

AIUM Practice Parameter for the Performance of Diagnostic and Screening Ultrasound Examinations of the Abdominal Aorta in Adults

Introduction

The American Institute of Ultrasound in Medicine (AIUM) is a multidisciplinary association dedicated to advancing the safe and effective use of ultrasound in medicine through professional and public education, research, development of clinical practice parameters, and accreditation of practices performing ultrasound examinations.

The *AIUM Practice Parameter for the Performance of Diagnostic and Screening Ultrasound Examinations of the Abdominal Aorta in Adults* was developed (or revised) by the American Institute of Ultrasound in Medicine (AIUM) in collaboration with other organizations whose members use ultrasound for performing this examination(s) (see “Acknowledgments”). Recommendations for personnel requirements, the request for the examination, documentation, quality assurance, and safety may vary among the organizations and may be addressed by each separately.

This Practice Parameter is intended to provide the medical ultrasound community with recommendations for the performance and recording of high-quality ultrasound examinations. The parameter reflects what the AIUM considers the appropriate criteria for this type of ultrasound examination but is not intended to establish a legal standard of care. Examinations performed in this specialty area are expected to follow the parameter with recognition that deviations may occur depending on the clinical situation.

The examination may be performed as a diagnostic screening study.¹⁻³

Indications

Indications for ultrasound of the abdominal aorta include but are not limited to the following:

Received February 9, 2021, Manuscript
accepted for publication February 10, 2021.

doi:10.1002/jum.15668

A. Diagnostic Evaluation for an Abdominal Aortic Aneurysm (AAA)

1. Palpable or pulsatile abdominal mass or abdominal bruit.
2. Unexplained lower back pain, flank pain, or abdominal pain.
3. Follow-up of a previously demonstrated AAA. Recommendations for rescanning patients are as follows.⁴
 - a. For AAA size of 3.0–3.9 cm, follow-up ultrasound every 3 years.
 - b. For AAA size of 4.0–4.9 cm, follow-up annually.
 - c. For AAA size of 5.0–5.4 cm, follow-up every 6 months.
4. Follow-up of patients after AAA repair, particularly after endovascular aortic aneurysm repair.

B. Screening Evaluation for

1. Men age 65 or older who have ever smoked.
2. Women age 65 or older with cardiovascular risk factors.
3. Individuals age 50 or older with a family history of aortic and/or peripheral vascular aneurysmal disease.
4. Individuals with a personal history of peripheral vascular aneurysmal disease.
5. Individuals with other risk factors for an AAA.

Qualifications and Responsibilities of Personnel

Physicians interpreting or performing this type of ultrasound examination should meet the specified AIUM Training Guidelines in accordance with AIUM accreditation policies.

Sonographers performing the ultrasound examination should be appropriately credentialed in the specialty area in accordance with AIUM accreditation policies.

Physicians not personally performing the examination must provide supervision, as defined by the Centers for Medicare and Medicaid Services Code of Federal Regulations 42 CFR §410.32.

Request for the Examination

The written or electronic request for an ultrasound examination must originate from a physician or other appropriately licensed health care provider or under the provider's direction. The clinical information provided should allow for the performance and interpretation of the appropriate ultrasound examination and should be consistent with relevant legal and local health care facility requirements.

Specifications of the Examination

A. Diagnostic Examination

The examination includes the following, when feasible:

1. Abdominal aorta
 - a. Longitudinal images (along the long axis of the vessel):
 - i. Proximal (below diaphragm, near the celiac artery).
 - ii. Mid (near the level of the renal arteries).
 - iii. Distal (through the iliac bifurcation).
 - b. Transverse images (perpendicular to the long axis of the vessel):
 - i. Proximal (below diaphragm, near the celiac artery).
 - ii. Mid (near the level of the renal arteries).
 - iii. Distal (through the iliac bifurcation).
 - c. Measurements:
 - i. Measurements are taken at the greatest diameter of the aorta, from outer edge to outer edge. The aorta should be imaged in the plane that is parallel to the long axis of the lumen (for measurement of the anteroposterior dimension) and perpendicular to the long axis of the lumen (for measurement of the transverse dimension). The aorta may also be scanned using a lateral or coronal approach if it cannot be visualized from an anterior transducer approach. The measurements obtained via these scan planes are equivalent to transverse measurements.
 - ii. If an AAA is present, the maximal size and location of the aneurysm should be documented and recorded. The relationship of the dilated segment with the renal arteries

and with the aortic bifurcation should be determined if possible.

- iii. At a minimum, the largest measurement should be recorded and reported. A measurement of the length of the aneurysm is optional.
 - iv. If an AAA is present, the shape of the aneurysm should be documented either as fusiform, eccentric, or saccular. Documentation should include representative images, which enable the radiologist to characterize the shape of the aneurysm.
2. Common iliac arteries
 - a. Longitudinal images of the proximal right and left common iliac arteries (along the long axis of the vessel).
 - b. Transverse images (perpendicular to the long axis of the vessel) of the proximal common iliac arteries, just below the bifurcation.
 - c. Measurement of the widest visualized portion of each common iliac artery, from outer edge to outer edge.

Color Doppler imaging and/or spectral Doppler imaging with waveform analysis of the aorta and iliac arteries may be helpful to demonstrate patency and the presence of an intraluminal thrombus.

After endovascular aortic aneurysm repair, color (or power) Doppler imaging and spectral Doppler imaging are required to document the presence or absence of endoleaks. Contrast-enhanced ultrasound may be helpful for identification of endoleaks. Note: This would be an off-label use of contrast-enhanced ultrasound based on the current Food and Drug Administration approval status.⁵

Interobserver measurements of an aortic aneurysm can vary by as much as 5 mm. Visual comparison with prior studies is recommended to ensure measurements are obtained at similar locations and to assess for interval change in aneurysm size. Consistent measurements of aneurysm diameter are recommended following endograft repair to check for interval enlargement in sac size.⁶ Excessive transducer pressure should be avoided when measuring aortic size.

B. AAA

Anteroposterior measurements of the aorta sufficient to determine whether an aortic aneurysm exists according to the criteria listed above in subhead

Specifications of the Examination, under A. Diagnostic Examination, number 1, section c, subsection i, should be obtained. If an aneurysm is present, its greatest dimension should be reported. However, if no aneurysm is identified, the largest diameter of the abdominal aorta should be reported.

C. Interpretation of the Screening Examination Should Include at Least 3 Categories

1. Positive: Infrarenal AAA greater than or equal to 3 cm in diameter or greater than or equal to 1.5 times the diameter of the more proximal infrarenal aorta.⁷ The latter definition is particularly important in women and small adults.⁸
2. Negative: No infrarenal AAA.
3. Indeterminate: Aneurysmal status not defined because of nonvisualization or partial visualization of the infrarenal abdominal aorta and/or iliac bifurcation.
4. The report should also state whether the suprarenal aorta was seen and, if seen, should reflect whether it is normal. The report should also state whether dilatation of the aorta above the celiac artery is noted. For the area above the celiac artery, an aneurysm may be reported if the diameter is greater than 3.9 cm for male patients or 3.1 cm for female patients.

Documentation

Accurate and complete documentation is essential for high-quality patient care. Written reports and ultrasound images/video clips that contain diagnostic information should be obtained and archived, with recommendations for follow-up studies if clinically applicable, in accordance with the *AIUM Practice Parameter for Documentation of an Ultrasound Examination*.

Equipment Specifications

An abdominal aortic ultrasound examination should be performed with real-time scanners with transducers that allow for appropriate penetration and resolution, depending on the patient's body habitus. Diagnostic information should be optimized while keeping total ultrasound exposure as low as reasonably achievable.

Quality and Safety

Policies and procedures related to quality assurance and improvement, safety, infection control, and equipment performance monitoring should be developed and implemented in accordance with the *AIUM Standards and Guidelines for the Accreditation of Ultrasound Practices*.

ALARA (As Low as Reasonably Achievable) Principle

The potential benefits and risks of each examination should be considered. The ALARA principle should be observed for factors that affect the acoustic output and by considering the transducer dwell time and total scanning time. Further details on ALARA may be found in the current AIUM publication *Medical Ultrasound Safety*.

Infection Control

Transducer preparation, cleaning, and disinfection should follow manufacturer recommendations and be consistent with the AIUM's *Guidelines for Cleaning and Preparing External- and Internal-Use Ultrasound Transducers and Equipment Between Patients, Safe Handling, and Use of Ultrasound Coupling Gel*.

Equipment Performance Monitoring

Monitoring protocols for equipment performance should be developed and implemented in accordance with the AIUM's *Standards and Guidelines for the Accreditation of Ultrasound Practices*.

Acknowledgments

This parameter was revised by the AIUM in collaboration with the American College of Radiology (ACR) and the Society of Radiologists in Ultrasound (SRU). We are indebted to the many volunteers who contributed their time, knowledge, and energy to developing this document.

Collaborative Subcommittees

AIUM

Tara Morgan, MD
Margarita Revzin, MD
Gayatri Yoshi, MD

ACR

John S. Pellerito, MD, chair
Nirvikar Dahiya, MD

Helena Gabriel, MD

Stephen I. Johnson, MD

Joseph F. Polak, MD, MPH

SRU

Raymond E. Bertino, MD

Franklin N. Tessler, MD

AIUM Clinical Standards Committee

Bryann Bromley, MD, chair

James M. Shwayder, MD, JD, vice chair

Nirvikar Dahiya, MD

Rob Goodman, MBBCh, MBA, BMSc

Rachel Bo-ming Liu, MD

Jean Spitz, MPH, CAE, RDMS

John Stephen Pellerito, MD

Original copyright 2006; revised 2020, 2015, 2010;
Renamed 2015

References

1. Adams DC, Tulloh BR, Galloway SW, Shaw E, Tulloh AJ, Poskitt KR. Familial abdominal aortic aneurysm: prevalence and implications for screening. *Eur J Vasc Surg* 1993; 7:709–712.
2. Ashton HA, Buxton MJ, Day NE, et al. The multicentre aneurysm screening study (MASS) into the effect of abdominal aortic aneurysm screening on mortality in men: a randomised controlled trial. *Lancet* 2002; 360:1531–1539.
3. US Preventive Services Task Force. Screening for abdominal aortic aneurysm. US Preventive Services Task Force website. <http://www.uspreventiveservicestaskforce.org/uspstf05/aaascr/aaars.htm> (Accessed August 26, 2019).
4. Chaikof EL, Dalman RL, Eskandari MK, et al. The Society for Vascular Surgery practice guidelines on the care of patients with an abdominal aortic aneurysm. *J Vasc Surg* 2018; 67:2–77.e2.
5. Harky A, Zywicka E, Santoro G, Jullian L, Joshi M, Dimitri S. Is contrast-enhanced ultrasound (CEUS) superior to computed tomography angiography (CTA) in detection of endoleaks in post-EVAR patients? A systematic review and meta-analysis. *J Ultrasound* 2019; 22:65–75.
6. Borgbjerg J, Bogsted M, Lindholt JS, Behr-Rasmussen C, Horlyck A, Frokjaer JB. Superior reproducibility of the leading to leading edge and inner to inner edge methods in the ultrasound assessment of maximum abdominal aortic diameter. *Eur J Vasc Endovasc Surg* 2018; 55:206–213.

7. Johnston KW, Rutherford RB, Tilson MD, Shah DM, Hollier L, Stanley JC. Suggested standards for reporting on arterial aneurysms. Subcommittee on reporting standards for arterial aneurysms, ad hoc committee on reporting standards, Society for Vascular Surgery and North American Chapter, International Society for Cardiovascular Surgery. *J Vasc Surg* 1991; 13:452–458.
8. Isselbacher EM. Thoracic and abdominal aortic aneurysms. *Circulation* 2005; 111:816–828.