AmeriHealth Caritas Louisiana

National Imaging Associates, Inc.*	
Clinical guidelines ABDOMEN CTA (Angiography)	Original Date: September 1997
CPT Codes: 74175	Last Revised Date: ~~May~~ April 202~~1~~0
Guideline Number: NIA_CG_034-1	Implementation Date: January 202~~1~~1

IMPORTANT NOTE~~:~~
Abd/Pelvis CTA & Lower Extremity CTA Runoff Requests: Only one authorization request is required, using CPT Code 75635 Abdominal Arteries CTA. This study provides for imaging of the abdomen, pelvis and both legs. The CPT code description is CTA aorto-iliofemoral runoff; abdominal aorta and bilateral ilio-femoral lower extremity runoff.

INDICATIONS FOR ABDOMEN CT ~~Angiography~~ANGIOGRAPHY/CT ~~Venography~~ VENOGRAPHY (CTA/CTV)~~:~~

For evaluation of known or suspected abdominal vascular disease~~:~~

Arterial Disease~~:~~

- ~~For evaluation of known or suspected abdominal vascular disease:~~ **Evaluation of known or suspected aortic aneurysm‡ (also approve MRA pelvis) (Chaikof, 2018; Khosa, 2013; Khumar, 2017)~~:~~**
-
  - **For screening, US is initial study**
  - **Known or suspected aneurysm > 2.5 cm AND equivocal or indeterminate ultrasound results~~;~~**
  - **Prior imaging (e.g., ultrasound) demonstrating aneurysm >2.5 cm in diameter~~;~~**
  - **Suspected complications of known aneurysm as evidenced by signs/symptoms such as new onset of abdominal or pelvic pain~~.~~**
  - **Surveillance imaging every three years for diameter 2.0-2.9 cm and annually for 3.0-3.4 cm if doppler ultrasound is inconclusive. If > 3.5 cm, < 6 month follow-up (and consider intervention) (Wainhainen, 2019)**
  -

* National Imaging Associates, Inc. (NIA) is a subsidiary of Magellan Healthcare, Inc.

‡NOTE: For known or suspected abdominal aneurysm, CT/MRI should not be approvable without a contraindication to CTA/MRA (such as severe renal dysfunction, contrast allergy, or another specific reason CT/MRI is preferred).

- ~~•~~ **Evidence of vascular abnormality seen on prior imaging studies and limited to the abdomen**
- ~~•~~ **For known large vessel diseases (abdominal aorta, inferior vena cava, superior/inferior mesenteric, celiac, splenic, renal or iliac arteries/veins), e.g., aneurysm, dissection, compression syndromes, arteriovenous malformations (AVMs), ~~and~~ fistulas, intramural hematoma, and vasculitis limited to the abdomen**~~For known large vessel diseases (celiac, splenic, renal arteries/veins), e.g., aneurysm, dissection, compression syndromes, arteriovenous malformations (AVMs), and fistulas, intramural hematoma, and vasculitis limited to the abdomen.~~
- For suspected aortic dissection (approve CTA/MRA abdomen and pelvis)~~.~~
- **For diagnosis or follow~~-~~up of visceral artery aneurysm (Ibrahim, 2018; Junternamms, 2018)**
- ~~•~~ **Suspected retroperitoneal hematoma or hemorrhage~~:~~ to determine vascular source of hemorrhage, in setting of trauma, tumor invasion, fistula or vasculitis, otherwise CT/MR abdomen and pelvis (rather than CTA/MRA) may be sufficient and the modality of choice for diagnosing hemorrhage (Ioannou, 2018)**~~For diagnosis or follow up of visceral artery aneurysm (Ibrahim, 2018; Junternamms, 2018):~~
- ~~•~~ ~~Evidence of vascular abnormality seen on prior imaging studies and limited to the abdomen.~~ For **evaluation of suspected mesenteric ischemia/ischemic colitis (can approve CTA/MRA abdomen and pelvis) (ACR, 2018)**~~.~~
- ~~•~~
- For patients with fibromuscular dysplasia (FMD), a one-time vascular study of the abdomen and pelvis (CTA or MRA) (Kadian-Dodov, 2016)
- For patients with v~~V~~ascular Ehlers-Danlos syndrome or Marfan syndrome recommend a one-time study of the abdomen and pelvis (CTA/MRA)
- For Loey~~t~~s~~z~~-Dietz imaging at least every two years (Chu, 2014)~~.~~
- For assessment in patients with spontaneous coronary artery dissection (SCAD) can be done at time of coronary angiography (also approve CTA pelvis) (Crousillat, 2020)~~.~~
- **Vascular invasion or displacement by tumor**
- **For evaluation of hepatic blood vessel abnormalities (aneurysm, hepatic vein thrombosis, stenosis post-transplant) after doppler ultrasound has been performed; to clarify or further evaluate ultrasound findings**~~.~~
- ~~•~~

    - ~~Evaluation of known or suspected aortic aneurysm (approve CTA/MRA abdomen and pelvis) (Chaikof, 2018; Khosa, 2013, Kumar, 2017):~~
    - ~~For screening, US is initial study~~
    - ~~Known or suspected aneurysm >2.5 cm AND equivocal or indeterminate ultrasound results~~
    - ~~Prior imaging (e.g. ultrasound) demonstrating aneurysm >2.5 cm in diameter~~

- ~~Suspected complications of known aneurysm as evidenced by signs/symptoms such as new onset of abdominal or pelvic pain~~
- ~~Surveillance imaging every three years for diameter 2.0-2.9 cm and annually for 3.0-3.4 cm if Doppler ultrasound inconclusive. If > 3.5 cm, < 6 month follow up (and consider intervention) (Wanhainen, 2019).~~

- ~~For May-Thurner syndrome (include pelvic CTV) (Ibrahim 2012; Wan-Ling, 2012)~~
- ~~Suspected retroperitoneal hematoma or hemorrhage (to determine vascular source of hemorrhage in setting of trauma, tumor invasion, fistula, or vasculitis; otherwise CT (rather than CTA) is sufficient and the modality of choice for diagnosing hemorrhage).~~

-

- ~~For~~ For evaluation of known or suspected renal artery stenosis or resistant hypertension in the setting of normal renal function (with impaired renal function, eGFR <30, use US with Doppler) unrelated to recent medication demonstrated by any of the following (Akbeyaz, 2017; Bailey, 2018; Gulas, 2018; Hartman, 2009; Harvin, 2017; Mohammed, 2012; Tullus, 2010; Whelton, 2018):
  - ~~o~~ Unsuccessful control after treatment with 3 or more (>2) anti-hypertensive medication at optimal dosing and one should be a diuretic~~.~~
  - ~~o~~ Acute elevation of creatinine after initiation of an ~~angiotension~~angiotensin converting enzyme inhibitor (ACE inhibitor) or ~~angiotension~~angiotensin receptor blocker (ARB)~~.~~
  - ~~o~~ Asymmetric kidney size noted on ultrasound~~.~~
  - ~~o~~ Onset of hypertension in a person younger than age 30 without any other risk factors or family history of hypertension**~~.~~
  - ~~o~~ Significant hypertension (diastolic blood pressure > 110 mm Hg) in a young adult (i.e., younger than 35 years) suggestive of fibromuscular dysplasia (Kong, 2018)
  - ~~o~~ Diagnosis of a syndrome with a higher risk of vascular disease, such as neurofibromatosis, tuberous sclerosis, and Williams' syndrome~~.~~
  - ~~o~~ New onset of hypertension after age 50~~.~~
  - ~~o~~ Acute rise in blood pressure in a person with previously stable blood pressures~~.~~
  - ~~o~~ Flash pulmonary edema without identifiable causes~~.~~
  - ~~o~~ Malignant or accelerated hypertension~~.~~
  - ~~o~~ Bruit heard over renal artery and hypertension~~.~~
  - ~~o~~ Abnormal/inconclusive renal doppler ultrasound~~For evaluation of suspected mesenteric ischemia (can approve CTA/MRA abdomen and pelvis) (ACR, 2018).~~
  -

Venous Disease

Suspected renal vein thrombosis in patient with known renal mass or from other causes (Mazhar, 2018)~~. Suspected renal vein thrombosis in patient with known renal mass or from other causes (Mazhar, 2018)~~

- ~~Suspected renal vein thrombosis in patient with known renal mass or from other causes (Mazhar, 2018)~~

-
- Venous thrombosis if previous studies have not resulted in a clear diagnosis **(add pelvis CTA/CTV when appropriate)** ~~and limited to the abdomen.~~
-
- **For May-Thurner syndrome (include pelvic CTV) (Ibrahim 2012; Wan-Ling, 2012)**
- Vascular invasion or displacement by tumor in the abdomen~~.~~
- For evaluation of portal venous system (hepatic portal system) after doppler ultrasound has been performed~~.~~
- **For diffuse unexplained lower extremity edema with negative or inconclusive ultrasound (Hoshino, 2016)**
- ~~For evaluation of transjugular intrahepatic portosystemic shunt (TIPS) when Doppler ultrasound indicates suspected complications (Darcy, 2012; Dariushnia, 2016; Farsad, 2014; Raissi, 2019).~~
- ~~For evaluation of known or suspected renal artery stenosis or resistant hypertension in the setting of normal renal function (with impaired renal function, eGFR <30, use US with Doppler) unrelated to recent medication demonstrated by any of the following (Akbeyaz, 2017; Bailey, 2018; Gulas, 2018; Hartman, 2009; Harvin, 2017; Mohammed, 2012; Tullus, 2010; Whelton, 2018):~~
    - ~~Unsuccessful control after treatment with 3 or more (>2) anti-hypertensive medication at optimal dosing and one should be a diuretic.~~
    - ~~Acute elevation of creatinine after initiation of an angiotension converting enzyme inhibitor (ACE inhibitor) or angiotension receptor blocker (ARB).~~
    - ~~Asymmetric kidney size noted on ultrasound.~~
    - ~~Onset of hypertension in a person younger than age 30 without any other risk factors or family history of hypertension**.~~
    - ~~Significant hypertension (diastolic blood pressure > 110 mm Hg) in a young adult (i.e., younger than 35 years) suggestive of fibromuscular dysplasia (Kong, 2018)~~
    - ~~Diagnosis of a syndrome with a higher risk of vascular disease, such as neurofibromatosis, tuberous sclerosis and Williams' syndrome.~~
    - ~~New onset of hypertension after age 50.~~
    - ~~Acute rise in blood pressure in a person with previously stable blood pressures.~~
    - ~~Flash pulmonary edema without identifiable causes.~~
    - ~~Malignant or accelerated hypertension.~~
    - ~~Bruit heard over renal artery and hypertension.~~

Pre-operative evaluation~~:~~

- For evaluation of transjugular intrahepatic portosystemic shunt (TIPS) when Doppler ultrasound indicates suspected complications (Darcy, 2012; Dariushnia, 2016; Farsad, 2014; Raissi, 2019)~~.~~
-
- Evaluation prior to interventional vascular procedures for luminal patency versus restenosis due to conditions such as atherosclerosis, thromboembolism, and intimal hyperplasia~~.~~
- For pre-transplant evaluation of either liver or kidney~~.~~

- Imaging of the deep inferior epigastric arteries for surgical planning (breast reconstruction surgery), include pelvic CTA/MRA (ACR, 2018~~7~~)

Post-operative or post-procedural evaluation~~:~~

- Evaluation of endovascular/interventional abdominal vascular procedures for luminal patency versus restenosis due to conditions such as atherosclerosis, thromboembolism, and intimal hyperplasia~~.~~
- Evaluation of post-operative complications, e.g., pseudoaneurysms related to surgical bypass grafts, vascular stents, and stent-grafts in the peritoneal cavity~~.~~
- Follow-up for post-endovascular repair (EVAR) or open repair of abdominal aortic aneurysm (AAA) or abdominal extent of iliac artery aneurysms. ~~-~~Routine, baseline study (post-op/intervention) is warranted within 1-3 months (CTA abdomen and pelvis should be approved) (**ACR 2018~~7~~;** Chaikof, 2018; Uberoi, 2011)~~.~~
    - **If a**~~A~~symptomatic at six (6)~~-~~-month intervals for one (1) year, then annually~~.~~
    - **If** ~~s~~**S**ymptomatic/complications related to stent graft – more frequent imaging may be needed~~.~~
    - Follow-up study may be needed to help evaluate a patient's progress after treatment, procedure, intervention, or surgery. Documentation requires a medical reason that clearly indicates why additional imaging is needed for the type and area(s) requested.
    -

Other Vascular indications~~:~~

- ~~-~~**Suspected retroperitoneal hematoma or hemorrhage~~:~~ to determine vascular source of hemorrhage, in setting of trauma, tumor invasion, fistula or vasculitis~~;~~, otherwise, CT/MR abdomen and pelvis (rather than CTA/MRA) may be sufficient and the modality of choice for diagnosing hemorrhage (Ioannou, 2018)**
- ~~-~~**For evaluation of hepatic blood vessel abnormalities (aneurysm, hepatic vein thrombosis, stenosis post-transplant) after doppler ultrasound has been performed; to clarify or further evaluate ultrasound findings**
- ~~-~~**Lower gastrointestinal hemorrhage: Active bleeding in a hemodynamically stable patient or non-localized intermittent bleeding as an alternative to Tc-99m RBC scan when colonoscopy did not localize the bleeding, is contraindicated, or unavailable (C~~ACR, 2014; C~~lerc, 2017; Karuppasamy, 2021)~~.~~**
-

Chest CTA/Abdomen/Pelvis CTA combo~~:~~

- For evaluation of extensive vascular disease involving the chest and abdominal cavities~~.~~~~:~~
- For pre-op or preprocedural evaluation for Transcatheter Aortic Valve Replacement (TAVR) (Achenbach, 2012; ACR, 2018~~7~~)
- Acute a~~A~~ortic dissection (Barman, 2014)
- Takayasu's arteritis (Keser, 2014)
- Marfans syndrome
- Loe~~y~~s~~tz~~-Dietz
- Spontaneous coronary artery dissection (SCAD)

- Vascular Ehlers-Danlos syndrome
- Post-op complications (Bennet, 2017; Choudhury, 2017)
- Significant post-traumatic or post-procedural vascular complications

---

BACKGROUND:

Computed tomography angiography (CTA) generates images of the arteries that can be evaluated for evidence of stenosis, occlusion, or aneurysms. It is used to evaluate the arteries of the abdominal aorta and the renal arteries. CTA uses ionizing radiation and requires the administration of iodinated contrast agent, which is a potential hazard in patients with impaired renal function. Abdominal CTA is not used as a screening tool, e.g., evaluation of asymptomatic patients without a previous diagnosis.

Cross-sectional imaging (liver ultrasound with Doppler, CT or MRI) should be completed no more than a month prior to the transjugular intrahepatic portosystemic shunt (TIPS) to assess for vascular patency and look for hepatic masses or other problems that could complicate the procedure.

Post-procedure, an ultrasound of the liver **is conducted** a day after to assess shunt patency. Hepatic encephalopathy (HE) is the most common complication and usually occurs 2-3 weeks after insertion of TIPS. Unique complications may include intravascular hemolysis and infection of the shunt. Other complications can include capsule puncture, intraperitoneal bleed, hepatic infarction, fistula, hematobilia, thrombosis of stent, occlusion, or stent migration and may require ~~cross-~~**cross-**sectional imaging.

~~Follow-~~**Follow-**up and maintenance imaging if complications suspected include Doppler ultrasound to assess shunt velocity. If asymptomatic sonogram performed at 4 weeks post placement, then every 6 months to a year. The gold standard for shunt patency is portal venography, usually reserved if concern for shunt occlusion.

OVERVIEW:

CTA and Renal Artery Stenosis:— Renal artery stenosis is the major cause of secondary hypertension. It may also cause renal insufficiency and end-stage renal disease. Atherosclerosis is one of the common causes of this condition, especially in older patients with multiple cardiovascular risk factors and worsening hypertension or deterioration of renal function. CTA is used to evaluate the renal arteries and detect renal artery stenosis.

**NF1 may present with hypertension due to renal artery stenosis in children. All young patients (<30 year) with hypertension should be clinically screened for secondary causes of hypertension, including NF1, so that renal revascularization can be offered before permanent end organ damage has occurred (Duan, 2014).

Abdominal Aneurysms and general guidelines for follow-up:
The normal diameter of the suprarenal abdominal aorta is 3.0 cm and that of the infrarenal is 2.0 cm. Aneurysmal dilatation of the infrarenal aorta is defined as diameter ≥ 3.0 cm or dilatation of the aorta ≥ 1.5x the normal diameter (Khosa, 2013). Initial evaluation of AAA is accurately made by ultrasound. Ultrasound can detect and size AAA, with the advantage of being relatively inexpensive, noninvasive, and not requireing iodinate contrast. The limitations are that overlying bowel gas can obscure findings and the technique is operator-dependent.

Asymptomatic Aneurysms may require treatment when:

- Diameter is > 2 cm
- Identified during pregnancy
- Multiple aneurysms are present
- Hepatic transplant

Recommended intervals for initial follow-up imaging of ectatic aortas and abdominal aortas (follow-up intervals may vary depending on comorbidities and the growth rate of the aneurysm) from the white paper of the ACR Incidental Findings Committee II on vascular findings (Khosa, 2013):
2.5-2.9 cm:……5 yr
3.0-3.4 cm:……3 yr
3.5-3.9 cm:……2 yr
4.0-4.4 cm:……1 yr
4.5-4.9 cm:……6 mo
5.0-5.5 cm:……3-6 mo

The Society of Vascular Surgery has different follow-up intervals for AAA (SVSChaikof, 2018):
>2.5 cm - <3 cm……..10 yr
3.0 - 3.9 cm……3 yr
4.0 - 4.9 cm……12 mo
5.0 - 5.4 cm……..6 mo.

The Society of Vascular Surgery recommends elective repair of AAA ≥ 5.5 cm in patients at low or acceptable surgical risk (Chaikof, 2018).

MRI/CT and acute hemorrhage: MRI is not indicated and MRA/MRV (MR Angiography/Venography) is rarely indicated for evaluation of intraperitoneal or retroperitoneal hemorrhage, particularly in the acute setting. CT is the study of choice due to its availability, speed of the study, and less susceptibility to artifact from patient motion. Advances in technology have allowed conventional CT to not just detect hematomas but also the source of acute vascular extravasation. In special cases finer vascular detail to assess the specific source vessel responsible for hemorrhage may require the use of CTA. CTA in diagnosis of lower gastrointestinal bleeding is such an example (Clerc, 2017).

MRA/MRV is often utilized in non-acute situations to assess vascular structure involved in atherosclerotic disease and its complications, vasculitis, venous thrombosis, vascular congestion or tumor invasion. Although some of these conditions may be associated with hemorrhage, it is usually

not the primary reason why MRI/MRA/MRV is selected for the evaluation. A special condition where MRI may be superior to CT for evaluating hemorrhage is to detect an underlying neoplasm as the cause of bleeding (Abe, 2010).

POLICY HISTORY:

Date	Summary
~~March~~April 2021	Added Notes: • For syndromes for which imaging starts in the pediatric age group, MRI preferred • ABDOMEN or Pelvis CT ALONE SHOULD ONLY BE APPROVED WHEN DISEASE PROCESS IS SUSPECTED TO BE LIMITED TO THE ABDOMEN or Pelvis. CT Abdomen/Pelvis Combo (CPT Codes: 74176, 74177, 74178) is the correct study when the indication(s) include both the abdomen AND pelvis, such as CTU (CT Urography), CTE (CT Enterography), acute abdominal pain, widespread inflammatory disease or neoplasm. Otherwise, the exam should be limited to the appropriate area. (i.e., Abdomen OR Pelvis) which includes the specific organ, area of known disease/abnormality or the area of concern.
May 2020	• Added compression syndromes for evaluation of vascular disease • Added evaluation of FMD, Vascular Ehlers-Danlos syndrome, Loetz-Dietz • Added May-Thurner Added to assess DVT in pregnant women vs serial compression ultrasound, to include pelvis • Added indications for combo studies for chest CTA/abdomen and pelvis CTA
May 2019	• Added indications for transjugular intrahepatic portosystemic shunt when Doppler ultrasound indicates suspected complications; accelerated hypertension; pre-transplant evaluation of either liver or kidney; imaging of deep inferior epigastric arteries for surgical planning (breast reconstruction surgery • For chest CTA/Abdomen CTA combo: added Transcatheter Aortic Valve Replacement; Acute Aortic dissection; Takayasu's arteritis; post op complications; significant post-traumatic or post-procedural vascular complications • Added and modified Background information and updated references

~~**Review Date:** May 2019~~
~~**Review Summary:**~~
- ~~Added indications for transjugular intrahepatic portosystemic shunt when Doppler ultrasound indicates suspected complications; accelerated hypertension; pre-transplant evaluation of either~~

liver or kidney; imaging of deep inferior epigastric arteries for surgical planning (breast reconstruction surgery

- For chest CTA/Abdomen CTA combo: added Transcatheter Aortic Valve Replacement; Acute Aortic dissection; Takayasu's arteritis; post op complications; significant post-traumatic or post-procedural vascular complications
- Added and modified Background information and updated references

Review Date: May 2020

Review Summary:

- Added compression syndromes for evaluation of vascular disease
- Added evaluation of FMD, Vascular Ehlers-Danlos syndrome, Loetz-Dietz
- Added May-Thurner Added to assess DVT in pregnant women vs serial compression ultrasound, to include pelvis
- Added indications for combo studies for chest CTA/abdomen and pelvis CTA

REFERENCES:

Abe T, Kai M, Miyoshi O, Nagaie T. Idiopathic retroperitoneal hematoma. *Case Rep Gastroenterol*. 2010;4(3):318-322. doi:10.1159/000320590.

Achenbach S, Delgado V, Hausleiter J, et al. SCCT expert consensus document on computed tomography imaging before transcatheter aortic valve implantation (TAVI)/transcatheter aortic valve replacement (TAVR). *J Cardiovasc Comput Tomogr*. 2012 Nov-Dec; 6(6):366-80.

Akbeyaz IH, Tirosh A, Robinson C, et al. Spontaneously resolving hyperreninemic hypertension caused by accessory renal artery stenosis in a 13-year-old girl: A case report. *J Clin Hypertension.* 2017 Jan; 19(1):100-102.

American College of Radiology (ACR). ACR Appropriateness Criteria®. https://acsearch.acr.org/list. Revised 2018.

~~American College of Radiology (ACR). ACR Appropriateness Criteria®. https://acsearch.acr.org/list. Published 2012.~~

Bailey SR, Beckman JA, Dao TD, et al. ACC / AHA / SCAI / SIR / SVM 2018 Appropriate Use Criteria for Peripheral Artery Intervention. *J Am Coll Cardiol*. 2018 Dec.

Barman M. Acute aortic dissection. *ESC Eur Society Cardiol*. 2014 Jul 02; 12(25).

Bennet KM, Kent KC, Schumaker J, et el. Targeting the most important complications in vascular surgery. *J Vasc Surg*. 2017; 65(3):793-803.

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*. January 2018; 67(1):2-77.e2. http://www.jvascsurg.org/article/S0741-5214(17)32369-8/fulltext#sec1.3. Retrieved February 15, 2018.

Choudhury M. Postoperative Management of Vascular Surgery Patients: A Brief Review. *Clin Surg*. 2017; 2:1584.

Chu LC, Johnson PT, et al. CT Angiographic Evaluation of Genetic Vascular Disease: Role in Detection, Staging, and Management of Complex Vascular Pathologic Conditions. *AJR*. May 2014; 202(5).

Crousillat DR, Wood MJ, et al. Spontaneous Coronary Artery Dissection: An Update for the Interventionalist. *Cath Lab Digest*. 2020 Mar; 28(3).

Darcy M. Evaluation and management of transjugular intrahepatic portosystemic shunts. *AJR Am J Roentgenol*. 2012 Oct; 199(4):730-6.

Dariushnia SR, Haskal ZJ, Midia M, et al. Quality improvement guidelines for transjugular intrahepatic portosystemic shunts. *J Vasc Interv Radiol*. 2016 Jan; 27(1):1-7.

Davis F, Rateri DL, et al. Aortic aneurysms in Loetz-Dietz Syndrome-at tale of two pathways? *J Clin Invest.* 2014; 124(1).

Duan L, Feng K, Tong A, et al. Renal artery stenosis due to neurofibromatosis type 1: Case report and literature review. *Eur J Med Res.* 2014 Mar; 19:17.

Farsad K, Kolbeck KJ. Clinical and radiologic evaluation of patients before TIPS creation. *AJR Am J Roentgenol*. 2014 Oct; 203(4):739-45.

Gulas E, Wysiadecki G, Szymanski J, et al. Morphological and clinical aspects of the occurrence of accessory (multiple) renal arteries. *Arch Med Sci.* 2018 Mar; 14(2):442-53.

Hartman R, Kawashima A. Radiologic evaluation of suspected renovascular hypertension. *Am Fam Physician.* August 1, 2009; 80(3):273-279. https://www.aafp.org/afp/2009/0801/p273.html. Retrieved February 15, 2018.

Harvin HJ, Verma N, Nikolaidis P, et al. ACR Appropriateness Criteria® - Renovascular Hypertension. *J Am Coll Radiol*. 2017 Nov; 14(11S):S540-9.

Hoshino Y, Machida M, et al. Unilateral leg swelling: Differential diagnostic issue other than deep venous thrombosis. *J Gen Fam Med*. 2016; 17(4):311-314.

Ibrahim F, Dunn J, Rundback J, et al. Visceral artery aneurysms: Diagnosis, surveillance, and treatment. *Curr Treat Options Med*. 2018 Oct 26; 20(12):97.

Ibrahim W, Zakareya AS, et al. Endovascular Management of May-Thurner Syndrome. *Ann Vasc. Dis*. 2012; 5(2):217-221.

Ioannou P, Alexakis G. Spontaneous retroperitoneal bleeding in a patient with primary antiphospholipid syndrome on aspirin. *Case Rep Emerg Med*. 2018. https://doi.org/10.1155/2018/4397893.

Juntermanns B, Bernheim J, Karaindros K, et al. Visceral artery aneurysms. *Gefasschirurgie*. 2018; 23(Suppl 1):19-22.

Kadian-Dodov D, Gornik HL, et al. Dissection and Aneurysm in Patients with Fibromuscular Dysplasia: Findings from the US Registry for FMD. *J Am Coll Cardiol*. 2016; 68(2).

Karuppasamy K, Kapoor BS, Fidelman N, et al. ACR Appropriateness Criteria® Radiologic Management of Lower Gastrointestinal Tract Bleeding: 2021 Update. *J Am Coll Radiol*. 2021;18(5S):S139-S152. doi:10.1016/j.jacr.2021.02.018.

Keser G, Direskeneli H, Aksu K. Management of Takayasu arteritis: A systematic review. *Rheumatology (Oxford).* 2014 May; 53(5):793-801.

Khosa F, Krinsky G, Macari M, et al. Managing incidental findings on abdominal and pelvic CT and MRI, Part 2: White paper of the ACR Incidental Findings Committee II on vascular findings. *J Am Coll Radiol*. 2013; 10(10):789-94. doi:10.1016/j.jacr.2013.05.021.

Kong W, Hu Z. Unique imaging findings in fibromuscular dysplasia of renal arteries: A case report. *Medicine (Baltimore).* 2018 Nov; 97(46):e12815.

Kranokpiraksa P, Kaufman JA. Follow-up of endovascular aneurysm repair: plain radiography, ultrasound, CT/CT angiography, MR imaging/MR angiography, or what? *J Vasc Interv Radiol*. 2008; 19(6):S27-S36. doi:10.1016/j.jvir.2008.03.009.

Kumar Y, Hooda K, et al. Abdominal aoric aneurysm. Pictorial review of common appearances and complications. *Ann Transl Med*. 2017; 5(12):256.

Liu PS, Platt JF. CT angiography of the renal circulation. *Radiol Clin North Am*. 2010; 48(2):347-65. doi: 10.1016/j.rcl.2010.02.005.

Mazhar HR, Aeddula NR. Renal Vein Thrombosis. StatPearls. Treasure Island, FL. StatPearls Publishing; 2019-2018 Dec 26.

Mohammed AMA, Abdalrasol RGE, Abdalhai KA, et al. Accessory renal vessels. *Acta Inform Med*. 2012 Sep; 20(3):196-97.

Raissi D, Roney EA, Issa MM, et al. Early TIPS failure in association with left mesenterico-gonadal spontaneous portosystemic venous shunt; a case report. *Clin Imaging*. 2019 Jan-Feb; 53:200-3.

Tullus K, Roebuck DJ, McLaren CA, et al. Imaging in the evaluation of renovascular disease. *Pediatr Nephrol*. June 2010; 25(6):1049-1056. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2855432/. Retrieved February 15, 2018.

Uberoi R, Tsetis D, Shrivastava V, et al. Standard of practice for the interventional management of isolated iliac artery aneurysms. *Cardiovasc Intervent Radiol*. 2011; 34(1):3-13. doi: 10.1007/s00270-010-0055-0.

Wan-Ling,MW.,Wen-Sheng,T.et.al. Comprehensive MDCT Evaluation of Patients with Suspected May-Thurner Syndrome. AJR, 2012;199(5)

Wanhainen A, Verzini F, et al. Editor's choice-European Society for Vascular Surgery (ESVS) 2019. Clinical Practice Guidelines on the management of aorto-iliac artery aneurysms. *Eur J Vasc Endovascul Surg*. 2019; 57(1):8-93.

Whelton PK, Carey RM, Wilbert S, et al. 2017 ACC / AHA / AAPA / ABC / ACPM / AGS / APHA / ASH / ASPC / NMA / PCNA Guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: A report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Hypertension*. 2018; 71(6):e13-115.

Reviewed / Approved by NIA Clinical Guideline Committee

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.

Reviewed / Approved by  M. Atif Khalid, M.D., Medical Director, Radiology