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| *National Imaging Associates, Inc.* | |
| Clinical guidelines CHEST CTA | Original Date: September 1997 |
| CPT Codes: 71275 | Last Revised Date: April 2023 March 2022 |
| Guideline Number: NIA_CG_022-1 | Implementation Date: January 20 24 23 |

GENERAL INFORMATION

- It is an expectation that all patients receive care/services from a licensed clinician. All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. If applicable: All prior relevant imaging results and the reason that alternative imaging cannot be performed must be included in the documentation submitted.*
- Where a specific clinical indication is not directly addressed in this guideline, medical necessity determination will be made based on widely accepted standard of care criteria. These criteria are supported by evidence-based or peer-reviewed sources such as medical literature, societal guidelines and state/national recommendations.*

INDICATIONS FOR CHEST CTA

Chest Computed Tomography Angiography (CTA) is ordered for evaluation of the intrathoracic blood vessels. Chest CT and Chest CTA should not be approved at the same time.

Suspected Pulmonary Embolism (PE)¹⁻⁵

- High risk for PE ~~is~~ based on shock or hypotension, OR a validated pre-test high probability score (such as Well's >6, Modified Geneva score >11 -see Background), and (D dimer is NOT needed for hi risk; can approve hi risk even with normal D dimer):
- Intermediate and Low risk require ~~LoAll others~~ Intermediate or high risk as determined by the parameters detailed in Overview section
- ~~Positive D-dimer^{2, 4} require a Positive D-Dimer (lowElevated D dD-Dimer if other thanimer-high risk (see Background)Background)⁶ risk and intermediate risk (determined using a validated clinical assessment pre-test score-see background) require elevated D-dimer }~~
- (NOTE: A normal D-dimer obviates the need for PE imaging in hemodynamically stable patients with a low or intermediate clinical likelihood of PE.)

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Vascular Disease

- Superior vena cava (SVC) syndrome⁷
- Subclavian Steal Syndrome after positive or inconclusive ultrasound^{8, 9}
- Thoracic Outlet Syndrome^{10, 11}
- Takayasu's arteritis¹²
- Clinical concern for Acute Aortic dissection^{13, 14}
 - Sudden painful ripping sensation in the chest or back and may include
 - New diastolic murmur
 - Cardiac tamponade
 - Distant heart sounds
 - Hypotension or shock

Initial/Screening for Thoracic Aortic Disease¹⁵⁻¹⁷

- Echocardiogram or chest x-ray show aneurysm
- Initial study for a suspected aneurysm
- Screening of first-degree relatives of individuals with a known thoracic aortic aneurysm (defined as > 50% above normal) or known dissection
- Evaluation in patients with known or suspected connective tissue disease or genetic condition that predisposes to aortic aneurysm or dissection, such as Marfan's, Ehler's Danlos, get a ~~one time~~ one-time study or for Loeys-Dietz syndrome- allow imaging at diagnosis and then every two years, or more frequently if abnormalities are found (Imaging may include head, neck, chest, abdomen and pelvis)14, 20 (MRA preferred due to cumulative radiation risk)
- ~~Known connective tissue disease or genetic conditions that predispose to aortic aneurysm or dissection (e.g., Marfan syndrome, Ehlers Danlos or Loeys-Dietz syndromes)~~
- Screening of the thoracic aorta after a diagnosis of a bicuspid aortic valve (dilation of the ascending aorta may not be seen on echocardiogram)¹⁸
 - If normal, re-image every three to five years
- Screening of first-degree relatives of patients with a bicuspid aortic valve
- Turner's syndrome – Screen for coarctation or aneurysm of the thoracic aorta
 - If normal results, screen every 5-10 years
 - If abnormal, screen annually
- Suspected vascular cause of dysphagia or expiratory wheezing with other imaging is suggestive or inconclusive

Follow-up after established Thoracic Aortic Aneurysm (TAA)¹⁵⁻¹⁷

- Six months follow-up after initial finding of a dilated thoracic aorta, for assessment of rate of change
 - Aortic Root or Ascending Aorta (in cm)
 - 3.5 to 4.4 -Annual
 - 4.5 to 5.5 or growth rate ≥ 0.5 cm/year - Every 6 months
 - Genetically mediated (Marfan's syndrome, Aortic Root or Ascending Aorta) (in cm)
 - 3.5 to 4.4 -Annual
 - 4.5 to 5.0 or growth rate ≥ 0.5 cm/year Every 6 months
 - Surgery generally recommended over 5.0 cm
 - Descending Aorta (in cm)¹⁹
 - 4.0 to 5.0 Annual
 - 5.0 to 6.0 Every 6 months
- Follow-up post medical treatment of aortic dissection:
 - Acute dissection: 1 month, 6 months, then annually
 - Chronic dissection: annually
- Follow-up post either root repair or AVR plus ascending aortic root/arch repair: TEVAR surveillance at 1 month, then 1 year post op and if stable, then annually
- Follow up open repair if no residual aortopathy within first post op year, then every 5 years baseline post op, then annually (if have residual aortopathy or abnormal findings on surveillance, annual follow up in then needed)-
- Re-evaluation of known ascending aortic dilation or history of aortic dissection with a change in clinical status or cardiac exam or when findings may alter management.

Congenital Malformations (Chest Magnetic Resonance Angiography preferred if pediatrics or repeat imaging)

- Thoracic malformation on other imaging (chest x-ray, echocardiogram, gastrointestinal study, or inconclusive CT)²⁰⁻²³
- Congenital heart disease with pulmonary hypertension²⁴ or vascular anomalies
- Pulmonary sequestration²⁵

Pulmonary Hypertension based on other testing^{26, 27}

- Echocardiogram
- Right heart catheterization

Atrial fibrillation with ablation planned²⁸

Preoperative/procedural evaluation

- Pre-operative evaluation for a planned surgery or procedure

- ~~Pre-transplant CT or CTA/MRA chest~~ CT or CTA/MRA chest approvable for surgical planning (to evaluate for vascular anatomy, mediastinal pathology, malignancy screening etc.)

Post-operative/procedural evaluation

- Post-operative complications^{29, 30}
- See above indications for TAA follow up
- ~~Routine post-operative~~^{31, 32}
 - ~~Thoracic endovascular or open surgical aneurysm repair~~
 - ~~1 month~~
 - ~~More frequent follow-up/possible intervention if complication detected~~
 - ~~If stable, annual for 5 years~~

Chest CTA and Abdomen CTA, ~~or~~ Abdomen/Pelvis CTA or Abdominal Arteries CTA

- Transcatheter Aortic Valve Replacement (TAVR)^{14, 31}
- Acute aortic dissection¹²
- Takayasu's arteritis¹²
- Post-operative complications^{29, 30}
- To evaluate for an embolic source of lower extremity vascular disease (may also approved as a combination chest CTA and Abdominal Arteries CTA when LE runoff disease needs to be evaluated as well). Echocardiography is also often needed, since the heart is the most commonly reported source of lower extremity emboli, accounting for 55 to 87 percent of events.³²

Other Indications

Further evaluation of indeterminate findings on prior imaging (unless follow up is otherwise specified within the guideline):

- For initial evaluation of an inconclusive finding on a prior imaging report that requires further clarification
- One follow-up exam of a prior indeterminate MR/CT finding to ensure no suspicious interval change has occurred. (No further surveillance unless specified as highly suspicious or change was found on last follow-up exam.)

BACKGROUND

Computed tomography angiography is a non-invasive imaging modality that may be used in the evaluation of thoracic vascular problems. Chest CTA (non-coronary) may be used to evaluate vascular conditions, e.g., pulmonary embolism, thoracic aneurysm, thoracic aortic dissection, aortic coarctation, or pulmonary vascular stenosis. The vascular structures as well as the surrounding anatomical structures are depicted by CTA.

Pulmonary embolism (PE) Methods utilizing clinical assessment to determine probability for PE include:

Wells Score³³

| | |
|---|--------------|
| ▪ Clinical symptoms of DVT (leg swelling, pain with palpation) | 3.0 |
| ▪ Other diagnosis less likely than pulmonary embolism | 3.0 |
| ▪ Heart rate >100 | 1.5 |
| ▪ Immobilization (≥3 days) or surgery in the previous four weeks | 1.5 |
| ▪ Previous DVT/PE | 1.5 |
| ▪ Hemoptysis | 1.0 |
| ▪ Malignancy | 1.0 |
| Probability | Score |
| Traditional clinical probability assessment (Wells criteria) | |
| High | >6.0 |
| Moderate | 2.0 to 6.0 |
| Low | <2.0 |

Modified Geneva Score³⁴

Modified Geneva score

| | Variables | Points |
|---------------------------------|--|---------------------|
| Risk factors | Age >65 years | 1 |
| | Previous deep venous thrombosis or pulmonary embolism | 3 |
| | Surgery under general anesthesia or fracture of the lower limbs within one month | 2 |
| | Active malignancy (solid or hematologic; currently active or cured within the last year) | 2 |
| Symptoms | Unilateral lower-limb pain | 3 |
| | Hemoptysis | 2 |
| Signs | Heart rate 75 to 94 beats per minute | 3 |
| | ≥95 beats per minute | 5 |
| | Pain on lower limb deep venous palpation and unilateral edema | 4 |
| | | Total points |
| Pre-test probability assessment | Low | 0 to 3 |
| | Intermediate | 4 to 10 |
| | High | ≥11 |

OVERVIEW

CTA and Coarctation of the Aorta – Coarctation of the aorta is a common vascular anomaly characterized by a constriction of the lumen of the aorta distal to the origin of the left subclavian artery near the insertion of the ligamentum arteriosum. The clinical sign of coarctation of the aorta is a disparity in the pulsations and blood pressures in the legs and arms. Chest CTA/[MRA](#) may be used to evaluate either suspected or known aortic coarctation and patients with significant coarctation should be treated surgically or interventionally. [It may also assist in the identification of postoperative complications.](#)

Central Venous Thrombosis – CTA/MRA is useful in the identification of venous thrombi. Venous thrombosis can be evaluated by gadolinium-enhanced 3D MRA as an alternative to CTA, which may not be clinically feasible due to allergy to iodine contrast media or renal insufficiency.

CTA and Pulmonary Embolism (PE) – ~~Note: D-Dimer blood test in patients at low risk for DVT is indicated prior to CTA imaging. Negative D-Dimer suggests alternative diagnosis in these patients.~~

CTA has high sensitivity and specificity and is the primary imaging modality to evaluate patients suspected of having acute pulmonary embolism. When high suspicion of pulmonary embolism on clinical assessment is combined with a positive CTA, there is a strong indication of pulmonary embolism. Likewise, a low clinical suspicion and a negative CTA can be used to rule out pulmonary embolism.

Low risk is not approved. Low risk is defined as **NO** to **ALL** of the following questions with intermediate and high risk defined based on the number of positive responses:³³:

- Evidence of current or prior DVT;
- HR > 100;
- Cancer diagnosis;
- Recent surgery or prolonged immobilization;
- Hemoptysis;
- History of PE;
- Oral hormone use;
- Another diagnosis beside PE is less likely

CTA and Thoracic Aortic Aneurysms—Computed tomographic angiography (CTA) allows the examination of the precise 3-D anatomy of the aneurysm from all angles and shows its relationship to branch vessels. This information is very important in determining the treatment: endovascular stent grafting or open surgical repair.

CTA and Thoracic Aorta Endovascular Stent Grafts—CTA is an effective alternative to conventional angiography for postoperative follow up of aortic stent grafts. It is used to review complications after thoracic endovascular aortic repair. CTA can detect luminal and extraluminal changes to the thoracic aorta after stent grafting and can be performed efficiently with fast scanning speed and high spatial and temporal resolution.

POLICY HISTORY

| Date | Summary |
|-------------|---|
| <u>2023</u> | <ul style="list-style-type: none">— <u>Simplified PE indications to high risk, no need for d dimer, all else requires d dimer (added Pretest probability tables and removed other details from background)</u>— <u>Clarified and updated follow up after repair of TAA</u> |
| March 2022 | <ul style="list-style-type: none">• For Suspected Pulmonary Embolism, clarified ‘intermediate or high risk’ as determined by parameters detailed in Overview section and included hyperlink to Overview section |
| April 2021 | <ul style="list-style-type: none">• Follow up recommendations for bicuspid aortic valve.• Added suspected vascular cause of dysphagia or expiratory wheezing |

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| | <ul style="list-style-type: none"> • Combined follow-up surveillance recommendations for endovascular and open ascending aorta repair as per literature review • Clarified pre-operative evaluation for a planned surgery or procedure |
| May 2020 | <ul style="list-style-type: none"> • For Suspected Pulmonary Embolism, removed: 'Low Risk is not approved' section • Moved Vascular Disease content from Chest CT to Chest CTA, including: <ul style="list-style-type: none"> ○ Initial evaluation of aneurysm <ul style="list-style-type: none"> ▪ Echocardiogram shows aneurysm ▪ Echocardiogram inconclusive of proximal aorta and first degree relative with thoracic aneurysm ▪ Chest x ray shows possible aneurysm • Follow-up after established Thoracic Aneurysm (above these sizes surgery is usually recommended) <ul style="list-style-type: none"> ○ Aortic Root or Ascending Aorta <ul style="list-style-type: none"> ▪ 3.5 to 4.5 Annual ▪ 4.5 to 5.4 Every 6 months ○ Genetically mediated (Marfans syndrome, Aortic Root or Ascending Aorta) <ul style="list-style-type: none"> ▪ 3.5 to 4.0 Annual ▪ 4.0 to 5.0 Every 6 months ○ Descending Aorta <ul style="list-style-type: none"> ▪ 4.0 to 5.0 Annual ▪ 5.0 to 6.0 Every 6 months • Thoracic Aortic Disease <ul style="list-style-type: none"> ○ Organized into two sections: <ul style="list-style-type: none"> ▪ Initial/Screening ▪ Follow-up of known aneurysm/vascular pathology <ul style="list-style-type: none"> ○ Removed: 'Annual follow-up of enlarged thoracic aorta that is above top normal for age, gender, and body surface area' |
| May 2019 | <ul style="list-style-type: none"> • Expanded vascular indications including: <ul style="list-style-type: none"> ○ Superior vena cava syndrome ○ Takayasu's arteritis ○ Subclavian steal syndrome after positive or inconclusive ultrasound • Expanded indications for congenital anomalies to include pulmonary sequestration • Updated thoracic aortic section to match cardiac guidelines |

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ADDITIONAL RESOURCES

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Reviewed / Approved by NIA Clinical Guideline Committee

POLICY HISTORY

| <u>Date</u> | <u>Summary</u> |
|-------------------|--|
| <u>April 2023</u> | <ul style="list-style-type: none">• <u>Simplified PE indications to high risk, no need for d dimer, all else requires d dimer (added Pretest probability tables and removed other details from background)</u>• <u>Clarified and updated follow up after repair of TAA</u>• <u>General Information moved to beginning of guideline with added statement on clinical indications not addressed in this guideline</u>• <u>Added statement regarding further evaluation of indeterminate findings on prior imaging</u> |
| <u>March 2022</u> | <ul style="list-style-type: none">• <u>For Suspected Pulmonary Embolism, clarified 'intermediate or high risk' as determined by parameters detailed in Overview section and included hyperlink to Overview section</u> |

Reviewed / Approved by NIA Clinical Guideline Committee

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