American College of Radiology
ACR Appropriateness Criteria®
Neck Mass/Adenopathy

Variant: 1 Nonpulsatile neck mass(es). Not parotid region or thyroid. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
MRI neck without and with IV contrast	Usually Appropriate	O
CT neck with IV contrast	Usually Appropriate	☢☢☢
US neck	May Be Appropriate	O
MRI neck without IV contrast	May Be Appropriate	O
CT neck without IV contrast	May Be Appropriate	☢☢☢
Arteriography cervicocerebral	Usually Not Appropriate	☢☢☢
MRA neck without and with IV contrast	Usually Not Appropriate	O
MRA neck without IV contrast	Usually Not Appropriate	O
CT neck without and with IV contrast	Usually Not Appropriate	☢☢☢
CTA neck with IV contrast	Usually Not Appropriate	☢☢☢
FDG-PET/MRI skull base to mid-thigh	Usually Not Appropriate	☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢

Variant: 2 Pulsatile neck mass(es). Not parotid region or thyroid. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
MRA neck without and with IV contrast	Usually Appropriate	O
MRI neck without and with IV contrast	Usually Appropriate	O
CT neck with IV contrast	Usually Appropriate	☢☢☢
CTA neck with IV contrast	Usually Appropriate	☢☢☢
US neck	May Be Appropriate	O
MRA neck without IV contrast	May Be Appropriate	O
MRI neck without IV contrast	May Be Appropriate	O
CT neck without IV contrast	May Be Appropriate (Disagreement)	☢☢☢
Arteriography cervicocerebral	Usually Not Appropriate	☢☢☢
CT neck without and with IV contrast	Usually Not Appropriate	☢☢☢
FDG-PET/MRI skull base to mid-thigh	Usually Not Appropriate	☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢

Variant: 3 Parotid region mass(es). Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
US neck	Usually Appropriate	O
MRI neck without and with IV contrast	Usually Appropriate	O
CT neck with IV contrast	Usually Appropriate	☢☢☢
Fluoroscopy sialography parotid	May Be Appropriate (Disagreement)	Varies
MRI neck with parotid sialography without and with IV contrast	May Be Appropriate	O
MRI neck with parotid sialography without IV contrast	May Be Appropriate	O
MRI neck without IV contrast	May Be Appropriate	O

CT neck without IV contrast	May Be Appropriate	☢☢☢
Arteriography cervicocerebral	Usually Not Appropriate	☢☢☢
MRA neck without and with IV contrast	Usually Not Appropriate	O
MRA neck without IV contrast	Usually Not Appropriate	O
CT neck with parotid sialography	Usually Not Appropriate	☢☢☢
CT neck without and with IV contrast	Usually Not Appropriate	☢☢☢
CTA neck with IV contrast	Usually Not Appropriate	☢☢☢
FDG-PET/MRI skull base to mid-thigh	Usually Not Appropriate	☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢

Variant: 4 Child. Neck mass(es). Not parotid region or thyroid. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
US neck	Usually Appropriate	O
MRI neck without and with IV contrast	Usually Appropriate	O
MRI neck without IV contrast	Usually Appropriate	O
CT neck with IV contrast	Usually Appropriate	☢☢☢
CT neck without IV contrast	May Be Appropriate (Disagreement)	☢☢☢
Arteriography cervicocerebral	Usually Not Appropriate	☢☢☢
MRA neck without and with IV contrast	Usually Not Appropriate	O
MRA neck without IV contrast	Usually Not Appropriate	O
CT neck without and with IV contrast	Usually Not Appropriate	☢☢☢
CTA neck with IV contrast	Usually Not Appropriate	☢☢☢
FDG-PET/MRI skull base to mid-thigh	Usually Not Appropriate	☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢

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Summary of Literature Review

Introduction/Background

Imaging may be requested in adult or pediatric patients with a palpable neck mass or neck fullness to determine whether a discrete mass or abnormal lymph node is present and to identify associated findings that may not be palpable. In adults, a neck mass is most likely to be either neoplastic or inflammatory [1-5], whereas in children the differential also includes congenital lymphovascular malformations and branchial cleft cysts among other benign entities [6]. For patients >40 years of age, especially with a smoking history, the diagnosis overwhelmingly favors a malignancy [7-10]. With the rise of human papillomavirus–related oral, pharyngeal, and laryngeal carcinomas, vigilance for carcinoma is now warranted for all adult age-groups [11,12]. The evidence for imaging of neck nodes is often inextricable from that of staging cancer, including

evaluation of the primary site. Ultimately, histology is needed to confirm any suspected malignancy [13,14].

The American Academy of Otolaryngology-Head and Neck Surgery recently created clinical guidelines for the evaluation of a neck mass in adults [14], emphasizing the importance of timely diagnosis. They issued a strong recommendation for contrast-enhanced neck CT or contrast-enhanced neck MRI for patients with a neck mass deemed at risk for malignancy. In their treatment flow chart, imaging was considered in parallel with fine-needle aspiration of the palpable mass or node for timing of diagnostic evaluation. Ultrasound (US) was considered an option for initial imaging in suspected thyroid or salivary masses or as an adjunct to expedite sampling.

It is important to acknowledge overlap of symptoms and examination findings. If the suspected origin of the neck mass is the thyroid gland, imaging should be guided by the ACR Appropriateness Criteria® topic on "Thyroid Disease" [15]. Additional evaluation of vascular processes in the neck is addressed in the ACR Appropriateness Criteria® topic on "Cerebrovascular Disease" [16] and the ACR Appropriateness Criteria® topic on "Tinnitus" [17]. Evaluation of neurological features associated with neck masses should be guided by the ACR Appropriateness Criteria® topic on "Plexopathy" [18].

Discussion of Procedures by Variant

Variant 1: Nonpulsatile neck mass(es). Not parotid region or thyroid. Initial imaging.

Cross-sectional imaging with CT or MRI allows for precise localization of the palpable finding. Both CT and MRI can accurately assess tumors and inflammation, and CT and MRI are considered equally effective studies for clinical oncologic evaluation [14,19].

Intravenous (IV) contrast is essential for detecting neck abscesses, especially those that are intramuscular [20-22]. Contrast-enhanced imaging is helpful for identifying nodal necrosis and can help guide the search for primary tumor [23,24]. Contrast also helps to clarify primary tumor within the upper aerodigestive tract and the relationship of neck masses to the major vessels of the neck.

Certain CT neck protocols do not scan above the hard palate in order to reduce radiation exposure to the eye lenses. Therefore, CT or MRI with inclusion of the face may also be necessary, depending on the clinical and endoscopic examination findings. If the suspected origin of the neck mass is the thyroid gland, imaging should be guided by the ACR Appropriateness Criteria® topic on "Thyroid Disease" [15].

Variant 1: Nonpulsatile neck mass(es). Not parotid region or thyroid. Initial imaging.
A. Arteriography cervicocerebral

There is no evidence to support the use of catheter angiography for evaluation of a nonpulsatile neck mass.

Variant 1: Nonpulsatile neck mass(es). Not parotid region or thyroid. Initial imaging.
B. CT neck

Contrast-enhanced CT has the advantage of superior spatial resolution and is the preferred initial imaging modality for a palpable nonpulsatile neck mass in an adult, particularly considering the risk of head and neck cancer [14,19,25,26]. The presence and distribution of abnormal lymph nodes may be helpful when refining the differential as a reactive or malignant process and in guiding the

search for an unknown primary malignancy [19,27,28]. Dual-phase CT imaging (without and with IV contrast) is not usually necessary. CT performed only without IV contrast may be helpful in some cases.

CT can help identify a dental source of infection in the febrile patient [20] and may be superior to US for evaluating the extent of deep neck inflammation [29-31]. CT Hounsfield units can confirm fat-containing lesions in the neck [28]. Advances in lower dose protocols and reconstruction algorithms vary among vendors [32], and all imaging should reflect "as low as reasonably achievable" (ALARA) practices [33].

Variant 1: Nonpulsatile neck mass(es). Not parotid region or thyroid. Initial imaging. C. CTA neck

There is no evidence to support the use of CT angiography (CTA) for evaluation of a nonpulsatile neck mass.

Variant 1: Nonpulsatile neck mass(es). Not parotid region or thyroid. Initial imaging. D. FDG-PET/CT skull base to mid-thigh

While there is established literature regarding the use of PET using the tracer fluorine-18-2-fluoro-2-deoxy-D-glucose (FDG)/CT for staging and surveillance of head or neck malignancy, FDG-PET/CT is not an initial imaging study for evaluation of a nonpulsatile neck mass.

Variant 1: Nonpulsatile neck mass(es). Not parotid region or thyroid. Initial imaging. E. FDG-PET/MRI skull base to mid-thigh

While there is growing literature regarding the use of FDG-PET/MRI for staging and surveillance of head or neck malignancy, FDG-PET/MRI is not an initial imaging study for evaluation of a nonpulsatile neck mass.

Variant 1: Nonpulsatile neck mass(es). Not parotid region or thyroid. Initial imaging. F. MRA neck

There is no evidence to support the use of MR angiography (MRA) for evaluation of a nonpulsatile neck mass.

Variant 1: Nonpulsatile neck mass(es). Not parotid region or thyroid. Initial imaging. G. MRI neck

The primary advantage of MRI is improved soft-tissue intrinsic contrast. Intrinsic T1-hyperintensity and fat suppression techniques can confirm fat-containing lesions in the neck [28]. Diffusion-weighted imaging can identify soft-tissue abscess [34]. Apparent diffusion coefficient values also have been proposed as a discriminator between benign and malignant nodal disease in the neck [34-36] and with intravoxel incoherent motion features for both primary and nodal disease [37]; however, histology is needed to confirm any suspected malignancy [13,14,19]. Motion artifact may be a significant issue, particularly for patients who have difficulty managing secretions that are due to neck disease. MRI performed without IV contrast may be helpful in some cases.

Variant 1: Nonpulsatile neck mass(es). Not parotid region or thyroid. Initial imaging. H. US neck

The overall use of neck US in the United States has lagged behind the use of US in Europe and Southeast Asia, which is due, in part, to greater accessibility of CT and MRI in the United States [38-40]. For discrete cystic lesions of the neck, US may suffice to characterize a lesion prior to definitive management. A few studies suggested that US can distinguish between metastatic and

inflammatory neck nodes [41-47]. Although these results are promising, scans are user dependent. US serves as a powerful tool for image-guided sampling [48], which is beyond the scope of this document. Advantages of US include the ability to be performed at the point of care and to expedite sampling [14]; however, US is limited for comprehensive evaluation of the deep spaces of the neck, and for larger, multispatial, and malignant lesions.

US may play a future rule in identifying unknown primary mucosal tumors, notably in the oropharynx [49]. Techniques such as US elastography and contrast-enhanced US are being explored for possible future clinical applications [44,45,50-58].

Variant 2: Pulsatile neck mass(es). Not parotid region or thyroid. Initial imaging.

A pulsatile neck mass may reflect a normal tortuous artery, atypical lymphovascular malformation, arteriovenous fistula, pseudoaneurysm, paraganglioma, or other mass abutting an artery. Additional evaluation of vascular processes in the neck is addressed in the ACR Appropriateness Criteria® topic on "Cerebrovascular Disease" [16] and the ACR Appropriateness Criteria® topic on "Tinnitus" [17].

Variant 2: Pulsatile neck mass(es). Not parotid region or thyroid. Initial imaging.
A. Arteriography cervicocerebral

Catheter angiography may be used for surgical planning and endovascular treatment or for further characterization of vascular neck lesions identified on US or cross-sectional imaging; however, it is not an initial imaging study for evaluation of a pulsatile neck mass.

Variant 2: Pulsatile neck mass(es). Not parotid region or thyroid. Initial imaging.
B. CT neck

Neck CT should be performed with IV contrast. Dual-phase CT imaging (without and with IV contrast) is not usually necessary. CT performed only without IV contrast may be helpful in a small minority of cases. Contrast is useful for distinguishing vessels from lymph nodes and confirming whether a mass is hypervascular as many pulsatile neck masses (especially those in level II or III) are lymph nodes overlying the carotid artery rather than true vascular masses. There is no current literature comparing the efficacy of contrast-enhanced CT to CTA or MRI and MRA for the evaluation of a pulsatile neck mass. Advances in lower dose protocols and reconstruction vary among vendors [32], and all imaging should reflect ALARA practices [33].

Variant 2: Pulsatile neck mass(es). Not parotid region or thyroid. Initial imaging.
C. CTA neck

Although CTA is optimized to visualize the cervical arteries, the soft tissues are usually well characterized. There is no current literature comparing efficacy of contrast-enhanced CT to CTA or MRI and MRA for the evaluation of a pulsatile neck mass.

Variant 2: Pulsatile neck mass(es). Not parotid region or thyroid. Initial imaging.
D. FDG-PET/CT skull base to mid-thigh

Patients with suspected recurrent paraganglioma may benefit from additional types of PET imaging beyond the scope of this document [63-65]; however, PET/CT is not an initial imaging study for evaluation of a pulsatile neck mass.

Variant 2: Pulsatile neck mass(es). Not parotid region or thyroid. Initial imaging.
E. FDG-PET/MRI skull base to mid-thigh

Patients with suspected recurrent paraganglioma may benefit from additional types of PET

imaging beyond the scope of this document [63-65]; however, PET/MRI is not an initial imaging study for evaluation of a pulsatile neck mass.

Variant 2: Pulsatile neck mass(es). Not parotid region or thyroid. Initial imaging.
F. MRA neck

MRA is complementary to MRI in the evaluation of a pulsatile neck mass to achieve anatomic and vascular detail. Time resolved (4-D) contrast-enhanced MRA technique may be useful for characterization of head and neck arteriovenous malformations [62]. There is no current literature comparing efficacy of contrast-enhanced CT to CTA or MRI and MRA for the evaluation of a pulsatile neck mass. The use of contrast for MRA is institution dependent but generally preferred.

Variant 2: Pulsatile neck mass(es). Not parotid region or thyroid. Initial imaging.
G. MRI neck

The primary advantage of MRI is improved soft-tissue intrinsic contrast. A noncontrast MRI also serves a role for anatomic definition of a pulsatile neck mass in patients who cannot receive contrast. There is no current literature comparing efficacy of contrast-enhanced CT to CTA or MRI and MRA for the evaluation of a pulsatile neck mass. Arterial phase, time-resolved (4-D) MRI may be useful for evaluation of possible paragangliomas in the head and neck [59-61], but it is not an initial imaging study of a new palpable neck mass.

Variant 2: Pulsatile neck mass(es). Not parotid region or thyroid. Initial imaging.
H. US neck

US may identify a distinct mass overlying or adjacent to an artery, may confirm vascularity of a lesion, or may be useful to confirm a clinical suspicion of a tortuous artery. The characteristic US appearance of phleboliths may aid in the diagnosis of low-flow vascular malformations [59].

Variant 3: Parotid region mass(es). Initial imaging.

Imaging generally cannot determine if a newly symptomatic or palpable parotid lesion is benign or malignant. However, imaging may help determine whether the mass is arising from within or outside the parotid gland, the characteristics of the mass, and whether additional masses are present [66]. An extraparotid mass usually reflects a lymph node. For an intraparotid lesion, differential considerations include lymph nodes, benign, malignant, inflammatory, and congenital etiologies. Although certain imaging findings often suggest a specific diagnosis for a parotid mass, histologic diagnosis is usually needed to exclude malignancy [26,67-72]. Clinical history and physical examination also influences the workup as numbness, trismus, fixation, and facial weakness may suggest a malignant etiology. Radiologist consultation is essential to achieve appropriate anatomic coverage.

Variant 3: Parotid region mass(es). Initial imaging.
A. Arteriography cervicocerebral

There is no evidence to support the use of catheter angiography for evaluation of a new parotid mass.

Variant 3: Parotid region mass(es). Initial imaging.
B. CT neck parotid sialography

In the absence of acute infection, CT sialography may provide detailed assessment of the parotid ducts if there is a clinical concern for duct obstruction.

Variant 3: Parotid region mass(es). Initial imaging.
C. CTA neck

There is no evidence to support the use of CTA for evaluation of a parotid region mass.

Variant 3: Parotid region mass(es). Initial imaging.
D. FDG-PET/CT skull base to mid-thigh

While there is established literature regarding the use of FDG-PET/CT for staging and surveillance of parotid malignancy, FDG-PET/CT is not an initial imaging study for evaluation.

Variant 3: Parotid region mass(es). Initial imaging.
E. FDG-PET/MRI skull base to mid-thigh

There is no evidence to support the use of FDG-PET/MRI for evaluation of a new parotid mass.

Variant 3: Parotid region mass(es). Initial imaging.
F. Fluoroscopy sialography parotid

In the absence of acute infection, conventional fluoroscopic parotid sialography may provide detailed assessment of the parotid ducts if there is a clinical concern for duct obstruction.

Variant 3: Parotid region mass(es). Initial imaging.
G. MRA neck

There is no evidence to support the use of MRA for evaluation of a parotid region mass.

Variant 3: Parotid region mass(es). Initial imaging.
H. MRI neck with parotid sialography

Noninvasive MRI sialography may provide assessment of the parotid ducts [88] complementary to anatomic MRI of the face or neck, if there is a clinical concern for acute parotitis in the setting of duct obstruction.

Variant 3: Parotid region mass(es). Initial imaging.
I. MRI neck

MRI with and without IV contrast is the preferred evaluation as it provides comprehensive information about the full extent of the mass (deep lobe involvement, local invasion), perineural tumor spread, and possible extension into the temporal bone [74,77,78]. MRI performed without IV contrast may be helpful in some cases. MRI characteristics, such as T2-hypointensity [79], intratumoral cystic components [80], and apparent diffusion coefficient values [81], have been proposed as features of malignancy. Ultimately, histologic confirmation is required. Depending on clinical examination features, such as cranial neuropathy (see the ACR Appropriateness Criteria® topic on "Cranial Neuropathy" [82]), or additional palpable nodes in the neck, MRI of the face and/or MRI of the neck should be considered for assessment, with radiologist consultation to achieve appropriate coverage. The main disadvantages of MRI are increased time, susceptibility artifacts, and motion artifacts. Advanced MRI techniques, such as perfusion imaging and texture analysis, show promise in differentiating benign from malignant lesions but are currently not used in routine clinical practice [83-87].

Variant 3: Parotid region mass(es). Initial imaging.
J. US neck

US is adept at localization of parotid versus extraparotid masses [77,89], and identifying features suspicious for malignancy [90]. Deep lobe lesions are generally not as well delineated with US as in the superficial lobe. Much of the published literature focuses on US-guided fine-needle aspiration, and not the diagnostic utility of US. Contrast-enhanced US and US elastography are newer techniques currently being explored for evaluation of salivary pathology [71,91-94].

Variant 4: Child. Neck mass(es). Not parotid region or thyroid. Initial imaging.

In children who present with neck masses, congenital etiologies should be added to differential diagnostic considerations [6,95] in addition to infectious and malignant etiologies. Clinical examination features and correlation with onset, change in mass size, fluctuance, fever, overlying skin erythema, or recent trauma are important to guiding imaging.

Variant 4: Child. Neck mass(es). Not parotid region or thyroid. Initial imaging.
A. Arteriography cervicocerebral

There is no evidence to support the use of catheter angiography for evaluation of a palpable neck mass in a child.

Variant 4: Child. Neck mass(es). Not parotid region or thyroid. Initial imaging.
B. CT neck

CT with IV contrast can be performed in children suspected of a having a malignancy or a deep neck infection that may require surgery [21,29,96]. CT has reduced or absent sedation requirements given the shorter examination time. Dual phase (without and with IV contrast) is not usually necessary, as most sialoliths are not obscured by contrast. [20]. CT performed only without IV contrast may be useful in some cases. Advances in lower dose protocols and reconstruction vary among vendors [32], and all imaging should reflect ALARA practices [33].

Variant 4: Child. Neck mass(es). Not parotid region or thyroid. Initial imaging.
C. CTA neck

There is no evidence to support the use of CTA for evaluation of a palpable neck mass in a child.

Variant 4: Child. Neck mass(es). Not parotid region or thyroid. Initial imaging.
D. FDG-PET/CT skull base to mid-thigh

There is no evidence to support the use of FDG-PET/CT for evaluation of a palpable neck mass in a child.

Variant 4: Child. Neck mass(es). Not parotid region or thyroid. Initial imaging.
E. FDG-PET/MRI skull base to mid-thigh

There is no evidence to support the use of FDG-PET/MRI for evaluation of a palpable neck mass in a child.

Variant 4: Child. Neck mass(es). Not parotid region or thyroid. Initial imaging.
F. MRA neck

There is no evidence to support the use of MRA for evaluation of a palpable neck mass in a child, though time-resolved postcontrast MRA could be useful for evaluating venous malformations and other pathology [59]. Contrast may not be necessary for defining arterial anatomy.

Variant 4: Child. Neck mass(es). Not parotid region or thyroid. Initial imaging.
G. MRI neck

MRI of the neck can be performed in children suspected of having a malignancy or a deep neck abscess that may require surgical drainage [21,29,96]. Additionally, in suspected vascular malformation, MRI provides detail of trans-spatial extent and adjacent neurovascular structures [97,98]. The addition of contrast is usually helpful for evaluation of suspected vascular lesions [99]; however, it should be considered on a case-by-case basis as it is not always necessary to achieve diagnosis [100].

Variant 4: Child. Neck mass(es). Not parotid region or thyroid. Initial imaging.

H. US neck

In children suspected of having a congenital abnormality, US is useful in differentiating solid from cystic neck lesions and in discriminating high-flow from low-flow vascular malformations [59,101-103]. Color-flow Doppler US is also helpful for characterizing vascular flow in solid lesions [41,104]. US may suffice for evaluation of superficial infection [105].

Summary of Highlights

- **Variant 1:** CT neck with IV contrast or MRI neck without and with IV contrast is usually appropriate for the initial imaging of nonpulsatile neck masses, not parotid region or thyroid. These procedures are equivalent alternatives.
- **Variant 2:** CT neck with IV contrast, CTA neck with IV contrast, MRI neck without and with IV contrast, or MRA neck is usually appropriate for the initial imaging of pulsatile neck masses, not parotid region or thyroid. These procedures are equivalent alternatives, although CTA or MRA may be complementary to CT and MRI.
- **Variant 3:** CT neck with IV contrast, MRI neck without and with IV contrast, or US neck is usually appropriate for the initial imaging of parotid region masses. These procedures are equivalent alternatives.
- **Variant 4:** CT neck with IV contrast, MRI neck without and with IV contrast, US neck, or MRI neck without IV contrast is usually appropriate for the initial imaging in children with neck masses, not parotid region or thyroid. CT and MRI studies may be complementary to US.

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 Range	Pediatric Effective Dose Estimate Range
O	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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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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