

**American College of Radiology  
ACR Appropriateness Criteria®  
Abdominal Aortic Aneurysm Follow-up (Without Repair)**

**Variant: 1 Asymptomatic abdominal aortic aneurysm surveillance (without repair).**

| Procedure                                           | Appropriateness Category          | Relative Radiation Level |
|-----------------------------------------------------|-----------------------------------|--------------------------|
| US duplex Doppler aorta abdomen                     | Usually Appropriate               | ○                        |
| MRA abdomen and pelvis with IV contrast             | Usually Appropriate               | ○                        |
| CTA abdomen and pelvis with IV contrast             | Usually Appropriate               | ⊕⊕⊕⊕                     |
| MRA abdomen and pelvis without and with IV contrast | May Be Appropriate                | ○                        |
| MRA abdomen and pelvis without IV contrast          | May Be Appropriate                | ○                        |
| MRI abdomen and pelvis with IV contrast             | May Be Appropriate                | ○                        |
| MRI abdomen and pelvis without and with IV contrast | May Be Appropriate                | ○                        |
| MRI abdomen and pelvis without IV contrast          | May Be Appropriate (Disagreement) | ○                        |
| CT abdomen and pelvis with IV contrast              | May Be Appropriate                | ⊕⊕⊕                      |
| CT abdomen and pelvis without IV contrast           | May Be Appropriate                | ⊕⊕⊕                      |
| CT abdomen and pelvis without and with IV contrast  | May Be Appropriate                | ⊕⊕⊕⊕                     |
| Aortography abdomen                                 | Usually Not Appropriate           | ⊕⊕⊕                      |
| Radiography chest abdomen pelvis                    | Usually Not Appropriate           | ⊕⊕⊕                      |

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### Summary of Literature Review

#### Introduction/Background

Abdominal aortic aneurysm (AAA) is defined as an aneurysmal dilation of the abdominal aorta of at least 3 cm in diameter. This entity has a high degree of morbidity and mortality in the event of rupture [1,2]. To mitigate this risk, screening programs have been widely instituted to identify small, developing aneurysms. Such screening reduces morbidity and health care costs related to this disease [3-8]. An increasing number of aneurysms are identified incidentally on ultrasound (US) and cross-sectional imaging, creating a growing cohort of patients with known AAA [9-12]. The reported prevalence of AAA in persons >65 years of age ranges from 1.7% to 4.5% for men and 0.5% to 1.3% for women [11,13,14].

While there is some debate in regards to which aneurysms are most at risk for rupture, there is general agreement that AAA with a maximum diameter >5.4 cm in males and >4.9 cm in females [15] should undergo prophylactic repair [2,14,16,17]. In patients with small AAA (males, diameter 3–5.4 cm, and females, diameter 3–4.9 cm), the risk of rupture is lower; thus surgery and surveillance is indicated. The majority of small AAAs grow slowly, but there is substantial variation

in growth rates between individuals. The intervals between US surveillance examinations used in randomized screening trials depend on aneurysm size [15,18-21]. However, no consensus exists regarding the optimal time intervals between US surveillance examinations [15]. Some studies have reported equivalent results for treatment of small aneurysms and surveillance, and there does not appear to be a clear preference for early operation [22,23].

Imaging surveillance provides 2 primary purposes. The first is to identify interval growth beyond the threshold for elective repair. The other is to monitor the growth trajectory and identify a potentially increasing rate of growth, with growth rates >2 mm per year associated with increased adverse events [20].

For information on interventional planning and follow-up of AAA, please see the ACR Appropriateness Criteria® topic on "[Abdominal Aortic Aneurysm: Interventional Planning and Follow-Up](#)" [24].

### **Special Imaging Considerations**

For the purposes of distinguishing between CT and CT angiography (CTA), ACR Appropriateness Criteria topics use the definition in the [Practice Parameter for the Performance and Interpretation of Body Computed Tomography Angiography \(CTA\)](#) [25].

*"CTA uses a thin-section CT acquisition that is timed to coincide with peak arterial or venous enhancement. The resultant volumetric dataset is interpreted using primary transverse reconstructions as well as multiplanar reformations and 3-D renderings."*

All elements are essential: 1) timing, 2) reconstructions/reformats, and 3) 3-D renderings. Standard CTs with contrast also include timing issues and recons/reformats. Only in CTA, however, is 3-D rendering a required element. This corresponds to the definitions that the CMS has applied to the Current Procedural Terminology codes.

### **Discussion of Procedures by Variant**

#### **Variant 1: Asymptomatic abdominal aortic aneurysm surveillance (without repair).**

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##### **A. US Duplex Doppler Aorta Abdomen**

US is the most widely studied and utilized imaging tool for evaluating an AAA, both for screening and during surveillance. US has been verified as having consistent measurement accuracy, which can approximate the accuracy demonstrated by CT and MRI or MR angiography (MRA) [17,18,26,27]. Studies have reported that US may underestimate the maximum AAA diameter by 4 mm, on average, and the interobserver measurement difference can range from 2 to 10 mm with US compared with <2 mm using CT [27-31]. Evidence is still lacking as to whether these differences are clinically impactful. Variation in accuracy is believed to be related to measurement technique. For example, there is debate as to whether to place the measurement caliper on the outer or inner edge of the vessel, without clear consensus on an ideal methodology [31]. Finally, no significant difference between rate of growth measurements between US and CT has been found [18,32]. US is also less capable of identifying specific aneurysm features beyond diameter, such as intraluminal thrombus or adjacent inflammation, both of which are more easily identified on CT [21,33,34].

## **Variant 1: Asymptomatic abdominal aortic aneurysm surveillance (without repair).**

### **B. CTA Abdomen and Pelvis**

CTA of the abdomen and pelvis presents many benefits over the other modalities. Relative to US, CTA is considered slightly more accurate at determining aneurysm diameter [27,30,31]. The use of iodinated contrast carries its own risks and contraindications that require consideration [35].

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### **C. CT Abdomen and Pelvis**

The majority of evidence regarding AAA surveillance using CT is based on CTA data and is primarily related to contrast bolus timing. Contrast-enhanced CT is well established in the literature and is capable of identifying aortic aneurysms, with many papers discussing incidental AAA identification [9,11,13].

There is no specific literature regarding the use of noncontrast CT in the surveillance of AAA. One study reviewed the incidence of AAA incidentally found during CT colonography. This included patients who underwent CT imaging, some with and others without the use of intravenous (IV) contrast. This review did not distinguish the difference between those patients [11]. This technique could theoretically be of use in patients with chronic renal disease who have aneurysms less amenable to imaging by US. Noncontrast imaging can be employed in CTA protocols to evaluate for calcification, with spectral CT scanners offering virtual noncontrast reconstructions as an alternative.

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### **D. MRA Abdomen and Pelvis**

There are benefits of MRA that make it worth considering in the surveillance of AAA. MRA can be obtained without the use of IV contrast, making it preferable in patients with advanced chronic renal disease. A prospective evaluation of nonenhanced MRA compared with contrast-enhanced CTA demonstrated equivalent accuracy of measurements for preoperative planning of endovascular aneurysm repair suggesting adequacy for surveillance imaging [36]. Superparamagnetic iron oxide-enhanced MR may be an alternative for patients with chronic renal disease [37].

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### **E. MRI Abdomen and Pelvis**

There is no relevant literature regarding the use of MRI for AAA surveillance in this setting; although, MRI may be useful in some cases. Similar to CT, there is excellent reproducibility in measurements between MRI examinations, a critical characteristic in monitoring for subtle changes in AAA size.

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### **F. Aortography Abdomen**

There is no relevant literature regarding the use of conventional angiography in the surveillance of AAA. Noninvasive techniques to monitor aneurysm characteristics make this invasive option less reasonable.

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### **G. Radiography Chest Abdomen Pelvis**

There is no relevant literature regarding the use of radiography in the surveillance of AAA. Calcified aneurysms may be identifiable by radiography.

## Summary of Highlights

- Variant 1: US duplex Doppler aorta of the abdomen, CTA of the abdomen and pelvis with IV contrast, or MRA of the abdomen and pelvis with IV contrast is usually appropriate for the surveillance of patients with an asymptomatic AAA not undergoing repair. These procedures are equivalent alternatives. The panel did not agree on recommending MRI of the abdomen and pelvis without IV contrast for asymptomatic AAA surveillance without repair. There is insufficient medical literature to conclude whether or not these patients would benefit from this procedure. The use of MRI of the abdomen and pelvis without IV contrast in this patient population is controversial but may be appropriate.

## Supporting Documents

The evidence table, literature search, and appendix for this topic are available at <https://acsearch.acr.org/list>. The appendix includes the strength of evidence assessment and the final rating round tabulations for each recommendation.

For additional information on the Appropriateness Criteria methodology and other supporting documents, please go to the ACR website at <https://www.acr.org/Clinical-Resources/Clinical-Tools-and-Reference/Appropriateness-Criteria>.

## Appropriateness Category Names and Definitions

| Appropriateness Category Name     | Appropriateness Rating | Appropriateness Category Definition                                                                                                                                                                                                          |
|-----------------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Usually Appropriate               | 7, 8, or 9             | The imaging procedure or treatment is indicated in the specified clinical scenarios at a favorable risk-benefit ratio for patients.                                                                                                          |
| May Be Appropriate                | 4, 5, or 6             | The imaging procedure or treatment may be indicated in the specified clinical scenarios as an alternative to imaging procedures or treatments with a more favorable risk-benefit ratio, or the risk-benefit ratio for patients is equivocal. |
| May Be Appropriate (Disagreement) | 5                      | The individual ratings are too dispersed from the panel median. The different label provides transparency regarding the panel's recommendation. "May be appropriate" is the rating category and a rating of 5 is assigned.                   |
| Usually Not Appropriate           | 1, 2, or 3             | The imaging procedure or treatment is unlikely to be indicated in the specified clinical scenarios, or the risk-benefit ratio for patients is likely to be unfavorable.                                                                      |

## Relative Radiation Level Information

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures

associated with different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, because of both organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared with those specified for adults (see Table below). Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® [Radiation Dose Assessment Introduction](#) document.

### Relative Radiation Level Designations

| Relative Radiation Level*                                                                                                                                                                                                                                                                                                                                                                                                 | Adult Effective Dose Estimate<br>Range | Pediatric Effective Dose<br>Estimate Range |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------------------|
| 0                                                                                                                                                                                                                                                                                                                                                                                                                         | 0 mSv                                  | 0 mSv                                      |
|                                                                                                                                                                                                                                                                                                                                          | <0.1 mSv                               | <0.03 mSv                                  |
|                                                                                                                                                                                                                                                         | 0.1-1 mSv                              | 0.03-0.3 mSv                               |
|                                                                                                                                                                        | 1-10 mSv                               | 0.3-3 mSv                                  |
|                                                                                       | 10-30 mSv                              | 3-10 mSv                                   |
|      | 30-100 mSv                             | 10-30 mSv                                  |

\*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as “Varies.”

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## Disclaimer

The ACR Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the FDA have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

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