasound testing follows best practice.

7.0 Vascular Ultrasound Personnel

- Facilities performing VUS in Ontario have adequately trained and experienced sonographers and physicians to perform and interpret VUS exams.

7.1 Vascular Sonographer

- All imaging technologists meet all requirements and are registered with the College of Medical Radiation and Imaging Technologists of Ontario (CMRITO).
- Sonographers are registered with CMRITO under the specialty of diagnostic medical sonography (DMS).
- Registrants understand and adhere to the CMRITO Standards of Practice and Code of Ethics, and participate in the Quality Assurance (QA) Program.
- The DMS registrant practices only in the areas of imaging technology in which the registrant is educated and experienced.

7.1.1 Education and Credentialing

In addition to being registered with the CMRITO as a diagnostic medical sonographer, it is strongly recommended that sonographers performing VUS exams have at least one of the following:

- Appropriate credentialing from Sonography Canada in the specialty of vascular sonography (i.e., Canadian Registered Vascular Sonographer)
- Appropriate credentialing from the American Registry for Diagnostic Medical Sonography (ARDMS) in the specialty of vascular sonography (i.e., Registered Vascular Technologist)
- Appropriate credentialing from Cardiovascular Credentialing International in the specialty of vascular sonography (i.e., Registered Vascular Specialist)

7.1.2 Continuing Education and Professional Development

- Registrants participate in the CMRITO's QA Program as part of maintaining and improving their competence, including completion of continuing education and professional development activities.

7.2 Interpreting Physician

Physicians interpreting VUS exams must:

- Hold a valid certificate of registration issued by the **College of Physicians and Surgeons of Ontario** (CPSO)
- Be certified by the **Royal College of Physicians and Surgeons of Canada** (RCPSC) including completion of an accredited residency program in the specialty/subspecialty of Diagnostic Radiology, Vascular Surgery, or Interventional Radiology

7.2.1 Education and Certification

- Vascular surgeons who are interpreting and reporting VUS exams have Registered Physician in Vascular Interpretation certification (strongly recommended).

7.2.2 Continuing Education and Professional Development

- Physicians participate in the Maintenance of Certification (MOC) Program including completion of continuing professional development activities that are eligible for RCPSC MOC credits.

8.0 Vascular Ultrasound Clinical Quality Program

8.1 Quality Lead

- Facilities have a physician Quality Lead (or equivalent role) who champions the development, implementation, and management of a Peer Learning Program.
- The Quality Lead fosters a positive culture of collaborative peer learning, focused on patient safety as well as the psychological safety of staff, to create lasting improvements to patient care.

8.2 Peer Learning Program

- The Peer Learning Program is conducted in accordance with the Quality of Care Information Protection Act (QCIPA) which enables confidential discussions in which information relating to errors, systemic problems, and opportunities for quality improvement can be shared in order to improve the quality of health care delivered to patients.

8.2.1 Peer Review of VUS Exams and Reports

- Facilities have processes for annual peer review of VUS exams and reports to identify and learn from errors.
- Peer review includes a minimum of five exams of each sonographer and each interpreting physician.
- The exams selected include at least one of each of the five VUS exams included in the VUS Standards (if performed by the facility).
- The exams are anonymized to minimize bias.

The reviews include, at a minimum:

- For each sonographer – a review of the quality, accuracy, and completeness of the exam, including the images, measurements, and report findings
- For each interpreting physician - a review of the quality and accuracy of exam interpretation and the completeness and timeliness of the exam report

- Feedback is provided by the Quality Lead, and any learning opportunities are identified with a plan for action and future improvement.

8.2.2 Case Conferences

- Facilities, led by the Quality Lead, conduct regular case conferences to collaboratively review challenging, complex, or interesting cases, discuss areas for quality improvement, review processes or protocols, or discuss emerging evidence or best practice.

Appendix F: Vascular Ultrasound Standards Self-Assessment - Clinical Checklist

1.0 Vascular Ultrasound Examination, Interpretation, and Reporting

1.1 Vascular Ultrasound Examination

1.1.3 Proper Techniques

Performance of a VUS exam includes but is not limited to:

- ☐ Identifying the correct patient as per facility instructions for positive patient identification
- ☐ Obtaining verbal or written consent as per facility protocols
- ☐ Obtaining and documenting relevant clinical/medical history and symptoms (i.e., exam indication)
- ☐ Completing the exam as per the common core protocol
- ☐ Reviewing and documenting sonographic findings to ensure that sufficient information is provided to the interpreting physician to provide an interpretation of the findings to direct patient management
- ☐ Immediately escalating any high-risk findings

1.3 Vascular Ultrasound Reporting

1.3.1.1 Findings

The description of exam findings includes, at a minimum, if relevant:

- ☐ Any abnormalities (e.g., atherosclerotic plaque, aneurysm, DVT, venous incompetency, tumour)
- ☐ Any incidental findings
- ☐ A statement of any exam limitations (e.g., difficult study due to body habitus)
- ☐ A statement of any technical difficulties (e.g., imaging was suboptimal)
- ☐ The reason(s) if a limited study is performed in lieu of a complete exam
- ☐ The reason(s) if any vessels, or segments of vessels, were not accessible or visualized
- ☐ Any anatomical variations (e.g., femoral vein duplication, saphenous vein removal for bypass grafting)
- ☐ Relevant comparisons to previous studies or reports as available

1.3.1.2 Interpretation

The interpretation section of the report includes the interpretation of exam findings and includes a summary of, at a minimum:

- Pertinent positive and negative findings as they relate to the assessment of the exam indication(s)
- Findings of other significant incidental pathology
- Recommendations regarding alternative or additional investigations, where appropriate

2.0 Carotid Ultrasound

2.1 The Carotid Ultrasound Examination

2.1.1 Common Core Protocol

- The patient is in the supine position with the chin tilted slightly upward and rotated away from the side to be examined.

2.1.1.1 Common Core Requirements – Images and Measurements

- Bilateral brachial systolic pressures are measured and recorded.

Common Core Requirements - B-mode Imaging

- Greyscale imaging is performed in both the transverse and longitudinal planes.

Greyscale images include, at a minimum:

- CCA – proximal, mid, distal
- Carotid bifurcation - with ICA and ECA visible
- ICA – proximal
- ECA - proximal
- Subclavian artery (longitudinal plane only) – if a quality image can be acquired

If any of the above can be recorded in one image, separate images are not required.

Common Core Requirements - Colour Doppler Imaging and Spectral Doppler Analysis

- Colour Doppler imaging and spectral Doppler analysis are performed in the longitudinal plane.

Colour Doppler images and spectral Doppler waveforms, PSV, and EDV include, at a minimum:

- CCA – proximal, mid, distal
- ICA – proximal, mid, distal
- ECA – proximal (EDV not required)
- Vertebral artery (EDV not required) – confirm direction of flow
- Subclavian artery (EDV not required)

- The ICA/CCA ratio is calculated using the highest PSV measured in the ICA and the PSV in the mid CCA.

Additional Imaging and Measurements

If atherosclerotic plaque is present, additional images and velocity measurements are recorded:

- Proximal to the stenosis
- At or distal to the stenosis, within one to two vessel diameters, to capture the highest PSV

If vascular intervention is present (e.g., endarterectomy, stent, bypass), additional images and PSV measurements are recorded:

- Proximal to the intervention site (i.e., at the proximal anastomosis)
- At the intervention site (i.e., mid-graft/stent)
- Distal to the intervention site (i.e., at the distal anastomosis)

- Additional images, waveforms, and/or measurements are taken to document, if present, any other vascular abnormalities (e.g., dissection, pseudoaneurysm).

2.3 Reporting the Carotid Ultrasound Examination

2.3.1 Findings

The description of exam findings includes, at a minimum:

- The presence or absence of plaque, location, plaque characteristics, and degree of stenosis (%)
- Any other significant pathology

3.0 Abdominal Aortic Aneurysm (AAA) Screening Ultrasound

3.1 The AAA Screening Ultrasound Examination

3.1.1 Common Core Protocol

- The patient is in the supine position.

3.1.1.1 Common Core Requirements – Images and Measurements

Common Core Requirements - B-mode Imaging and Measurements

Greyscale imaging is performed in both the transverse and longitudinal planes, with the diameter measured in the both the transverse and A-P planes perpendicular to the long axis of the vessel in, at a minimum:

- Proximal aorta (suprarenal)
- Mid aorta (juxtarenal)
- Distal aorta (infrarenal)
- Right CIA
- Left CIA

- Diameter measurements are taken from outer edge to outer edge of the vessels.

Given that the length of an AAA often causes confusion and can be misleading, it is recommended that the **length not be measured**.

Additional Imaging and Measurements

If an aneurysm is present:

- Additional images are recorded of the aneurysm
- The widest outer wall to outer wall diameter is measured perpendicular to the long axis of the vessel in both transverse and A-P planes

If atherosclerotic plaque is present, additional images and velocity measurements are recorded:

- Proximal to the stenosis
- At or distal to the stenosis, within one to two vessel diameters, to capture the highest PSV

- Additional images, waveforms, and/or measurements are taken to document, if present, any other vascular abnormalities (e.g., dissection)

- If an aneurysm is bilobed, the diameters of both dilations are measured.

3.3 Reporting the AAA Screening Ultrasound Examination

3.3.1 Findings

The description of exam findings includes, at a minimum:
- The specific location of an aneurysm
- The maximum diameter of the aneurysm
- Specific mention if the aneurysm is saccular or fusiform in shape if it can be accurately assessed
- Any atherosclerotic plaque or thrombus in the aneurysm if present

4.0 Lower Extremity Arterial Ultrasound

4.1 The Lower Extremity Arterial Ultrasound Examination

4.1.1 Common Core Protocol

- The patient is in the supine position with the leg to be examined externally rotated.

4.1.1.1 Common Core Requirements – Images and Measurements

- Bilateral measurement of ABI is performed.
- Measurement of brachial artery systolic pressure is obtained from both arms.
- Measurement of ankle systolic pressure is obtained bilaterally from the distal PTA and distal ATA.

- The ABI is calculated using the higher of the two ankle systolic pressures (i.e., the highest of the PTA or ATA pressures) divided by the highest of the two brachial artery pressures (i.e., left ABI = highest ankle pressure in the left leg divided by the highest of the brachial pressures in both arms).

Common Core Requirements - B-mode Imaging and Measurements

- ☐ Greyscale imaging is performed in the longitudinal plane.

Greyscale images include, at a minimum:
- ☐ Abdominal aorta (infrarenal)
- ☐ CIA
- ☐ EIA
- ☐ CFA
- ☐ SFA – proximal, mid, distal
- ☐ PFA – proximal
- ☐ Popliteal artery

Additional greyscale imaging is performed in the transverse plane with the diameter measured in both the transverse and A-P planes perpendicular to the long axis of the vessel in, at a minimum:
- ☐ Proximal aorta (suprarenal)
- ☐ Mid aorta (juxtarenal)
- ☐ Distal aorta (infrarenal)
- ☐ CIA

- ☐ Diameter measurements are taken from outer edge to outer edge of the vessels.

Common Core Requirements - Colour Doppler Imaging and Spectral Doppler Analysis

- ☐ Colour Doppler imaging and spectral Doppler analysis are performed in the longitudinal plane.

Colour Doppler images and spectral Doppler waveforms and PSV include, at a minimum:
- ☐ Abdominal aorta (infrarenal)
- ☐ CIA
- ☐ EIA
- ☐ CFA
- ☐ SFA – proximal, mid, distal
- ☐ PFA – proximal
- ☐ Popliteal artery – above and below the knee
- ☐ ATA – distal
- ☐ PTA – distal

Additional Imaging and Measurements

If atherosclerotic plaque is present, additional images and velocity measurements are recorded:
- ☐ Proximal to the stenosis
- ☐ At or distal to the stenosis, within one to two vessel diameters, to capture the highest PSV

If an aneurysm is present:

- Additional images are recorded of the aneurysm
- The widest outer wall to outer wall diameter is measured perpendicular to the long axis of the vessel in both transverse and A-P planes

If vascular intervention is present (e.g., endarterectomy, stent, bypass), additional images and PSV measurements are recorded:

- Proximal to the intervention site (i.e., at the proximal anastomosis)
- At the intervention site (i.e., mid-graft/stent)
- Distal to the intervention site (i.e., at the distal anastomosis)

- Additional images, waveforms, and/or measurements are taken to document, if present, any other vascular abnormalities (e.g., dissection, pseudoaneurysm).

4.3 Reporting the Lower Extremity Arterial Ultrasound Examination

4.3.1 Findings

The description of exam findings includes, at a minimum:

- The presence or absence of plaque, location, characteristics, and degree of stenosis (%)
- The specific location of an aneurysm and the maximum diameter
- Any other significant pathology

5.0 Lower Extremity Venous Thrombosis Ultrasound

5.1 The Lower Extremity Venous Thrombosis Ultrasound Examination

5.1.1 Common Core Protocol

- If possible, the patient is in the supine position with the head and shoulders raised with the legs tilted downwards from the head by at least 30 degrees.
- The leg to be examined is externally rotated and knee slightly flexed.

5.1.1.1 Common Core Requirements – Images and Measurements

Common Core Requirements - B-mode Imaging

- Greyscale imaging is performed in the transverse plane.

Greyscale images without and with transducer compressions include, at a minimum:

- CFV
- Femoral vein – proximal thigh, mid thigh, distal thigh
- Popliteal vein
- PTVs – proximal calf, mid calf, distal calf
- Peroneal veins – proximal calf, mid calf, distal calf
- SSV – SPJ, proximal calf, mid calf, distal calf
- GSV – SFJ, proximal thigh, knee, mid calf

- Venous compressions are applied with the ultrasound transducer every 1 to 2 cm with adequate pressure to completely obstruct the normal vein lumen.

The images without and with transducer compressions can each be taken as a split screen image.

- If a unilateral exam is performed, greyscale images include the contralateral CFV.

Colour Doppler Imaging and Spectral Doppler Analysis

- Colour Doppler imaging and spectral Doppler analysis are performed in the longitudinal plane.

Colour Doppler images demonstrating colour filling and spectral Doppler waveforms demonstrating spontaneity, respirophasicity, and/or flow in response to distal augmentation include, at a minimum:

- CFV
- Femoral vein – proximal thigh, mid thigh, distal thigh
- Popliteal vein

- If a unilateral exam is performed, spectral Doppler waveforms include the contralateral CFV.

- If nonspontaneous flow is present in the CFV or if there is suspicion of thrombus or obstruction superior to the CFV, the exam includes Doppler imaging of the EIV, CIV, and IVC.

Distal augmentation can be helpful to identify veins and to document the extent of a thrombus.

- Augmentation is applied to the vein manually just inferior to the level of insonation.

The Valsalva maneuver may also be used, particularly in the groin.

Additional Imaging and Measurements

If a DVT is present, additional images and waveforms are recorded:
- Proximal to the thrombus or obstruction
- At the thrombus or obstruction
- Distal to the thrombus or obstruction

- Additional measurements include the extent of the thrombus.

If an SVT is present, additional measurements include:
- Thrombus distance from the saphenofemoral or saphenopopliteal junction
- Total involved length of the thrombus
- Any extension through perforators, if applicable

Additional images, waveforms, and/or measurements are taken to document if present:
- Areas of suspected thrombus when clinically relevant
- Symptomatic areas
- Thrombophlebitis
- Baker's cyst
- Any other sites of intervention or abnormalities

5.3 Reporting the Lower Extremity Venous Thrombosis Ultrasound Examination

5.3.1 Findings

The description of exam findings includes, at a minimum:
- The compressibility of the veins
- Normal or abnormal colour filling
- The presence or absence of an augmented waveform in response to distal augmentation
- Normal or abnormal flow (i.e., respirophasic or continuous)
- The presence or absence of any thrombus and the location, extent/length, distance from the SFJ or SPJ (for SVT), and estimated age
- Any anatomical variations due to previous procedures (e.g., saphenous vein removal for bypass graft)
- Any other significant pathology (e.g., Baker's cyst, thrombophlebitis)

- If only the veins above or below the knee are examined, this is reflected in the findings.

6.0 Lower Extremity Venous Reflux Ultrasound

6.1 The Lower Extremity Venous Reflux Ultrasound Examination

- A lower extremity venous reflux ultrasound exam includes an initial assessment for venous thrombosis (including the common core protocol and requirements in Section 5.0).

A lower extremity venous reflux ultrasound is contraindicated if a DVT is present.

6.1.1 Common Core Protocol

- Ideally, the patient is in the supine position in reverse Trendelenburg, or standing, so the lower extremity is in a dependent position to encourage venous distension.
- The leg to be examined is externally rotated and knee slightly flexed.

6.1.1.1 Common Core Requirements – Images and Measurements

Common Core Requirements - B-mode Imaging and Measurements

- Greyscale imaging is performed in the transverse plane.

Greyscale images with diameter measurements include, at a minimum:
- SSV – SPJ if visualized, or proximal calf
- GSV – SFJ, proximal thigh, at knee

- Diameter measurements are taken from outer edge to outer edge in the A-P plane.

Colour Doppler Imaging and Spectral Doppler Analysis

- Colour Doppler imaging and spectral Doppler analysis are performed in the longitudinal plane.

Colour Doppler images and spectral Doppler waveforms demonstrating baseline flow and response to venous augmentation, with documentation of reflux time, include, at a minimum:

- CFV
- Femoral vein – proximal thigh, mid thigh, distal thigh
- Popliteal vein – above knee, below knee
- PTVs – mid calf, distal calf
- Peroneal veins – mid calf, distal calf
- SSV – SPJ, proximal calf, mid calf, distal calf
- GSV – SFJ, proximal thigh, knee, mid calf

- Augmentation is applied to the vein manually just inferior to the level of insonation.

The Valsalva maneuver may also be used.

- Superficial reflux is traced to its source whenever possible with representative images recorded and reflux time documented.

Additional Imaging and Measurements

- Additional images, waveforms, and/or measurements are taken to document, if present, varicose veins (and their connection to larger veins reported).

6.3 Reporting the Lower Extremity Venous Reflux Ultrasound Examination

6.3.1 Findings

The description of exam findings includes, at a minimum:

- The presence and location of any incompetent veins
- The most superior point of incompetency in the lower extremity
- The presence and location of any varicose veins and their connection to larger veins

Appendix G: Sonographer Worksheet and Interpreting Physician Reporting Templates

Carotid Ultrasound (Section 2.0)
Sonographer Technical Worksheet and Interpreting Physician Reporting Template

Patient name:	Exam date:
Patient identification number:	Sonographer's name or initials:
Exam indication(s):	
Relevant comparisons to previous studies or reports:	

Sonographer Technical Findings

	Right	Left
Brachial systolic pressure (mmHg)		

Right					
	PSV (cm/s)	EDV (cm/s)	Plaque surface	Plaque structure	Degree of stenosis[1]
CCA - prox			□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
CCA - mid			□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
CCA - distal			□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
ICA – prox			□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ 50-69%□ 70-99%
ICA – mid			□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ 50-69% □ 70-99%
ICA – distal			□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ 50-69%□ 70-99%
ECA - prox		---			
	PSV (cm/s)	Flow direction			
Vertebral		□ antegrade □ retrograde □ bi-direction □ absent			
Subclavian		---		ICA/CCA ratio	

Left					
	PSV (cm/s)	EDV (cm/s)	Plaque surface	Plaque structure	Degree of stenosis[1]
CCA - prox			□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
CCA - mid			□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
CCA - distal			□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
ICA – prox			□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ 50-69% □70-99%
ICA – mid			□smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ 50-69% □70-99%
ICA – distal			□smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ 50-69% □70-99%
ECA - prox		---			
	PSV (cm/s)	Flow direction			
Vertebral		□ antegrade □ retrograde □ bi-direction □ absent			
Subclavian		---		ICA/CCA ratio	

1 Intersocietal Accreditation Commission Vascular Testing Communication – Updated Recommendations for Carotid Stenosis Interpretation Criteria (2023)

Ontario Health

Carotid Ultrasound (Section 2.0)
Sonographer Technical Worksheet and Interpreting Physician Reporting Template

Patient name:	Patient identification number:

Site of vascular intervention	□ no	□ yes	If yes, describe:
Other abnormalities or incidental findings	□ no	□ yes	If yes, describe:
Exam limitations or technical difficulties	□ no	□ yes	If yes, describe:
Limited study	□ no	□ yes	If yes, describe:
Any vessels not accessible or visualized	□ no	□ yes	If yes, describe:
Anatomical variations	□ no	□ yes	If yes, describe:

Physician Interpretation

Pertinent positive and negative findings as they relate to the assessment of the exam indication(s) including:

- The presence or absence of plaque, location, plaque characteristics, and degree of stenosis (%)
- Any other significant pathology
- Findings of other significant incidental pathology
- Relevant comparisons to previous studies or reports
- Recommendations regarding alternative or additional investigations where appropriate

Interpreting physician: Date and time the exam is interpreted/reported:

Abdominal Aortic Aneurysm (AAA) Screening Ultrasound (Section 3.0)
Sonographer Technical Worksheet and Interpreting Physician Reporting Template

Patient name:	Exam date:
Patient identification number:	Sonographer's name or initials:
Exam indication(s):	
Relevant comparisons to previous studies or reports:	

Sonographer Technical Findings

	Transverse diameter (cm)	A-P diameter (cm)
Proximal aorta (suprarenal)		
Mid aorta (juxtarenal)		
Distal aorta (infrarenal)		
Right CIA		
Left CIA		

Aneurysm location: □ suprarenal □ juxtarenal □ infrarenal □ right CIA □ left CIA

Aneurysm shape (if it can be accurately assessed): □ saccular □ fusiform □ bilobed

If bilobed:

	Transverse diameter (cm)	A-P diameter (cm)
Dilation 1		
Dilation 2		

Atherosclerotic plaque or thrombus in the aneurysm □ no □ yes

Plaque characteristics:

Surface contour □ smooth □ irregular

Internal structure □homogeneous □ heterogeneous □ calcified

Degree of stenosis: □ <50% □ >50%

Other abnormalities or incidental findings □ no □ yes If yes, describe:

Exam limitations or technical difficulties □ no □ yes If yes, describe:

Limited study □ no □ yes If yes, describe:

Any vessels not accessible or visualized □ no □ yes If yes, describe:

Anatomical variations □ no □ yes If yes, describe:

Abdominal Aortic Aneurysm (AAA) Screening Ultrasound (Section 3.0)
Sonographer Technical Worksheet and Interpreting Physician Reporting Template

Patient name:	Patient identification number:

Physician Interpretation

Pertinent positive and negative findings as they relate to the assessment of the exam indication(s) including:

- The specific location of an aneurysm
- The maximum diameter of the aneurysm
- Specific mention if the aneurysm is saccular or fusiform in shape if it was accurately assessed
- Any atherosclerotic plaque or thrombus in the aneurysm if present
- Findings of other significant incidental pathology
- Relevant comparisons to previous studies or reports
- Recommendations regarding alternative or additional investigations where appropriate

Given that the length of an AAA often causes confusion and can be misleading, it is recommended that the **length not be reported**.

Interpreting physician: Date and time the exam is interpreted/reported:

Lower Extremity Arterial Ultrasound (Section 4.0)
Sonographer Technical Worksheet and Interpreting Physician Reporting Template

Patient name:	Exam date:
Patient identification number:	Sonographer's name or initials:
Exam indication(s):	
Relevant comparisons to previous studies or reports:	

Sonographer Technical Findings

Right	
	Pressure (mmHg)
Brachial	
Anterior tibial	
Posterior tibial	

Left	
	Pressure (mmHg)
Brachial	
Anterior tibial	
Posterior tibial	

ABI	

ABI	

	Transverse diameter (cm)	A-P diameter (cm)	PSV (cm/s)
Proximal aorta (suprarenal)			----------
Mid aorta (juxtarenal)			----------
Distal aorta (infrarenal)			
Right CIA			
Left CIA			
Right EIA	----------	----------	
Left EIA	----------	----------	

Right					
	PSV (cm/s)	Waveform analysis	Plaque surface	Plaque structure	Degree of stenosis
CFA		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
SFA – prox		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
SFA – mid		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
SFA – distal		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
PFA - prox		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
Pop artery – above knee		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
Pop artery – below knee		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
ATA – distal		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
PTA - distal		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%

Lower Extremity Arterial Ultrasound (Section 4.0)
Sonographer Technical Worksheet and Interpreting Physician Reporting Template

Patient name:	Patient identification number:

Left					
	PSV (cm/s)	Waveform analysis	Plaque surface	Plaque structure	Degree of stenosis
CFA		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
SFA – prox		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
SFA – mid		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
SFA – distal		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
PFA - prox		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
Pop artery – above knee		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
Pop artery – below knee		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
ATA – distal		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%
PTA - distal		□ multi □ mono	□ smooth □ irregular	□ homo □ hetero □ calcified	□ <50% □ >50%

Aneurysm □ no □ yes If yes, describe:

Site of vascular intervention □ no □ yes If yes, describe:

Other abnormalities or incidental findings □ no □ yes If yes, describe:

Exam limitations or technical difficulties □ no □ yes If yes, describe:

Limited study □ no □ yes If yes, describe:

Any vessels not accessible or visualized □ no □ yes If yes, describe:

Anatomical variations □ no □ yes If yes, describe:

Physician Interpretation

Pertinent positive and negative findings as they relate to the assessment of the exam indication(s) including:

- The presence or absence of plaque, location, characteristics, and degree of stenosis (%)
- Any other significant pathology
- Findings of other significant incidental pathology
- Relevant comparisons to previous studies or reports
- Recommendations regarding alternative or additional investigations where appropriate

Interpreting physician: Date and time the exam is interpreted/reported:

Lower Extremity Venous Thrombosis Ultrasound (Section 5.0)
Sonographer Technical Worksheet and Interpreting Physician Reporting Template

Patient name:	Exam date:
Patient identification number:	Sonographer's name or initials:
Exam indication(s):	
Relevant comparisons to previous studies or reports:	

Patient's position:
If possible, the patient is in the supine position with the head and shoulders raised with the legs tilted downwards from the head by at least 30 degrees.

Sonographer Technical Findings

Right		
	Compressibility	If thrombus, estimated age
CFV	□ compressible □ partially compressible □ non-compressible	□ acute □ chronic □ indeterminant
Femoral vein	□ compressible □ partially compressible □ non-compressible	□ acute □ chronic □ indeterminant
Popliteal vein	□ compressible □ partially compressible □ non-compressible	□ acute □ chronic □ indeterminant
PTV	□ compressible □ partially compressible □ non-compressible	□ acute □ chronic □ indeterminant
Peroneal vein	□ compressible □ partially compressible □ non-compressible	□ acute □ chronic □ indeterminant
SSV	□ compressible □ partially compressible □ non-compressible	□ acute □ chronic □ indeterminant
GSV	□ compressible □ partially compressible □ non-compressible	□ acute □ chronic □ indeterminant
SFJ	□ compressible □ partially compressible □ non-compressible	□ acute □ chronic □ indeterminant

Right		
	Colour Filling	Augmentation
CFV	□ normal □ abnormal	□ normal □ reduced □ absent
Femoral vein	□ normal □ abnormal	□ normal □ reduced □ absent
Popliteal vein	□ normal □ abnormal	□ normal □ reduced □ absent

Left		
	Compressibility	If thrombus, estimated age
CFV	□ compressible □ partially compressible □ non-compressible	□ acute □ chronic □ indeterminant
Femoral vein	□ compressible □ partially compressible □ non-compressible	□ acute □ chronic □ indeterminant
Popliteal vein	□ compressible □ partially compressible □ non-compressible	□ acute □ chronic □ indeterminant
PTV	□ compressible □ partially compressible □ non-compressible	□ acute □ chronic □ indeterminant
Peroneal vein	□ compressible □ partially compressible □ non-compressible	□ acute □ chronic □ indeterminant
SSV	□ compressible □ partially compressible □ non-compressible	□ acute □ chronic □ indeterminant
GSV	□ compressible □ partially compressible □ non-compressible	□ acute □ chronic □ indeterminant
SFJ	□ compressible □ partially compressible □ non-compressible	□ acute □ chronic □ indeterminant

Left		
	Colour Filling	Augmentation
CFV	□ normal □ abnormal	□ normal □ reduced □ absent
Femoral vein	□ normal □ abnormal	□ normal □ reduced □ absent
Popliteal vein	□ normal □ abnormal	□ normal □ reduced □ absent

Lower Extremity Venous Thrombosis Ultrasound (Section 5.0)
Sonographer Technical Worksheet and Interpreting Physician Reporting Template

Patient name:	Patient identification number:

Veins were examined: □ above the knee □ below the knee

Deep vein thrombosis □ no □ yes If yes, extent/length:

Superficial vein thrombosis □ no □ yes

If yes,
Distance from the SFJ or SPJ: Total involved length:
Extension through perforators:

Other abnormalities or incidental findings □ no □ yes If yes, describe:

Exam limitations or technical difficulties □ no □ yes If yes, describe:

Limited study □ no □ yes If yes, describe:

Any vessels not accessible or visualized □ no □ yes If yes, describe:

Anatomical variations □ no □ yes If yes, describe:

Physician Interpretation

Pertinent positive and negative findings as they relate to the assessment of the exam indication(s) including:

- The presence or absence of any thrombus and the location, extent/length, distance from the SFJ or SPJ (for SVT), and estimated age
- Any other significant pathology (e.g., Baker's cyst, thrombophlebitis)
- Findings of other significant incidental pathology
- Relevant comparisons to previous studies or reports
- Recommendations regarding alternative or additional investigations where appropriate

Interpreting physician: Date and time the exam is interpreted/reported:

Lower Extremity Venous Reflux Ultrasound (Section 6.0)
Sonographer Technical Worksheet and Interpreting Physician Reporting Template

Patient name:	Exam date:
Patient identification number:	Sonographer's name or initials:
Exam indication(s):	
Relevant comparisons to previous studies or reports:	

Note: The lower extremity venous reflux ultrasound exam also includes an initial assessment for thrombosis including the common core protocol and requirements in Section 5.0 (See Lower Extremity Venous Thrombosis Ultrasound Worksheet). A lower extremity venous reflux ultrasound is contraindicated if a DVT is present.

Patient's position:
Ideally, the patient is in the supine position in reverse Trendelenburg, or standing, so the lower extremity is in a dependent position to encourage venous distension.

Sonographer Technical Findings

Right	
	Diameter (cm)
SSV	
GSV - SFJ	
GSV – proximal thigh	
GSV - knee	

Left	
	Diameter (cm)
SSV	
GSV - SFJ	
GSV – proximal thigh	
GSV - knee	

Right	
	Competency
CFV	□ competent □ incompetent
Femoral vein	□ competent □ incompetent
Popliteal vein	□ competent □ incompetent
PTV	□ competent □ incompetent
Peroneal vein	□ competent □ incompetent
SSV	□ competent □ incompetent
GSV	□ competent □ incompetent

Left	
	Competency
CFV	□ competent □ incompetent
Femoral vein	□ competent □ incompetent
Popliteal vein	□ competent □ incompetent
PTV	□ competent □ incompetent
Peroneal vein	□ competent □ incompetent
SSV	□ competent □ incompetent
GSV	□ competent □ incompetent

Most superior point of incompetency:

Superficial reflux source:

Varicose veins □ no □ yes

If yes, describe their connection to larger veins:

Lower Extremity Venous Reflux Ultrasound (Section 6.0)
Sonographer Technical Worksheet and Interpreting Physician Reporting Template

Patient name:	Patient identification number:

Other abnormalities or incidental findings	□ no	□ yes	If yes, describe:
Exam limitations or technical difficulties	□ no	□ yes	If yes, describe:
Limited study	□ no	□ yes	If yes, describe:
Any vessels not accessible or visualized	□ no	□ yes	If yes, describe:
Anatomical variations	□ no	□ yes	If yes, describe:

Physician Interpretation

Pertinent positive and negative findings as they relate to the assessment of the exam indication(s) including:

- The presence and location of any incompetent veins
- The most superior point of incompetency in the lower extremity
- The presence and location of any varicose veins and their connection to larger veins
- Findings of other significant incidental pathology
- Relevant comparisons to previous studies or reports
- Recommendations regarding alternative or additional investigations where appropriate

Interpreting physician: Date and time the exam is interpreted/reported: