American College of Radiology
ACR Appropriateness Criteria®
Acute Elbow and Forearm Pain

Variant 1:   Adult. Acute elbow or forearm pain. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
Radiography area of interest	Usually Appropriate	Varies
US area of interest	Usually Not Appropriate	O
MRI area of interest without and with IV contrast	Usually Not Appropriate	O
MRI area of interest without IV contrast	Usually Not Appropriate	O
Bone scan area of interest	Usually Not Appropriate	☢☢☢
CT area of interest with IV contrast	Usually Not Appropriate	Varies
CT area of interest without and with IV contrast	Usually Not Appropriate	Varies
CT area of interest without IV contrast	Usually Not Appropriate	Varies

Variant 2:   Adult. Acute elbow or forearm pain. Suspect fracture. Radiographs normal or indeterminate. Next imaging study.

Procedure	Appropriateness Category	Relative Radiation Level
Radiography area of interest repeat in 10-14 days	Usually Appropriate	Varies
CT area of interest without IV contrast	Usually Appropriate	Varies
US area of interest	Usually Not Appropriate	O
MRI area of interest without and with IV contrast	Usually Not Appropriate	O
MRI area of interest without IV contrast	Usually Not Appropriate	O
Bone scan area of interest	Usually Not Appropriate	☢☢☢
CT area of interest with IV contrast	Usually Not Appropriate	Varies
CT area of interest without and with IV contrast	Usually Not Appropriate	Varies

Variant 3:   Adult. Acute elbow or forearm pain. Suspect tendon or ligament or muscle injury. Radiographs normal or indeterminate. Next imaging study.

Procedure	Appropriateness Category	Relative Radiation Level
US area of interest	Usually Appropriate	O
MRI area of interest without IV contrast	Usually Appropriate	O
MRI area of interest without and with IV contrast	Usually Not Appropriate	O
Bone scan area of interest	Usually Not Appropriate	☢☢☢
CT area of interest with IV contrast	Usually Not Appropriate	Varies
CT area of interest without and with IV contrast	Usually Not Appropriate	Varies
CT area of interest without IV contrast	Usually Not Appropriate	Varies

ACUTE ELBOW AND FOREARM PAIN

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Summary of Literature Review

Introduction/Background

The elbow and forearm are commonly injured in traumatic, athletic, and nonathletic injuries, accounting for approximately 5% of emergency department visits for upper extremity injuries in 2020 [1]. Traumatic injuries may occur because of a fall or direct blow to the elbow and proximal forearm and result in acute fractures and/or dislocation. Although it is of paramount importance to identify fractures and dislocation in the setting of acute trauma to the elbow and forearm, it is also crucial to recognize the wide range of soft tissue injuries. Athletic injuries typically are associated with overhead throwing activities. These injuries may be occult at the time of initial imaging and include disruption of musculotendinous structures, ligaments, nerves, and articular cartilage. Clinically, these patients present with pain, decreased range of motion, instability, altered biomechanics, and/or decreased athletic performance. When patients present with acute elbow and forearm pain, and musculoskeletal infections involving bones and soft tissues are suspected, the ACR Appropriateness Criteria® topic on "Suspected Osteomyelitis, Septic Arthritis, or Soft Tissue Infection (Excluding Spine and Diabetic Foot)" [2] should be consulted. Nonathletic or microtraumatic injuries can occasionally present with acute elbow pain but typically are more chronic in severity, which is discussed in the ACR Appropriateness Criteria® topic on "Chronic Elbow Pain" [3].

Diagnostic imaging plays a key role in the assessment of acute elbow pain. A thorough understanding of diagnostic imaging modalities is essential to expeditiously identify the damaged structures and assist in treatment/surgical planning, thus allowing for rapid return to play/activity.

Special Imaging Considerations

Stress radiographs and/or fluoroscopy can be used to detect medial joint line opening suggestive of valgus instability of the elbow. Comparison to the contralateral elbow can be helpful to look for asymmetry. Schnetzke et al [4] evaluated the joint stability in 68 patients with simple elbow dislocation. After closed reduction, stability was evaluated under fluoroscopy. In this study, patients were divided into 3 different groups according to the degree of joint widening tested at full extension, 30° of flexion, pronation and supination, and varus and valgus stress, respectively. Under 10° of widening was considered slight instability, >10° of widening was considered moderate instability, and frank re-dislocation at stress testing was considered gross instability. The latter was treated with surgical fixation, whereas the patients with mild and moderate instability were treated with conservative measures. The patients with mild instability achieved significantly better scores on the Mayo Elbow Performance Scores (MEPS) (77.6 versus 52.6%; P = .043). The average MEPS score showed a trend toward a worse outcome in the group with moderate instability. Furthermore, the author showed a relatively reliable agreement between stress fluoroscopy and MRI in 25 of the 32 patients with postinjury MRIs available.

In a more recent study, the same authors tested joint widening on cadaveric human elbows at various stages of ligamentous transection. The 5 sequential stages, evaluated with varus stress, included 1) intact, 2) transection of the lateral ulnar collateral ligament (UCL), 3) complete transection of the lateral collateral ligament complex, 4) transection of the anterior aspect of the capsule, and 5) transection of the medial collateral ligament. The 5 sequential stages, evaluated by valgus stress, included 1) intact, 2) transection of the anteromedial collateral ligament, 3) complete transection of the medial collateral ligament, 4) transection of the anterior capsule, and 5) transection of

the lateral collateral ligamentous complex. The authors concluded that dynamic fluoroscopy makes it possible to distinguish among different stages of collateral ligament injury of the elbow [5].

Initial Imaging Definition

Initial imaging is defined as imaging at the beginning of the care episode for the medical condition defined by the variant. More than one procedure can be considered usually appropriate in the initial imaging evaluation when:

- There are procedures that are equivalent alternatives (ie, only one procedure will be ordered to provide the clinical information to effectively manage the patient's care)

OR

- There are complementary procedures (ie, more than one procedure is ordered as a set or simultaneously where each procedure provides unique clinical information to effectively manage the patient's care).

Discussion of Procedures by Variant

Variant 1: Adult. Acute elbow or forearm pain. Initial imaging.

Bone Scan Area of Interest

There is no evidence to support the use of 3-phase bone scan as the initial imaging study for the evaluation of acute elbow and forearm pain.

CT Area of Interest With IV Contrast

There is no evidence to support the use of contrast-enhanced CT of the elbow/proximal forearm as the initial imaging study for the evaluation of acute elbow and forearm pain.

CT Area of Interest Without and With IV Contrast

There is no evidence to support the use of noncontrast/contrast-enhanced CT of the elbow/proximal forearm as the initial imaging study for the evaluation of acute elbow and forearm pain.

CT Area of Interest Without IV Contrast

There is no evidence to support the use of noncontrast CT of the elbow/proximal forearm as the initial imaging study for the evaluation of acute elbow and forearm pain.

MRI Area of Interest Without and With IV Contrast

There is no evidence to support the use of noncontrast/contrast-enhanced MRI of the elbow/proximal forearm as the initial imaging study for the evaluation of acute elbow and forearm pain.

MRI Area of Interest Without IV Contrast

There is no evidence to support the use of contrast-enhanced MRI of the elbow/proximal forearm as the initial imaging study for the evaluation of acute elbow and forearm pain.

Radiography Area of Interest

Radiographs are beneficial as the initial imaging assessment for acute elbow and proximal forearm pain. Conventional radiographs are often the first-imaging modality used to exclude a fracture or dislocation. In adults, the most frequent fracture involves the radial head or neck and accounts for 50% of cases [1].

An elbow joint effusion can be identified on conventional radiography with the presence of posterior and anterior fat pad elevation. In combination with the clinical context of acute trauma, the presence of a joint effusion can imply an occult elbow fracture. Avulsion fractures can also be identified at the attachment sites of tendons and ligaments. Occasionally, triceps tendon tears may result in avulsion fractures of the olecranon or an olecranon enthesophyte.

Injuries to the coronoid process are sequela of prior elbow dislocation, which is typically associated with soft tissue injury. As such, coronoid process fractures should prompt the referring provider to assess for associated tendon or ligament injury because these are commonly associated with elbow dislocation.

US Area of Interest

There is limited evidence to support the use of ultrasound (US) of the elbow/proximal forearm as the initial imaging study for the evaluation of acute elbow and forearm pain.

Variant 2: Adult. Acute elbow or forearm pain. Suspect fracture. Radiographs normal or indeterminate. Next imaging study.

This variant is associated with osseous injury only. Please refer to Variant 3 for recommendations for the evaluation of soft tissue injury.

Bone Scan Area of Interest
There is no evidence to support the use of 3-phase bone scan as the initial imaging study for the evaluation of acute elbow and forearm pain.

CT Area of Interest With IV Contrast
There is no evidence to support the use of contrast-enhanced CT of the elbow/proximal forearm as the initial imaging study for the evaluation of acute elbow and forearm pain.

CT Area of Interest Without and With IV Contrast
There is no evidence to support the use of noncontrast/contrast-enhanced CT of the elbow/proximal forearm as the initial imaging study for the evaluation of acute elbow and forearm pain.

CT Area of Interest Without IV Contrast
Studies show the advantages of CT to conventional radiography in the identification and clarification of fracture morphology. Acar et al [6] evaluated 148 patients with elbow trauma with equivocal or no fracture identified on conventional radiographs. They further screened patients with an elbow extension test, which measures the ability to fully extend the elbow while sitting down and with the shoulders at 90° of flexion. Those with a positive (abnormal) test underwent CT, and 12.8% of these patients were found to have occult fractures, including fractures of the radial head, olecranon, and coronoid process. In the setting of tearing of the supporting elbow ligamentous structures, Lee et al [7] showed additional fractures of the radial head, coronoid process, and medial and lateral humeral epicondyles in patients with posterolateral elbow dislocation.

In the elbow, the additional knowledge gleaned from CT includes size of fracture fragments and amount of displacement or angulation, which may affect the surgical treatment options. Isolated radial head fractures, Essex-Lopresti injuries, and Monteggia fractures with dislocation of the elbow can be diagnosed. Traumatic elbow injuries are categorized into radial head fracture with posterior dislocation, terrible triad injury, posterior and anterior fracture-dislocation, trans-olecranon (anterior) fracture-dislocation, and varus posteromedial rotational instability. Fracture mapping and quantitative 3-D CT analysis of coronoid and olecranon fractures have identified specific shapes, sizes, and orientations of fracture fragments according to a pattern of traumatic elbow instability.

Specifically, with regards to proximal olecranon fractures, plate and screw constructs tend to have only a few short proximal screws, and further stabilization with a supplementary wire or suture fixation incorporating the triceps attachment has been found to be helpful and knowledge of the fracture morphology is helpful for this surgical planning. Furthermore, CT can assess the degree of ulnohumeral incongruity, which is inversely proportional to the proximal olecranon fracture size [8].

MRI Area of Interest Without and With IV Contrast
There is no evidence to support the use of noncontrast/contrast-enhanced MRI of the elbow/proximal forearm as the next imaging study for the evaluation of occult fracture of the elbow and/or proximal forearm.

MRI Area of Interest Without IV Contrast
There is no evidence to support the use of noncontrast MRI of the elbow/proximal forearm as the next imaging study for the evaluation of occult fracture of the elbow and/or proximal forearm. In the setting of the Osborne-Cotterill lesion, occasionally the impaction, avulsion, and shear fracture of the posterolateral capitellum during elbow fracture-dislocation could be nondisplaced on CT; however, MRI is able to demonstrate the injury with marrow edema at the fracture site [9].

Radiography Area of Interest Repeat in 10-14 Days
Pavic et al [10] evaluated 193 patients with acute elbow trauma with no acute fracture identified at the time of initial radiographic evaluation. Of note, these patients all had elbow joint effusions. Follow-up conventional radiographs were performed in 184 patients (95%) and showed fractures of the radial neck in 58% and nondisplaced fractures of the radial head in 37% of cases. Five percent of patients continued to have normal radiographs and were further evaluated with MRI and found to have intraarticular joint effusions, bone contusion, and radial and UCL ruptures.

US Area of Interest

There is no evidence to support the use of diagnostic US of the elbow/proximal forearm as the imaging study for the evaluation of acute elbow and forearm pain. There are 2 studies discussing point-of-care US that are too small to support use in this setting [11,12].

Variant 3: Adult. Acute elbow or forearm pain. Suspect tendon or ligament or muscle injury. Radiographs normal or indeterminate. Next imaging study.

Bone Scan Area of Interest

There is no evidence to support the use of 3-phase bone scan for the assessment of tendon, ligamentous, or muscle injury.

CT Area of Interest With IV Contrast

There is no evidence to support the use of contrast-enhanced CT of the elbow/proximal forearm for the assessment of tendon, ligamentous, or muscle injury.

CT Area of Interest Without and With IV Contrast

There is no evidence to support the use of noncontrast/contrast-enhanced CT of the elbow/proximal forearm for the assessment of tendon, ligamentous, or muscle injury.

CT Area of Interest Without IV Contrast

There is no evidence to support the use of noncontrast CT of the elbow/proximal forearm for the assessment of tendon, ligamentous, or muscle injury.

MRI Area of Interest Without and With IV Contrast

There is no evidence to support the use of noncontrast/contrast-enhanced MRI of the elbow/proximal forearm as the for the assessment of tendon, ligamentous, or muscle injury.

MRI Area of Interest Without IV Contrast

Several studies have evaluated the use of noncontrast MRI in the assessment for ligamentous and tendinous injury [13]. Tarallo et al showed the best interobserver agreement in the assessment of lateral collateral complex injuries and the worst interobserver reliability for the UCL [7,14-18].

The use of MRI in the setting of previous history of elbow dislocation is documented whether related to the classic elbow dislocation or the "reversed Horii circle" mechanism of injury and can result in significant ligamentous and tendinous injury to the lateral and the medial stabilizers of the elbow, respectively [14,17,19]. Dutto et al [15] demonstrated a concordance rate between MRI and surgical exploration of 87.5% for injuries of the medial collateral ligamentous complex and 90.9% for injuries of the lateral collateral ligamentous complex. Luokkala et al [16] evaluated 17 consecutive patients with acute simple elbow dislocations and found complete anterior capsule tears in addition to lateral and medial collateral ligamentous injuries.

Athletes are prone to both acute and chronic overuse injuries of the elbow [13]. In a study of elbow injuries incurred during participation of the Rio de Janeiro 2016 Summer Olympic Games, Alizai et al [20] showed a predominance of UCL injury. For the purposes of this document, it is difficult to ascertain the acuity of the injuries from this report.

Furthermore, MRI is particularly useful in the assessment of biceps tears [21-24]. MRI has an improved sensitivity for the detection of partial tears of the biceps and triceps tendons. In a study of 77 patients, Nicolay et al [24] showed partial rupture of the long head of the biceps with an intact short head of the biceps to be the most common injury. On the other hand, isolated complete ruptures of the long head represented the least common injury pattern. Traumatic ruptures had a significantly higher association with ruptures of the short head of the biceps tendon, whereas ruptures of the long head of the biceps tendon accounted for 89% of atraumatic ruptures.

With regard to distal biceps tendon pathology, a nonstandard imaging view, the flexion-abduction-supination (FABS) MRI view, can be performed. Originally described by Giuffre et al [25] in 2004, with the FABS view, the patient is imaged in the prone position with the elbow flexed at 90°, abducted at the shoulder, and with the forearm supinated (thumbs up position). Imaging planes are prescribed in the coronal plane with respect to the humerus to achieve an unraveled view of the distal biceps tendon allowing for the visualization of the entirety of the tendon on a single image [25]. In 2020, Schenkels et al [26] evaluated 50 patients with surgically confirmed distal biceps tendon pathology and found no significant difference in the sensitivity and specificity of the FABS view in the

diagnosis of partial distal biceps tendon tears. However, the interrater reliability was better for FABS view and significantly more accurate than surgical findings in grading the extent of pathology.

In 2021, Tiegs-Heiden et al [27] showed that the FABS sequences changed the radiologist's impression of the distal biceps tendon in the minority of cases and did not significantly change the diagnostic accuracy. The authors suggest that it may have a benefit in challenging cases of high-grade partial versus complete tendon tears, by its ability to identify subtle residual tendon fibers.

MRI is also useful in the assessment of rare triceps tears [21-24]. Lee et al [23] evaluated a small subset of patients and found 2 major causes for acute traumatic rupture of the triceps tendon at the elbow. A fall on an outstretched hand was categorized as an indirect injury, whereas a direct blow to the triceps by an object was considered a direct injury. The authors found that the indirect injury was most likely to result in injury of the lateral and long heads of the distal triceps tendon with an intact medial head tendon. Direct injuries were more likely to have a full-thickness rupture with an odds ratio of 1.75 (95% confidence interval, 0.92-3.32; $P = .02$). In addition, they found that the indirect injuries had associated ligamentous injuries with an odds ratio of 0.13 (95% confidence interval, 0.02-0.78; $P < .001$). However, one paper noted the overestimation of triceps tear severity compared with surgical assessment [28].

US Area of Interest
The use of US to evaluate the distal biceps tendon is well described in the literature [21,29,30]. A study by de la Fuente et al [30] investigated the sensitivity of US in detecting injuries of the distal biceps brachii tendon. The authors compared US examinations with MRI and surgery and found a slight statistical advantage of US over MRI. However, US is at a disadvantage with regard to the detection of partial tearing and tendinopathy.

Lynch et al [31] showed the accuracy of US in the diagnosis of complete distal biceps tendon rupture was inferior to MRI, 45.5% compared with 86.4%. The accuracy rate of US to detect partial tears of the biceps was the same as MRI at 66.7%. The sensitivity and specificity of US for the detection of biceps tendon tears were 62.5% and 20.0%, respectively, inferior to MRI at 76% and 50%. The authors concluded that MRI is a more accurate imaging modality at correctly identifying the type of distal biceps tendon tear, thus enabling the orthopedic surgeon to provide a more precise treatment plan.

Deschrijver et al [32] conducted an extensive literature search and meta-analysis to assess the usefulness of clinical examination testing as well as the usefulness of US. They further investigated whether supplementary sonographic views/maneuvers (eg, posterior approach Cobra technique, lateral approach supinator view, and medial approach pronator view) added benefit to the standard US examination. Their conclusion was that US can be considered an alternative to MRI in the evaluation of the distal biceps tendon ruptures. In a recent study by Miller et al, it was shown that radiologists preferred the medial imaging approach. Furthermore, this particular imaging approach demonstrated substantial interreader agreement [33].

Triceps tendon ruptures are rare, and a handful of studies have shown that US can identify both complete and isolated partial tears of the triceps brachii tendon [34,35]. In addition, in a feasibility study, Barret et al [12] showed that traumatic ligamentous lesions could be detected on US examination with the identified pathology matching the clinical symptomatology. Of note, no traumatic ruptures of the flexor or extensor tendon origins were detected on this study; however, this was a small study with only 9 patients. Assessment of the anterior bundle of the UCL in athletes is well documented and thus could be useful in the setting of acute trauma as well [20,36-38].

The ability of US to visualize tendinous and ligamentous structures in cadaveric and normal volunteers of the medial and lateral elbow is well accepted; however, there are few articles evaluating its usefulness in the acute setting. A case report by van Duijn and Felton [39] described a case of an 18-year-old collegiate baseball pitcher with preinjury and postinjury US with MR arthrographic correlation. This patient was already participating in a research study evaluating the reliability of UCL thickness measurements using US imaging. In this study, the preinjury US image showed a normal hyperechoic appearance of the anterior band of the UCL. Postinjury images showed disruption of the ligamentous fibers of the anterior band of the UCL, with a large hypoechoic gap separating the 2 torn ends of the UCL, which was confirmed at the time of MR arthrography. A single study by Bilger et al [40] evaluated the use of US in the acute phase of closed elbow injuries and found a strong interrater reliability for injuries of the radial collateral, annular, and anterior bundle of the medial collateral ligaments. They further showed 100% US-surgical correlation in a subset of patients who had surgery. In a cadaveric study, Arrigoni et al [41] evaluated the lateral compartment of the elbow after release of the anterior half of the common extensor origin and after complete radial collateral ligament release. They concluded that US evaluation can detect changes related to tendon tears or

muscular avulsions of the common extensor origin and can depict lateral elbow compartmental pathologic laxity as evidence by widening of the articular joint space under dynamic stress maneuvers. Unfortunately, accurate identification of injuries to the lateral collateral ligament was not reliable.

The majority of literature using US for the diagnosis of tendinous injuries is found in the setting of chronic elbow pain, particularly in the athlete. US of the elbow has moderate agreement with MRI of the elbow for the diagnosis and grading of common extensor tendon tears, with the sensitivity, specificity, and accuracy reported at 64.52%, 85.19%, and 72.73%, respectively [42]. Sonoelastography has shown promise for the detection of medial epicondylalgia with a sensitivity, specificity, accuracy, and positive predictive value, and negative predictive value of 95.2%, 92%, 93.5%, 90.0%, and 95.8%, respectively [43].

Conventional US has a sensitivity and specificity of 81% and 91%, respectively, in the detection of full-thickness UCL tears [44]. The sensitivity and specificity of dynamic stress US for the detection of UCL injury are 96% and 81%, respectively [44].

In a review of the literature, Sutterer et al [45] found that stress US can aid in the diagnosis of medial UCL tears, with an injured elbow stress delta (change in ulnohumeral joint space with valgus stress) of 2.4 mm and a stress delta difference (side-side difference in stress delta) of 1 mm, compatible with abnormal ulnohumeral joint laxity as a result of medial UCL injury.

Given the scarcity of literature with regards to lateral and medial supporting structures, more rigorous studies evaluating the usefulness of US in the acute setting are needed; however, given US accuracy in the evaluation of chronic injuries, it will likely provide clinical usefulness for assessment of acute injury.

Summary of Recommendations

- **Variant 1**: Radiography is usually appropriate for the initial imaging of acute elbow or forearm pain.

- **Variant 2**: In the setting of acute elbow or forearm pain with normal or indeterminate radiographs, repeat radiographs in 10 to 14 days or CT without IV contrast is usually appropriate as the next imaging study of the elbow/proximal forearm for the assessment for suspected fracture. These procedures are equivalent alternatives (ie, only one procedure will be ordered to provide the clinical information to effectively manage the patient's care).

- **Variant 3**: In the setting of acute elbow or forearm pain with normal or indeterminate radiographs, US or MRI without IV contrast is usually appropriate as the next imaging study of the elbow/proximal forearm for the assessment for suspected tendon, ligament, or muscle injury. These procedures are equivalent alternatives (ie, only one procedure will be ordered to provide the clinical information to effectively manage the patient's care).

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 go to www.acr.org/ac.

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 [46].

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 (eg, 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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