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Each practice guideline and technical standard, representing a policy statement by the College, has undergone a thorough consensus process in which it has been subjected to extensive review, requiring the approval of the Commission on Quality and Safety as well as the ACR Board of Chancellors, the ACR Council Steering Committee, and the ACR Council. The practice guidelines and technical standards recognize that the safe and effective use of diagnostic and therapeutic radiology requires specific training, skills, and techniques, as described in each document. Reproduction or modification of the published practice guideline and technical standard by those entities not providing these services is not authorized.

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ACR PRACTICE GUIDELINE FOR THE PERFORMANCE OF PERIPHERAL VENOUS ULTRASOUND EXAMINATION

PREAMBLE

These guidelines are an educational tool designed to assist practitioners in providing appropriate radiologic care for patients. They are not inflexible rules or requirements of practice and are not intended, nor should they be used, to establish a legal standard of care. For these reasons and those set forth below, the American College of Radiology cautions against the use of these guidelines in litigation in which the clinical decisions of a practitioner are called into question.

The ultimate judgment regarding the propriety of any specific procedure or course of action must be made by the physician or medical physicist in light of all the circumstances presented. Thus, an approach that differs from the guidelines, standing alone, does not necessarily imply that the approach was below the standard of care. To the contrary, a conscientious practitioner may responsibly adopt a course of action different from that set forth in the guidelines when, in the reasonable judgment of the practitioner, such course of action is indicated by the condition of the patient, limitations on available resources, or advances in knowledge or technology subsequent to publication of the guidelines. However, a practitioner who employs an approach substantially different from these guidelines is advised to document in the patient record information sufficient to explain the approach taken.

The practice of medicine involves not only the science, but also the art of dealing with the prevention, diagnosis, alleviation, and treatment of disease. The variety and complexity of human conditions make it impossible to

always reach the most appropriate diagnosis or to predict with certainty a particular response to treatment. Therefore, it should be recognized that adherence to these guidelines will not assure an accurate diagnosis or a successful outcome. All that should be expected is that the practitioner will follow a reasonable course of action based on current knowledge, available resources, and the needs of the patient to deliver effective and safe medical care. The sole purpose of these guidelines is to assist practitioners in achieving this objective.

I. INTRODUCTION

The clinical aspects of this guideline (Indications, Specifications of the Examination, and Equipment Specifications) were developed collaboratively by the American College of Radiology (ACR) and the American Institute of Ultrasound in Medicine (AIUM). Recommendations for physician requirements, written request for the examination, procedure documentation, and quality control vary between the two organizations and are addressed by each separately.

These guidelines have been developed to assist practitioners performing noninvasive ultrasound evaluation of peripheral venous structures. Occasionally, an additional and/or specialized examination may be necessary. While it is not possible to detect every abnormality, adherence to the following guidelines will maximize the probability of detecting most of the

abnormalities that occur in the veins of the extremities and other superficial veins.

II. QUALIFICATIONS AND RESPONSIBILITIES OF THE PHYSICIAN

See the [ACR Practice Guideline for Performing and Interpreting Diagnostic Ultrasound Examinations](#).

III. INDICATIONS FOR PERIPHERAL VENOUS EXAMINATIONS

The indications for peripheral venous ultrasound examinations include, but are not limited to:

1. Evaluation of possible venous obstruction or thrombus in symptomatic or high-risk asymptomatic individuals.
2. Assessment of venous insufficiency.
3. Assessment of dialysis access grafts (see the [ACR Practice Guideline for the Performance of Ultrasound Vascular Mapping for Preoperative Planning of Dialysis Access](#)).
4. Venous mapping prior to harvest for arterial bypass or reconstructive surgery.
5. Evaluation of veins prior to venous access.
5. Evaluation for deep-vein thrombosis (DVT) in patients with suspected pulmonary embolism.
6. Follow-up for patients with known venous thrombosis.

IV. WRITTEN REQUEST FOR THE EXAMINATION

The written or electronic request for a peripheral venous ultrasound examination should provide sufficient information to demonstrate the medical necessity of the examination and allow for the proper performance and interpretation of the examination.

Documentation that satisfies medical necessity includes 1) signs and symptoms and/or 2) relevant history (including known diagnoses). The provision of additional information regarding the specific reason for the examination or a provisional diagnosis would be helpful and may at times be needed to allow for the proper performance and interpretation of the examination.

The request for the examination must be originated by a physician or other appropriately licensed health care provider. The accompanying clinical information should be provided by a physician or other appropriately licensed health care provider familiar with the patient's clinical problem or question and consistent with the state scope of practice requirements. 2006 (Res. 35)

V. SPECIFICATIONS OF THE EXAMINATION

A. Technique for Evaluation of the Peripheral Venous System

1. Venous thromboembolic disease
For lower extremity evaluation, the common femoral vein, the femoral vein (formerly known as superficial¹ femoral vein), proximal deep femoral vein, proximal greater saphenous vein, and popliteal vein should be examined using appropriate duplex technique and patient position. Doppler evaluation should be used to support the presence or absence of an abnormality. At a minimum, a bilateral common femoral venous waveform should be obtained to evaluate for asymmetry or loss of cardiovascular pulsatility and respiratory phasicity. A noncompressible segment of vein should be interrogated with spectral or color Doppler for the presence or absence of flow. Focal calf pain will generally require evaluation of the localized region.

The femoral and popliteal veins should be imaged to the fullest extent possible, and images should be recorded at each of the following levels: common femoral vein; junction of common femoral vein with the great saphenous vein; proximal deep femoral, proximal, mid, and distal femoral vein; and popliteal vein. Vascular and nonvascular abnormalities, if found, should be reported, but may require additional imaging for diagnosis or further characterization. Symptomatic areas generally require additional views, if the cause of the symptoms is not already elucidated by the standard examination. When using compression as a diagnostic criterion for deep venous thrombosis, real-time imaging should be performed in the transverse plane along the full length of the femoral and popliteal veins, with and without pressure applied to the skin in an effort to completely oppose the venous walls. Images with and without compression should be recorded at each of the levels listed above. The extent and location of sites where the veins fail to compress should be clearly recorded.

The patient presentation, clinical indication, or clinical management pathways may require protocol adjustments such as more detailed evaluation of the superficial venous system,

¹The consensus is that "superficial" is no longer used. The suggested terminology is to refer to this deep vein as the femoral vein.

evaluation of the deep calf veins, or a bilateral study.

2. Venous insufficiency

When evaluating for venous insufficiency, the location and duration of reversed blood flow should be determined during the performance of accepted maneuvers.

Doppler interrogation should be performed at as many levels as necessary to ensure a complete examination based on the clinical indications. Augmentation with calf or thigh pressure, Valsalva, or forced respiration may be used.

The patient should be positioned in the erect or reverse Trendelenburg position for the detection or exclusion of reflux. The examined leg should be in the non-weight-bearing position. The patient should not be studied only in the supine position.

3. Upper extremity

Upper extremity duplex evaluation consists of assessment of subclavian, innominate, jugular, and axillary veins. Basilic, cephalic, and brachial veins, forearm veins, and focal symptomatic areas may be examined as indicated.

Duplex Doppler or color Doppler techniques are used to assess venous compressibility, thrombus, wall thickening, spontaneous venous flow, cardiac and respiratory phasicity of flow, and venous filling defects.

4. Vein mapping

Vein mapping of superficial leg (arm) veins is performed to determine the patency, size, and course of superficial veins to be used for vein grafting. The location of the vein may be marked on the skin overlying the veins.

B. Diagnostic Criteria for Venous Examinations

Compression ultrasound findings are the main criteria to diagnose or exclude venous thrombosis. These can be supplemented by Doppler evaluation. Doppler ultrasound criteria should be used to diagnose or exclude venous insufficiency.

VI. DOCUMENTATION

Adequate documentation is essential for high quality in patient care. There should be a permanent record of the ultrasound examination and its interpretation. Images of all appropriate areas, both normal and abnormal, should be recorded. Variations from normal size should be

accompanied by measurements. Images should be labeled with the patient identification, facility identification, examination date, and the side (right or left) of the anatomic site imaged. An official interpretation (final report) of the ultrasound findings should be in accordance with the [ACR Practice Guideline for Communication of Diagnostic Imaging Findings](#) and should be included in the patient's medical record, regardless of where the study is performed. Retention of the ultrasound examination should be consistent both with clinical need and with relevant legal and local healthcare facility requirements.

VII. EQUIPMENT SPECIFICATIONS

The sonographic evaluation of the peripheral veins should include both real-time imaging of the veins and their contents and evaluation of the flow signals originating from within the lumen of the veins. Real-time imaging should be conducted at the highest clinically appropriate frequency, realizing that there is a trade-off between resolution and beam penetration. This should usually be at a frequency of 5 MHz or greater, with the occasional need for a lower frequency transducer. In most cases, a linear or curved linear transducer is preferable, but sector scanners can produce diagnostic studies. Evaluation of the flow signals originating from within the lumen of the vein should be conducted with a carrier frequency of 2.5 MHz or above. A display of the relative amplitude and direction of moving blood should be available.

Imaging and flow analysis are currently performed with duplex sonography, using range gating. Color Doppler can be used to facilitate the examination.

VIII. QUALITY CONTROL AND IMPROVEMENT, SAFETY, INFECTION CONTROL, AND PATIENT EDUCATION CONCERNS

Policies and procedures related to quality, patient education, infection control, and safety should be developed and implemented in accordance with the ACR Policy on Quality Control and Improvement, Safety, Infection Control, and Patient Education Concerns appearing elsewhere in the ACR Practice Guidelines and Technical Standards book.

Equipment performance monitoring should be in accordance with the [ACR Technical Standard for Diagnostic Medical Physics Performance Monitoring of Real Time Ultrasound Equipment](#).

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collaboration with the American Institute of Ultrasound in Medicine (AIUM).

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