



Vital Health
— MEDICAL GROUP —

DIAGNOSTIC ULTRASOUND GUIDE

Common uses, preparation, limitations and current clinical considerations



ABOUT THIS BOOKLET

This booklet updates VHMG's prior ultrasound reference guide with current, evidence-based descriptions of how common ultrasound examinations are used. It is intended for patient and staff education. It is not a standing order, a substitute for clinician judgment, or a guarantee of insurance coverage or medical necessity.

Updated August 2026



01 UNDERSTANDING DIAGNOSTIC ULTRASOUND

A modern overview of what ultrasound can - and cannot - tell us.

Diagnostic ultrasound (sonography) uses high-frequency sound waves to create real-time images of organs, soft tissues and blood flow. It does not use ionizing radiation. Doppler ultrasound adds information about the direction and speed of blood flow.

WHY CLINICIANS USE ULTRASOUND

- Noninvasive imaging of many soft tissues and organs.
- Real-time assessment of motion, blood flow and compressibility.
- Guidance for selected needle procedures and biopsies.
- Follow-up of known findings when ultrasound is the appropriate modality.

IMPORTANT LIMITATIONS

- Bowel gas and deeper structures can limit image quality.
- Ultrasound does not see through bone well and is not the best test for every condition.
- A normal ultrasound does not exclude every disease process.
- Abnormal findings may require CT, MRI, mammography, laboratory testing or specialist evaluation.

Inside this guide

Echocardiogram

Prostate Ultrasound

Abdominal & Renal Ultrasound

Scrotal / Testicular Ultrasound

Abdominal Aortic Aneurysm (AAA) Ultrasound

Extremity Vascular Ultrasound

Carotid Duplex Ultrasound

Musculoskeletal & Soft-Tissue Ultrasound

Thyroid Ultrasound

Breast Ultrasound

Pelvic & Bladder Ultrasound

Preparing for Your Exam & Understanding Results

SAFETY NOTE

Standard diagnostic ultrasound has no known harmful effects when used appropriately. However, an ultrasound examination should still be performed for a defined clinical reason and interpreted in the context of the patient's history, examination and other testing.

Clinical sources: ACR/RSNA RadiologyInfo - Ultrasound; How to Prepare for Your Ultrasound Exam (reviewed June 2026).



02 ECHOCARDIOGRAM

Heart ultrasound: structure, pumping function, valves and blood flow.

A transthoracic echocardiogram (TTE) is a noninvasive ultrasound of the heart. It can show chamber size, heart muscle movement, pumping function, valve structure and function, and fluid around the heart. Doppler measurements help assess blood flow and pressure relationships.

COMMON REASONS IT MAY BE ORDERED

- New or changing heart murmur or suspected valve disease.
- Shortness of breath, edema or other findings suggesting heart failure.
- Known or suspected cardiomyopathy or reduced heart function.
- Assessment after myocardial infarction when structural or functional information is needed.
- Evaluation of pulmonary hypertension, pericardial effusion or selected congenital heart disease.
- Arrhythmia when there is concern for underlying structural heart disease.

WHAT IT CAN HELP EVALUATE

- Left and right ventricular size and systolic function, including ejection fraction.
- Valve stenosis or regurgitation.
- Wall-motion abnormalities and chamber enlargement.
- Pericardial effusion and some causes of elevated pulmonary pressures.
- Selected aortic root and congenital abnormalities.

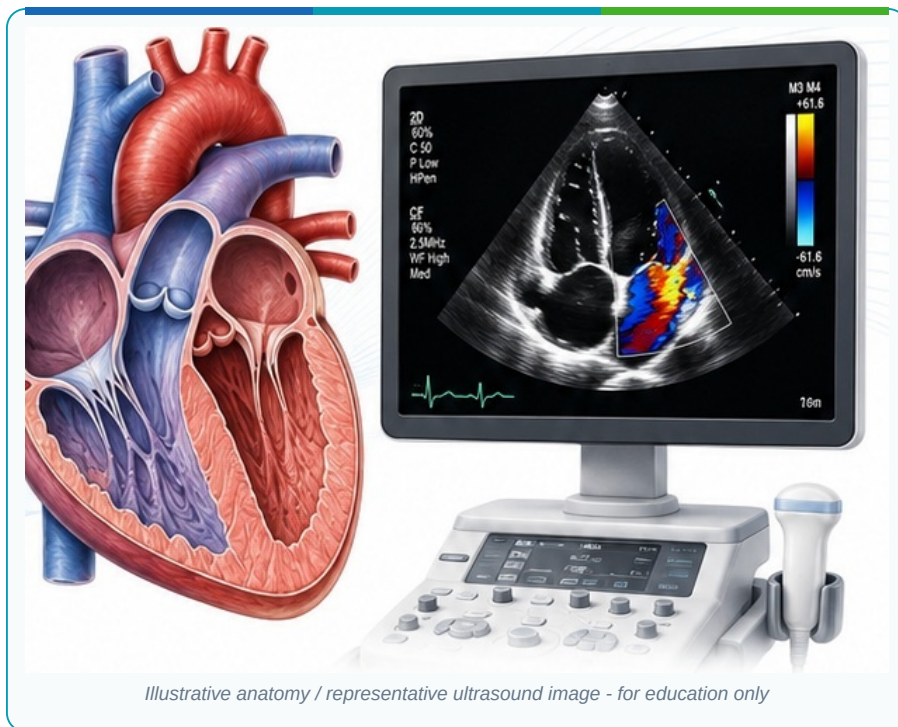
PREPARATION / WHAT TO EXPECT

Most standard transthoracic echocardiograms require no fasting or special preparation. A small amount of gel is placed on the chest and the sonographer obtains images from several positions.

CURRENT CLINICAL CONSIDERATION

Hypertension, diabetes, COPD or chest pain alone do not automatically mean an echocardiogram is needed. Acute or concerning chest pain requires prompt clinical evaluation; an echo is only one possible part of that workup.

Clinical sources: American Heart Association - What Is an Echocardiogram?; AHA/ACC heart-failure imaging recommendations.





03 ABDOMINAL & RENAL ULTRASOUND

Liver, gallbladder, bile ducts, pancreas, spleen, kidneys, bladder and selected abdominal vessels.

Abdominal ultrasound is commonly used to evaluate upper abdominal pain, abnormal laboratory tests and structural abnormalities. A renal/bladder ultrasound focuses on the kidneys and urinary bladder and can include measurement of bladder volume before and after voiding.

COMMON REASONS IT MAY BE ORDERED

- Right upper-quadrant or generalized abdominal pain, nausea or abdominal distention.
- Abnormal liver enzymes, jaundice, suspected fatty liver or chronic liver disease.
- Suspected gallstones, gallbladder inflammation or bile-duct dilation.
- Flank pain, hematuria, recurrent urinary infection or suspected urinary obstruction.
- Known renal cysts, polycystic kidney disease, hydronephrosis or selected renal masses.
- Ascites, splenomegaly or selected follow-up of known abdominal findings.

WHAT IT CAN HELP EVALUATE

- Liver size and echotexture; focal lesions may be seen but may need additional imaging.
- Gallstones, gallbladder wall findings and bile-duct dilation.
- Kidney size, cysts, hydronephrosis and some stones.
- Bladder wall, urinary retention and post-void residual when requested.
- Spleen size, abdominal fluid and portions of the pancreas and aorta.

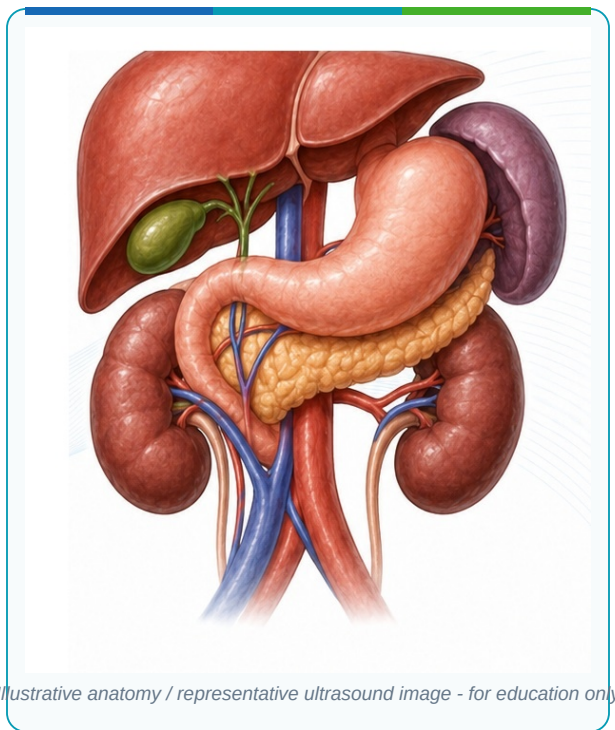
PREPARATION / WHAT TO EXPECT

Preparation depends on the target organs. Upper-abdominal studies often require fasting so the gallbladder is distended and bowel gas is reduced. Renal/bladder or pelvic studies may require a full bladder. Follow the specific instructions given when the test is scheduled.

CURRENT CLINICAL CONSIDERATION

Ultrasound may miss small ureteral stones and can be limited by bowel gas or body habitus. CT or MRI may be recommended when ultrasound does not fully answer the clinical question.

Clinical sources: ACR/RSNA RadiologyInfo - Abdominal Ultrasound (reviewed March 2024); Renal Ultrasound (reviewed September 2024); Kidney and Bladder Stones (reviewed June 2026).





04 ABDOMINAL AORTIC ANEURYSM (AAA) ULTRASOUND

Screening and surveillance of enlargement of the abdominal aorta.

An abdominal aortic aneurysm is an enlargement of the abdominal aorta. Ultrasound is the standard noninvasive test for screening and is also commonly used to measure and follow a known aneurysm.

SCREENING GUIDANCE

- USPSTF: one-time ultrasound screening for men age 65-75 who have ever smoked.
- USPSTF: selectively offer screening to men age 65-75 who have never smoked based on risk factors and preferences.
- USPSTF: do not routinely screen women who have never smoked and have no family history of AAA.
- For women age 65-75 who have ever smoked or have a family history, evidence is insufficient for a universal recommendation.

OTHER CLINICAL USES

- Measure a known aneurysm and document interval change.
- Evaluate a pulsatile abdominal mass when clinically appropriate.
- Assess selected patients with strong family history or other risk factors when ordered by a clinician.
- Support vascular or surgical follow-up plans based on aneurysm size and growth.

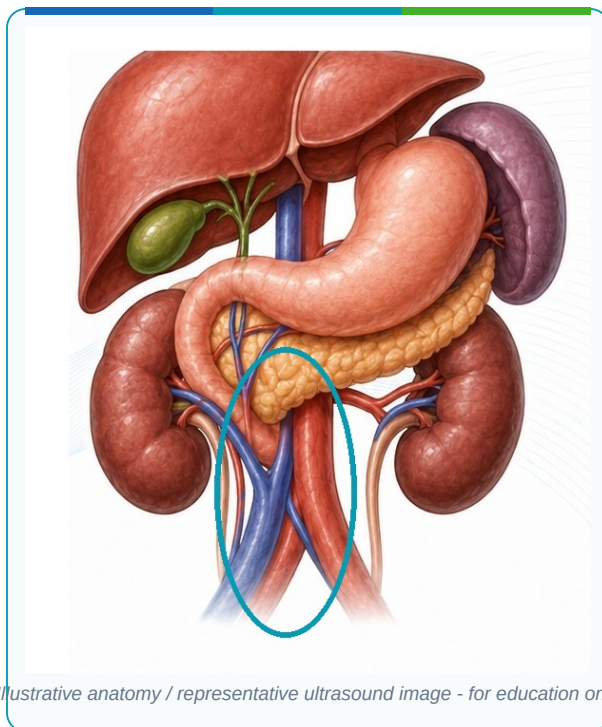
PREPARATION / WHAT TO EXPECT

Fasting may be requested because bowel gas can obscure the abdominal aorta. The sonographer measures the aorta in standardized planes.

CURRENT CLINICAL CONSIDERATION

Sudden severe abdominal or back pain, fainting, low blood pressure or symptoms concerning for aneurysm rupture are emergencies and should not wait for a routine outpatient ultrasound.

Clinical sources: U.S. Preventive Services Task Force - Abdominal Aortic Aneurysm: Screening (2019, current recommendation page).



Illustrative anatomy / representative ultrasound image - for education only



05 CAROTID DUPLEX ULTRASOUND

Doppler evaluation of the carotid arteries that supply blood to the brain.

Carotid duplex ultrasound combines B-mode imaging and Doppler measurements to evaluate plaque, narrowing (stenosis) and blood-flow patterns in the carotid arteries.

COMMON REASONS IT MAY BE ORDERED

- Symptoms of transient ischemic attack (TIA) or stroke, such as focal weakness, speech difficulty or transient monocular vision loss.
- A carotid bruit or known carotid atherosclerotic disease when imaging is clinically appropriate.
- Follow-up after carotid endarterectomy, stenting or previously documented stenosis.
- Selected high-risk patients when a clinician determines the result would change management.

WHAT IT CAN HELP EVALUATE

- Presence and distribution of plaque.
- Degree of carotid stenosis using blood-flow velocities and waveform analysis.
- Patency after intervention and progression of known disease.
- Selected abnormalities of the vertebral arteries when included in the protocol.

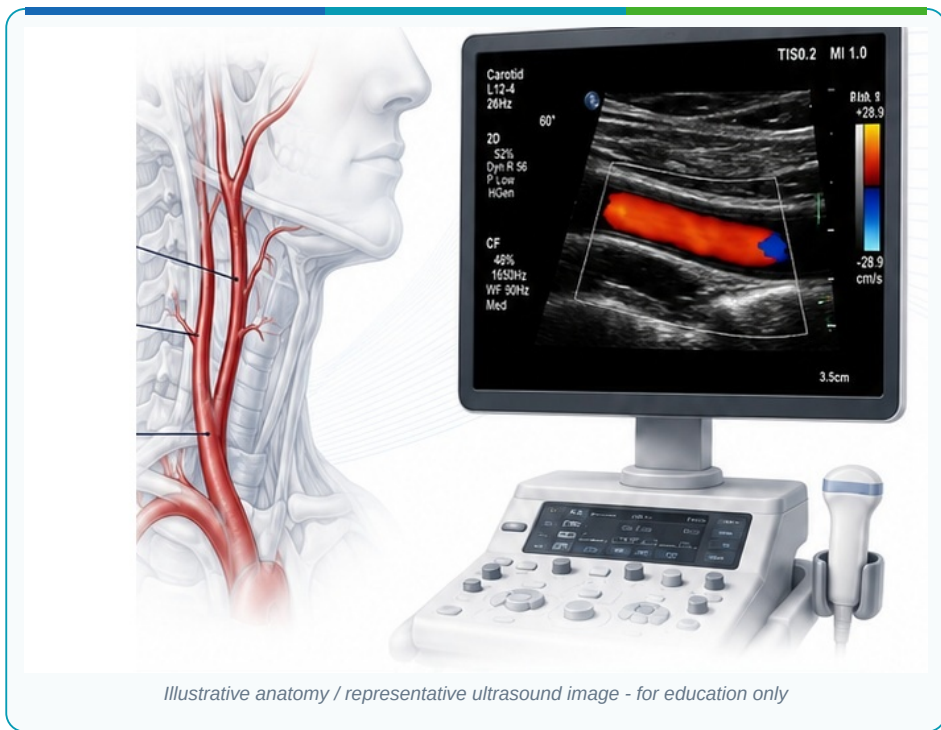
PREPARATION / WHAT TO EXPECT

Little or no preparation is typically required. An open-neck shirt is helpful. The study is performed with gel and a transducer along both sides of the neck.

CURRENT CLINICAL CONSIDERATION

Routine screening of the general adult population without neurologic symptoms is not recommended by the USPSTF. Dizziness or vertigo alone is usually not a reason to assume carotid disease; the ordering clinician should evaluate the full neurologic and cardiovascular picture.

Clinical sources: ACR/RSNA RadiologyInfo - Carotid Ultrasound (reviewed June 2026); USPSTF - Asymptomatic Carotid Artery Stenosis: Screening (2021).





06 THYROID ULTRASOUND

Structural imaging of the thyroid gland and nearby neck tissues.

Thyroid ultrasound evaluates the size and structure of the thyroid, characterizes nodules and can assess nearby lymph nodes. It is also used to guide fine-needle aspiration when biopsy is indicated.

COMMON REASONS IT MAY BE ORDERED

- A palpable thyroid nodule, neck mass or enlarged thyroid (goiter).
- A thyroid nodule found incidentally on another imaging study.
- Follow-up of a known nodule when recommended based on size and ultrasound features.
- Evaluation of suspicious cervical lymph nodes in the setting of thyroid disease.
- Ultrasound guidance for thyroid fine-needle aspiration.

WHAT IT CAN HELP EVALUATE

- Nodule size, composition, echogenicity, margins and calcification pattern.
- Features used in risk-stratification systems such as ACR TI-RADS.
- Growth or stability of previously documented nodules.
- Thyroid enlargement, cysts and selected adjacent structures.

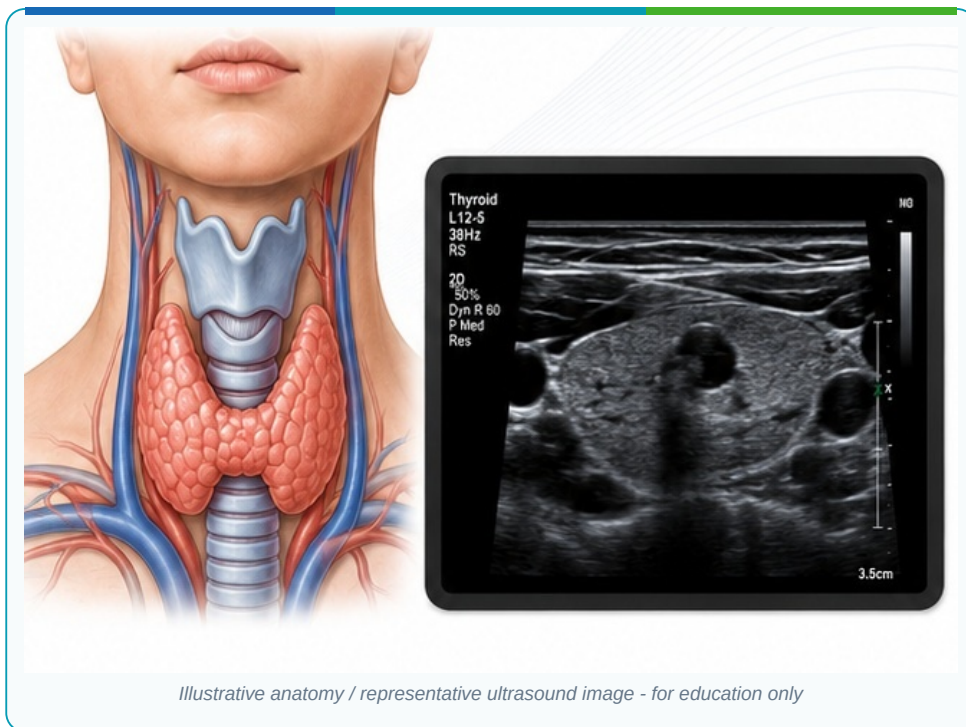
PREPARATION / WHAT TO EXPECT

No fasting is usually required. Jewelry or clothing around the neck may need to be removed.

CURRENT CLINICAL CONSIDERATION

Thyroid ultrasound evaluates structure - not thyroid hormone function. Symptoms such as fatigue, hair loss, weight change or an abnormal TSH are primarily assessed with clinical evaluation and laboratory testing; ultrasound is added when there is a structural question.

Clinical sources: ACR/RSNA RadiologyInfo - Thyroid Ultrasound; Ultrasound-Guided Thyroid Biopsy (reviewed July 2026).





07 PELVIC & BLADDER ULTRASOUND

Ultrasound of the uterus, endometrium, ovaries, adnexa and urinary bladder.

Pelvic ultrasound may be transabdominal, transvaginal or, less commonly, transrectal depending on the anatomy and clinical question. It is widely used to evaluate pelvic pain, abnormal bleeding and gynecologic or urinary findings.

COMMON REASONS IT MAY BE ORDERED

- Pelvic pain, abnormal uterine bleeding or postmenopausal bleeding.
- Suspected fibroids, ovarian cysts, adnexal masses or pelvic inflammatory disease.
- Assessment of endometrial thickness when clinically indicated.
- Evaluation of IUD location or selected fertility-related questions.
- Bladder symptoms, urinary retention or post-void residual measurement.
- Pregnancy-related evaluation, including concern for ectopic pregnancy, when ordered in the appropriate setting.

WHAT IT CAN HELP EVALUATE

- Uterine size, contour and fibroids.
- Endometrium and selected causes of abnormal bleeding.
- Ovarian size, cysts, masses and blood flow when Doppler is used.
- Bladder distention, wall findings and residual urine volume.
- Free fluid and selected pelvic masses.

PREPARATION / WHAT TO EXPECT

Transabdominal pelvic ultrasound commonly requires a full bladder. Transvaginal ultrasound is typically performed after emptying the bladder. The exact preparation depends on the exam ordered.

CURRENT CLINICAL CONSIDERATION

Ultrasound findings can support evaluation for polycystic ovary syndrome (PCOS), but PCOS is not diagnosed by ultrasound alone. Severe pelvic pain, heavy bleeding, fainting or concern for ectopic pregnancy requires urgent clinical assessment.

Clinical sources: ACR/RSNA RadiologyInfo - Pelvis Ultrasound (reviewed June 2026).



Illustrative anatomy / representative ultrasound image - for education only



08 PROSTATE ULTRASOUND

Transrectal ultrasound (TRUS) for prostate size, anatomy and procedure guidance.

Prostate ultrasound uses sound waves to image the prostate and nearby structures. High-quality prostate images are commonly obtained with a small transducer inserted a short distance into the rectum.

COMMON REASONS IT MAY BE ORDERED

- Lower urinary-tract symptoms or suspected benign prostatic hyperplasia (BPH) when prostate size or anatomy is needed.
- Abnormal digital rectal examination or elevated PSA as part of a broader urologic evaluation.
- Measurement of prostate volume for treatment planning.
- Guidance for prostate biopsy or selected therapeutic procedures.
- Evaluation of selected infertility or seminal-vesicle concerns.

WHAT IT CAN HELP EVALUATE

- Prostate size and shape.
- Focal abnormalities that may require additional evaluation.
- Relationship of the prostate to surrounding structures.
- Real-time guidance for tissue sampling.

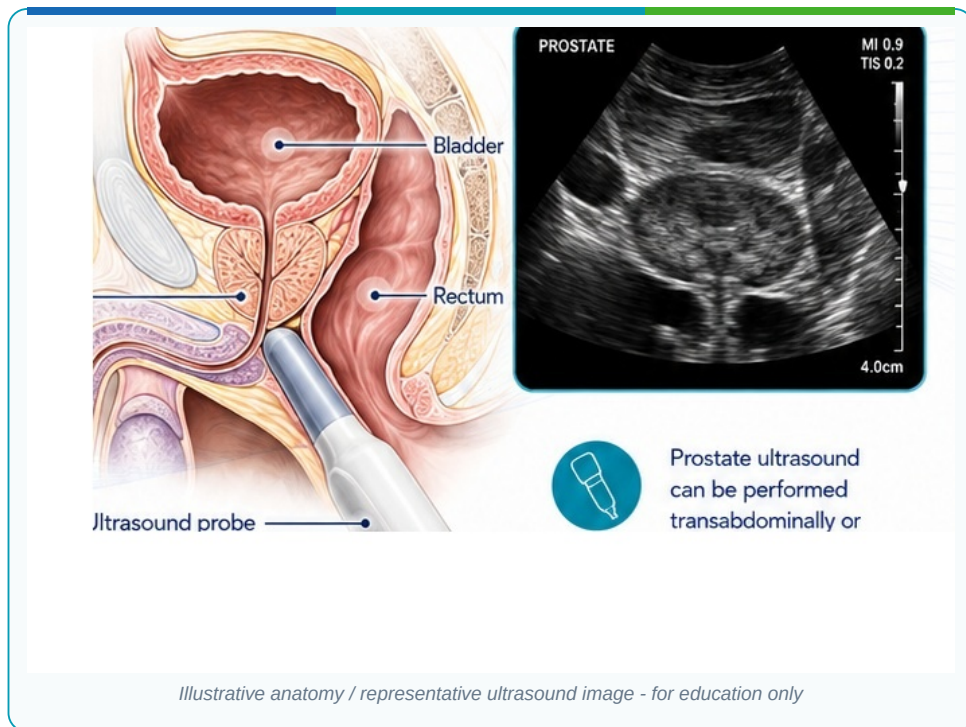
PREPARATION / WHAT TO EXPECT

Preparation varies. A simple diagnostic TRUS may require little preparation. If biopsy or another intervention is planned, medication management, bowel preparation and antibiotics may be required according to the proceduralist's instructions.

CURRENT CLINICAL CONSIDERATION

Prostate ultrasound is not a stand-alone screening test for prostate cancer and cannot confirm cancer. PSA, clinical examination, MRI and biopsy are used as appropriate; biopsy is required for tissue diagnosis.

Clinical sources: ACR/RSNA RadiologyInfo - Prostate Ultrasound (reviewed August 2026); Ultrasound- or MRI-Guided Prostate Biopsy (reviewed July 2026).





09 SCROTAL / TESTICULAR ULTRASOUND

Primary imaging for testicular pain, swelling, masses and trauma.

Scrotal ultrasound with Doppler evaluates the testicles, epididymides and surrounding tissues. It is the primary imaging test for many causes of acute scrotal pain and for evaluation of a scrotal mass.

COMMON REASONS IT MAY BE ORDERED

- Sudden or persistent testicular or scrotal pain.
- Swelling, hydrocele, suspected epididymitis or orchitis.
- Palpable lump or suspected testicular mass.
- Scrotal trauma.
- Varicocele or selected infertility evaluation.
- Undescended testis when sonographic localization is appropriate.

WHAT IT CAN HELP EVALUATE

- Blood flow to the testicle and findings concerning for torsion.
- Inflammation of the epididymis or testis.
- Hydrocele, varicocele, cysts and other fluid collections.
- Intra- versus extra-testicular location of a mass.
- Selected injuries after trauma.

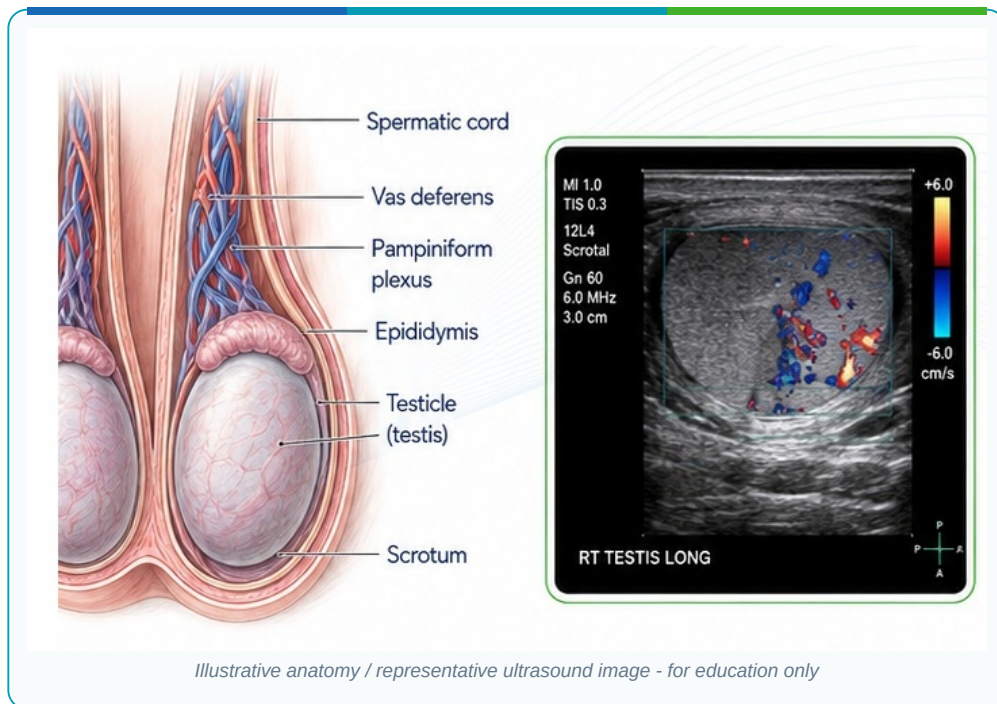
PREPARATION / WHAT TO EXPECT

Little or no preparation is generally required. A towel or support is used to position the scrotum while gel and a transducer are applied to the skin.

CURRENT CLINICAL CONSIDERATION

Sudden severe testicular pain is a medical emergency because testicular torsion can threaten blood supply and may require immediate surgery. Do not delay emergency evaluation while waiting for a routine appointment.

Clinical sources: ACR/RSNA RadiologyInfo - Ultrasound Imaging of the Scrotum (reviewed August 2024).





10 EXTREMITY VASCULAR ULTRASOUND

Arterial and venous duplex studies of the arms and legs.

Vascular ultrasound combines grayscale imaging, compression and Doppler techniques to evaluate veins and arteries. The exact protocol depends on whether the clinical question is DVT, venous reflux, arterial disease or follow-up of a vascular procedure.

VENOUS STUDIES

- Suspected deep vein thrombosis (DVT) with new unilateral swelling, pain or other compatible findings.
- Evaluation of superficial thrombophlebitis in selected patients.
- Chronic venous insufficiency, varicose veins and reflux mapping.
- Follow-up of known venous thrombosis or selected venous procedures.

ARTERIAL STUDIES

- Suspected peripheral artery disease (PAD), especially after abnormal physiologic testing such as ABI.
- Claudication, rest pain, nonhealing wounds or diminished pulses when vascular imaging is indicated.
- Localization and grading of arterial stenosis or occlusion.
- Assessment of bypass grafts, stents, aneurysms or other vascular interventions.

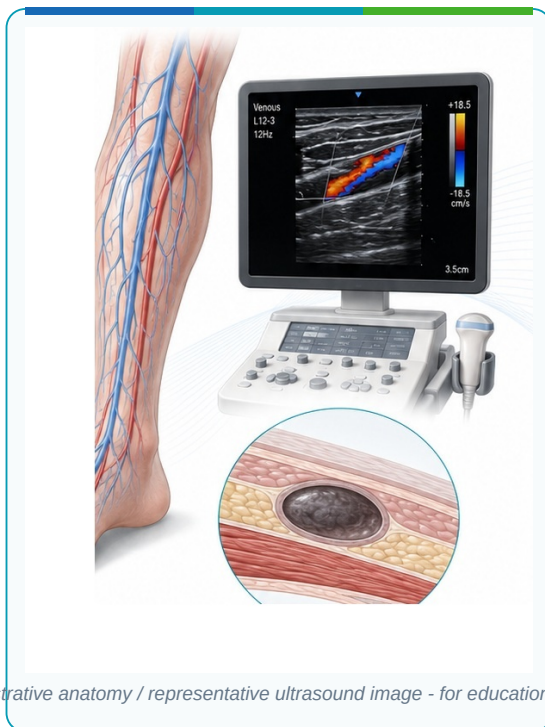
PREPARATION / WHAT TO EXPECT

Most extremity vascular studies require little preparation. Compression may be used during a venous DVT examination. Arterial studies use Doppler waveforms and velocity measurements along the limb.

CURRENT CLINICAL CONSIDERATION

DVT can lead to pulmonary embolism. Leg swelling plus new chest pain, shortness of breath, fainting or coughing blood requires emergency evaluation. For suspected PAD, ABI is often an important first-line physiologic test; duplex provides anatomic and flow detail when needed.

Clinical sources: ACR/RSNA RadiologyInfo - Vascular Ultrasound and Venous Ultrasound (reviewed July 2026); ACR Appropriateness Criteria - suspected lower-extremity DVT.



Illustrative anatomy / representative ultrasound image - for education only



11 MUSCULOSKELETAL & SOFT-TISSUE ULTRASOUND

Real-time imaging of tendons, muscles, joints, nerves and superficial lumps.

Musculoskeletal ultrasound is particularly useful for superficial soft tissues and dynamic evaluation. It can assess a palpable lump, fluid collection or hernia and can also evaluate many tendon, muscle, bursal and nerve abnormalities.

COMMON REASONS IT MAY BE ORDERED

- Palpable soft-tissue lump or superficial mass.
- Suspected cyst, lipoma, hematoma, abscess or fluid collection.
- Tendon tear or tendinopathy, muscle injury or bursitis.
- Nerve entrapment such as carpal tunnel syndrome.
- Suspected hernia or a mass that changes with movement or position.
- Image guidance for selected injections, aspirations or biopsies.

WHAT IT CAN HELP EVALUATE

- Whether a superficial lesion is cystic, solid or vascular.
- Tendon continuity, motion and surrounding inflammation.
- Muscle tears and hematomas.
- Joint or bursal fluid.
- Dynamic hernias and selected nerve abnormalities.

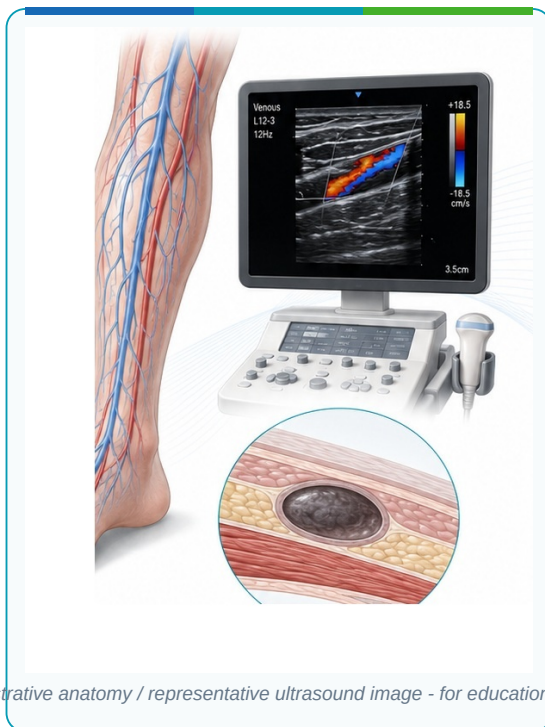
PREPARATION / WHAT TO EXPECT

Little or no special preparation is usually needed. Wear clothing that allows access to the body area being examined.

CURRENT CLINICAL CONSIDERATION

Ultrasound cannot fully characterize every soft-tissue mass. Deep, enlarging, painful or otherwise concerning masses may require MRI, CT and/or biopsy. Ultrasound is also limited in evaluating structures deep to bone.

Clinical sources: ACR/RSNA RadiologyInfo - Musculoskeletal Ultrasound (reviewed March 2025); ACR Appropriateness Criteria - Soft-Tissue Masses.



Illustrative anatomy / representative ultrasound image - for education only



12 BREAST ULTRASOUND

Targeted breast imaging and selected supplemental screening.

Breast ultrasound uses sound waves to evaluate breast tissue in real time. It is commonly used to assess a palpable area or an abnormality identified on mammography and can guide needle biopsy when needed.

COMMON REASONS IT MAY BE ORDERED

- A palpable breast lump or focal breast symptom.
- Further evaluation of a finding seen on mammography or tomosynthesis.
- Distinguishing a simple fluid-filled cyst from a solid or complex mass.
- Evaluation in younger, pregnant or breastfeeding patients when ultrasound is appropriate for the clinical question.
- Ultrasound-guided biopsy of a visible breast lesion.
- Selected supplemental screening based on breast density and individual risk.

WHAT IT CAN HELP EVALUATE

- Cysts, solid masses and focal areas of concern.
- Lesion shape, margins, orientation and vascularity.
- Axillary lymph nodes when clinically indicated.
- Real-time guidance for biopsy or aspiration.

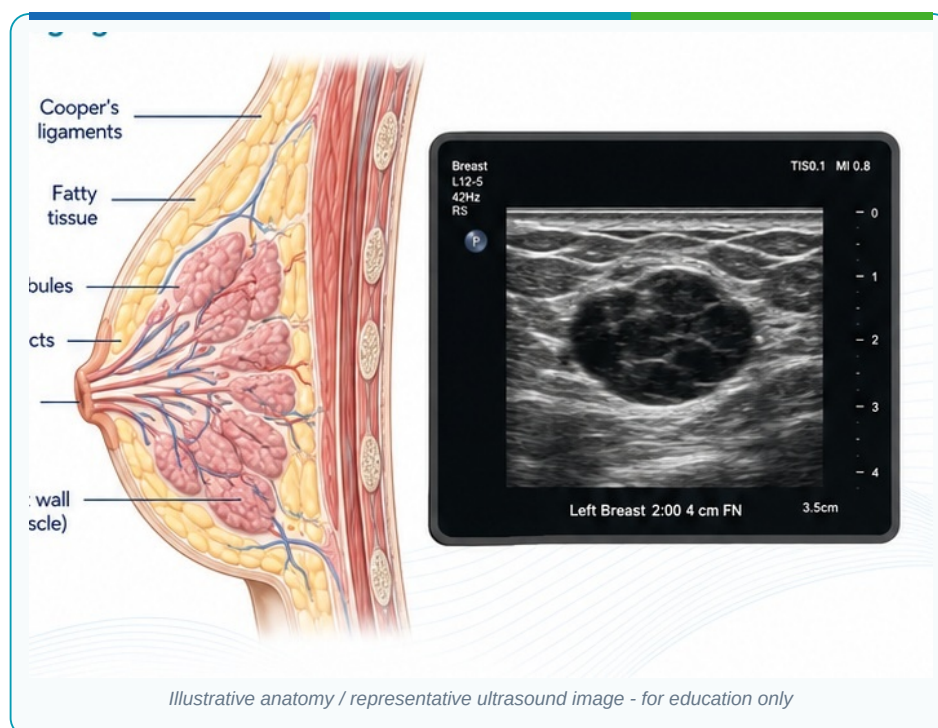
PREPARATION / WHAT TO EXPECT

No fasting is needed. Patients may be asked to change into a gown and remove clothing or jewelry from the upper body.

CURRENT CLINICAL CONSIDERATION

Breast ultrasound does not replace screening mammography. Mammography is better for many calcifications, including suspicious microcalcifications. Supplemental ultrasound can increase false-positive findings, so use should be based on breast density, overall risk and clinician/radiologist recommendations.

Clinical sources: ACR/RSNA RadiologyInfo - Breast Ultrasound (updated 2026); Breast Cancer Screening; Dense Breasts.





13 PREPARING FOR YOUR EXAM & UNDERSTANDING RESULTS

Practical guidance that applies across many ultrasound examinations.

BEFORE THE EXAM

- Follow the exact instructions given for your specific test; preparation varies by body area.
- Some abdominal exams require fasting. Some pelvic, renal or bladder exams require a full bladder.
- Wear comfortable clothing and be prepared to expose the area being examined.
- Bring an accurate medication list and relevant prior imaging information when requested.
- Do not stop prescription blood thinners unless the clinician performing an invasive procedure specifically instructs you to do so.

DURING AND AFTER THE EXAM

- Gel is placed on the skin and the sonographer moves a transducer over the area being examined.
- Doppler may be used to assess blood flow. Compression is commonly used in DVT studies.
- Most diagnostic ultrasound exams are noninvasive; transvaginal or transrectal exams use specialized probes when clinically appropriate.
- After a routine diagnostic ultrasound, normal activities can usually be resumed immediately.

How results are used

- Images are interpreted according to the practice's imaging workflow and a report is sent to the ordering clinician.
- The ordering clinician interprets the ultrasound result together with symptoms, examination findings, laboratory tests and prior imaging.
- A follow-up ultrasound, CT, MRI, mammogram, biopsy or specialist referral may be recommended when the initial study is indeterminate or abnormal.
- Insurance coverage and prior-authorization requirements vary by payer and are separate from the clinical appropriateness of an exam.

WHEN SYMPTOMS ARE URGENT

Ultrasound is often useful, but it should not delay emergency care. Call 911 or seek emergency evaluation for symptoms such as new stroke-like deficits, severe chest pain, sudden severe abdominal/back pain with fainting, sudden severe testicular pain, or symptoms of possible pulmonary embolism.

Clinical sources: ACR/RSNA RadiologyInfo - How to Prepare for Your Ultrasound Exam (reviewed June 2026) and procedure-specific guidance.



14 CLINICAL REFERENCES

Primary sources used to modernize the original VHMG ultrasound booklet.

ACR/RSNA RadiologyInfo

General Ultrasound; How to Prepare for Your Ultrasound Exam; Abdominal Ultrasound; Renal Ultrasound; Carotid Ultrasound; Thyroid Ultrasound; Pelvis Ultrasound; Prostate Ultrasound; Ultrasound Imaging of the Scrotum; Vascular Ultrasound; Venous Ultrasound; Musculoskeletal Ultrasound; Breast Ultrasound; Breast Cancer Screening; Dense Breasts; thyroid and prostate biopsy guidance.

U.S. Preventive Services Task Force

Abdominal Aortic Aneurysm: Screening (2019 recommendation, current online guidance); Asymptomatic Carotid Artery Stenosis: Screening (2021 recommendation).

American Heart Association

What Is an Echocardiogram? and cardiovascular imaging guidance for structural heart disease and heart failure.

American College of Radiology Appropriateness Criteria

Soft-Tissue Masses; Suspected Lower-Extremity Deep Vein Thrombosis; other imaging-appropriateness resources linked through RadiologyInfo.

PUBLICATION NOTE

Clinical content was reviewed and updated in August 2026. Guidance can change. VHMG should periodically re-review this booklet, especially when professional-society recommendations, imaging criteria, Medicare rules or payer requirements change.

Vital Health Medical Group

Advanced primary care • coordinated diagnostics • patient-centered follow-up