

Pulmonary Embolism Reporting and Data System (PE-RADS™) v2026 for the Diagnosis of Acute Pulmonary Embolism on CT and MR Angiography

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Pulmonary embolism (PE), defined as blockage of the pulmonary arteries, is a common and serious condition that requires accurate diagnosis and standardized reporting. Noninvasive imaging is well established for the diagnosis and management of PE and is incorporated into multiple societal guidelines. However, specific technical recommendations for the optimal interpretation and standardized reporting of CT and MR angiography remain absent. Diagnostic imaging is used to identify the presence or absence of PE and to risk-stratify patients. Evolving treatment options can be considered once an acute clot is identified, the patient's status is defined, and the patient is referred for appropriate treatment in a timely manner. Patient management for PE often involves multiple care teams, and clear and consistent communication between care teams is critical to patient care. The goal of the Pulmonary Embolism Reporting and Data System (PE-RADS) is twofold: (a) to create a standard lexicon for the description of terms used for acute PE diagnosis at CT and MR angiography and (b) to develop a structured, hierarchical reporting system that incorporates anatomic and accessory findings to classify clot location and right heart imaging features in acute PE and to assist in determining the cardiovascular status of the patient to inform next-step management.

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Pulmonary embolism (PE) has an annual age-standardized incidence of 0.99 per 1000 in the United States and an adjusted mortality rate of 12.2 per 100 000 population in 2020 (1). A PE refers to blockage of the pulmonary arterial system by foreign material that is carried through the bloodstream. While the composition of emboli may vary, the majority of cases represent blood clots that have detached from another cardiovascular site, most commonly the femoral veins. The diagnosis of PE is made when a filling defect is identified within the lumen of the pulmonary arteries. CT and MR angiography are commonly used noninvasive modalities to identify and localize filling defects from the level of the main pulmonary artery to the subsegmental pulmonary arteries. The framework for the Pulmonary Embolism Reporting and Data System (PE-RADS) is structured hierarchically based on the anatomic location of the most proximal clot within the pulmonary arterial system. Risk stratification after a PE diagnosis is based on hemodynamic status, which reflects the heart's ability to overcome afterload pressures that vary with the amount and location of clot within the pulmonary arterial system. Larger and more centrally located clots are often distinguished from subsegmental PE for management decisions and may guide consideration for interventional (catheter-based or surgical) management. Direct and indirect signs of preload and afterload on the heart from clot can be inferred from imaging findings and from laboratory and clinical parameters, including cardiac biomarkers, lactic acid levels, blood pressure, electrocardiography, and echocardiography.

Risk stratification guides clinical management and triage to inpatient, outpatient, or intensive/critical care settings, as well as consideration of isolated anticoagulation, systemic thrombolysis, catheter-based therapies, surgical embolectomy, and mechanical

circulatory support or some combination of therapies. These treatment pathways are not defined by imaging findings alone. The structure of PE-RADS is complementary to existing commonly utilized guidelines by various professional societies, including the European Society of Cardiology, the American Heart Association and American College of Cardiology, the American College of Chest Physicians, the Pulmonary Embolism Response Team (PERT) Consortium, and the American Society of Hematology (2–7). All the above guidelines or scientific statements are targeted towards an audience of bedside clinicians treating acute PE. While recommendations are made in these publications regarding the utilization of various imaging modalities and optimal interpretation, standardized reporting of CT and MR angiography remains absent. It is the authors' hope that multi-disciplinary teams including PERTs are likely to utilize the current document in concert with clinical guidelines documents to optimize processes of care for patients with acute PE. The PE-RADS classification should be used as a complementary assessment in conjunction with detailed text reporting to provide a thorough imaging report for an individual patient. The authors recognize that diagnostic imaging provides a diagnosis, and clinical decision making incorporates imaging findings with laboratory, hemodynamic, and patient-specific factors, which may change over a continuum of time.

Methodology

PE-RADS was formed within the American College of Radiology (ACR) Reporting and Data Systems (RADS) committee with oversight by the ACR RADS Steering Committee. The writing group was convened with 50% representation by the ACR plus additional representation nominated by the Society of Thoracic

Abbreviations

ACR = American College of Radiology, LV = left ventricle, PE = pulmonary embolism, PE-RADS = Pulmonary Embolism Reporting and Data System, RADS = Reporting and Data Systems, RV = right ventricle

Summary

The Pulmonary Embolism Reporting and Data System (PE-RADS) provides a standardized framework for reporting acute pulmonary embolism at CT and MR angiography to guide treatment considerations based on clot location and right heart imaging features.

Essentials

- The Pulmonary Embolism Reporting and Data System (PE-RADS) creates a standard lexicon for the description of terms used for acute pulmonary embolism (PE) diagnosis at CT and MR angiography.
- PE-RADS provides a structured, hierarchical reporting system incorporating anatomical and accessory findings to classify clot location and right heart imaging features in acute PE and to assist in determining cardiovascular status to inform next-step management.

Radiology, PERT Consortium, Society of Interventional Radiology, Society for Cardiovascular Angiography and Intervention, and American College of Chest Physicians. The committee met to determine the framework for assessing PEs to establish the literature search criteria. These areas were disease pathology, imaging techniques, management, and outcomes associated with PEs. Decisions were based on group discussion, independent surveys, available evidence from the literature, and consensus supported by expert opinion within the ACR RADS program (8).

The working group developed PE-RADS in alignment within the context of multiple existing society guidelines for risk stratification of acute PE (2–7) and reporting guidelines (9). Standardized radiologic descriptions and disease classification are increasingly important for communicating findings as treatment modalities evolve, including catheter-based strategies. PE-RADS provides a standardized reporting scheme that that, until now, has not been available for acute PE and parallels other ACR-developed reporting schemes that provide population-based guidance for patient care. The authors acknowledge that laboratory values, the patient's hemodynamic status, clinical presentation, and medical history are all critically important for patient management and the use of PE-RADS is to provide consistent communication of anatomic findings and allow for population-based classification of disease and treatment. The scope of PE-RADS focuses exclusively on imaging findings of acute PE and the right heart on CT and MR angiography. It provides a population-level framework for standardized classification and next-step treatment.

PE-RADS Lexicon of Terminology

Imaging Findings of PE

The diagnosis of PE must include an understanding that not all intravascular filling defects represent acute PE (Table 1, Fig 1). Acute PE manifests as a well-defined area of lower attenuation or signal compared with the surrounding contrast material within the vasculature. The margins of the embolus should be distinct unlike flow artifacts, which tend to be quite ill-defined (10–14), and the filling defect is usually seen in more than one imaging plane. Acute PE is usually centrally located within the lumen of

a vessel and may expand the affected vessel (especially when occlusive). When eccentrically located within the lumen, acute PE tends to form acute angles with the vessel wall (13,14).

As the embolus ages, the margins become less well defined, and the filling defect becomes less mass-like (12,13). As the borders begin to get resorbed, the embolus may become recanalized, and the angles with the vessel wall become less acute (13). Subacute emboli may have concave portions and may appear more lentiform (15). Chronic PE is related to incomplete resolution of emboli in the pulmonary arteries and may follow up to 6% of cases of acute PE (14). The residual thrombus triggers a cytokine-mediated fibrotic proliferation and secondary microvasculopathy, which may lead to elevated pulmonary arterial pressure and increased pulmonary vascular resistance (14–20). These filling defects tend to be linear and are more often eccentrically located within the vessel (10,14,16,18). Chronic PE tends to form obtuse angles with the vessel walls and may be adherent to the wall itself. Other pulmonary artery findings of chronic PE include webs, abrupt vessel cutoff, small caliber vessels, or beaded vessels (18). Chronic PE does not tend to expand the affected vessel and occasionally may calcify.

Nonvascular findings may also help determine the age of PE. Acute PE may present with peripheral infarcts and an area of relative oligemia when the clot is obstructive. In chronic PE, mosaic attenuation is frequently seen from the altered areas of perfusion (18), and bronchiectasis and bronchial artery enlargement have also been reported (21). The diagnosis of subacute PE relies on identifying filling defects that may resemble those of chronic PE but without webs, occlusion, or stenosis of vessels (15). In acute and subacute PE, mosaic attenuation, bronchiectasis, and bronchial artery enlargement are usually absent.

Alternative etiologies of filling defects in the pulmonary arterial system include those of thrombus in situ, tumor thrombus, primary sarcoma, and embolized foreign bodies. Thrombus in situ refers to thrombus that may form in the pulmonary artery, usually in the setting of elevated pulmonary pressures. Although it may mimic the filling defects of chronic PE, other findings of chronic PE (mosaic attenuation, bronchiectasis, enlarged bronchial arteries) tend to be absent. Tumor emboli represent embolized neoplasm within the pulmonary artery; these filling defects tend to enhance with contrast and may show increased uptake on fluorodeoxyglucose (FDG) PET, and treatment is aimed at the neoplasm instead of the filling defect. The most common primary tumor of the pulmonary artery is an intimal sarcoma, which tends to present as a large filling defect and can mimic large central PE on imaging. Patients with pulmonary artery sarcoma are not as symptomatic as those who present with central acute thromboembolism. Pulmonary artery sarcomas also tend to show uptake on FDG PET and enhance with intravenous contrast material. On cross-sectional imaging, sarcomas usually present with lymphadenopathy and enlarged bronchial arteries. Embolized foreign bodies may present as filling defects or with infarcts, and their appearance will depend on the size and attenuation of the foreign body. Septic embolism is not included as part of PE-RADS, as it is an infectious presentation; imaging diagnosis is made primarily on lung parenchymal findings, and treatment options differ from non-infectious causes of PE (22). In cases where an intravascular embolus is

Table 1: Pulmonary Embolism Reporting and Data System (PE-RADS) Lexicon of Terminology for CT and MR Angiography

Term	Explanation	Clinical Implication or Timeframe of Occurrence
Image quality		
Optimal diagnostic	Examination can assess pulmonary arteries to the subsegmental levels Homogeneous attenuation of contrast attained to the subsegmental pulmonary arteries without artifact obscuring the vessel lumen	Ability to exclude presence of PE to the subsegmental pulmonary arteries
Limited/suboptimal	Examination can assess pulmonary arteries to the lobar level Image quality concerns are limited to segmental and/or subsegmental pulmonary arteries	Reduced sensitivity and specificity for excluding PE at segmental and/or subsegmental levels
Non-diagnostic	Examination cannot exclude pulmonary embolus at the main or lobar levels Image quality concerns present at the central levels of the pulmonary arteries	This should be used if there is an inability to exclude PE at main or lobar levels
PE		
Acute	Round or tubular filling defect with well-defined borders located within the vessel lumen Centrally located within the lumen, and when occlusive, the embolus may expand the affected vessel Density is typically 40–70 HU for CT	Within 14 days
Subacute	Tubular or elliptical filling defect within vessel lumen No expansion of the vessel	2–12 weeks
Chronic	Filling defects with vessel lumen at site of prior acute PE Central or peripherally located No expansion of the vessel Linear filling defects, occluded small vessels	Greater than 12 weeks
Heart		
Right ventricle enlargement	Right ventricle is the same size as, or larger than, the left ventricle*	
Right heart thrombus	Filling defect of variable size or morphology within right atrium or ventricle, distinguishable from trabeculations, mixing artifacts, and non-acute etiologies (eg, foreign body)	

Note.—Tables provided courtesy of the American College of Radiology. PE = pulmonary embolism.

* In the setting of right ventricular hypertrophy, enlargement may reflect chronic pressure elevation; without prior imaging, this should be noted as possibly long-standing.

identified in association with parenchymal findings, indication of septic emboli, and clinical context of infection, it should not be graded using PE-RADS to avoid confusion regarding appropriate management.

Image Quality

Heterogeneous contrast opacification of the pulmonary arterial system, as well as artifacts from lung and/or pleural disease, cardiac or respiratory motion, or technical limitations (including quantum noise, streak or beam hardening, chemical shift, aliasing, magnetic susceptibility, and truncation artifacts) can impact visualization of the arterial lumen, producing suboptimal and/or non-diagnostic image quality. Ideal image quality with homogeneous contrast opacification and sharp definition of the vasculature allows for confident differentiation of artifacts from acute PE and for confident diagnosis of the presence or absence of PE. Suboptimal examinations with limitations in image quality should be delineated. For PE-RADS, two categories of image quality limitations are defined based on their impact on patient management: (a) limited image quality, which

excludes assessment of segmental and/or subsegmental arteries, and (b) non-diagnostic image quality, in which the central arteries (main and/or lobar vessels) are unable to be assessed.

PE-RADS Categories of Disease

PE-RADS follows a classification scheme based on the most proximal location of PE on a per-patient basis. Given the prognostic data based on cardiac status, this reporting system will also include modifiers related to right heart status and presence of thrombus proximal to the pulmonary arterial system.

Anatomic Classification for Location of Clot

PE-RADS ordinal categories (Fig 2, Table 2) are based on the anatomic location of the most proximal thrombus (ie, pulmonary embolus) and range from PE-RADS 0 (none) to PE-RADS 4 (central location). This categorization system takes into account variations in pulmonary arterial anatomy and aligns with a classification initially developed to determine treatment options for patients with chronic thromboembolic disease (23). Historically, studies have investigated

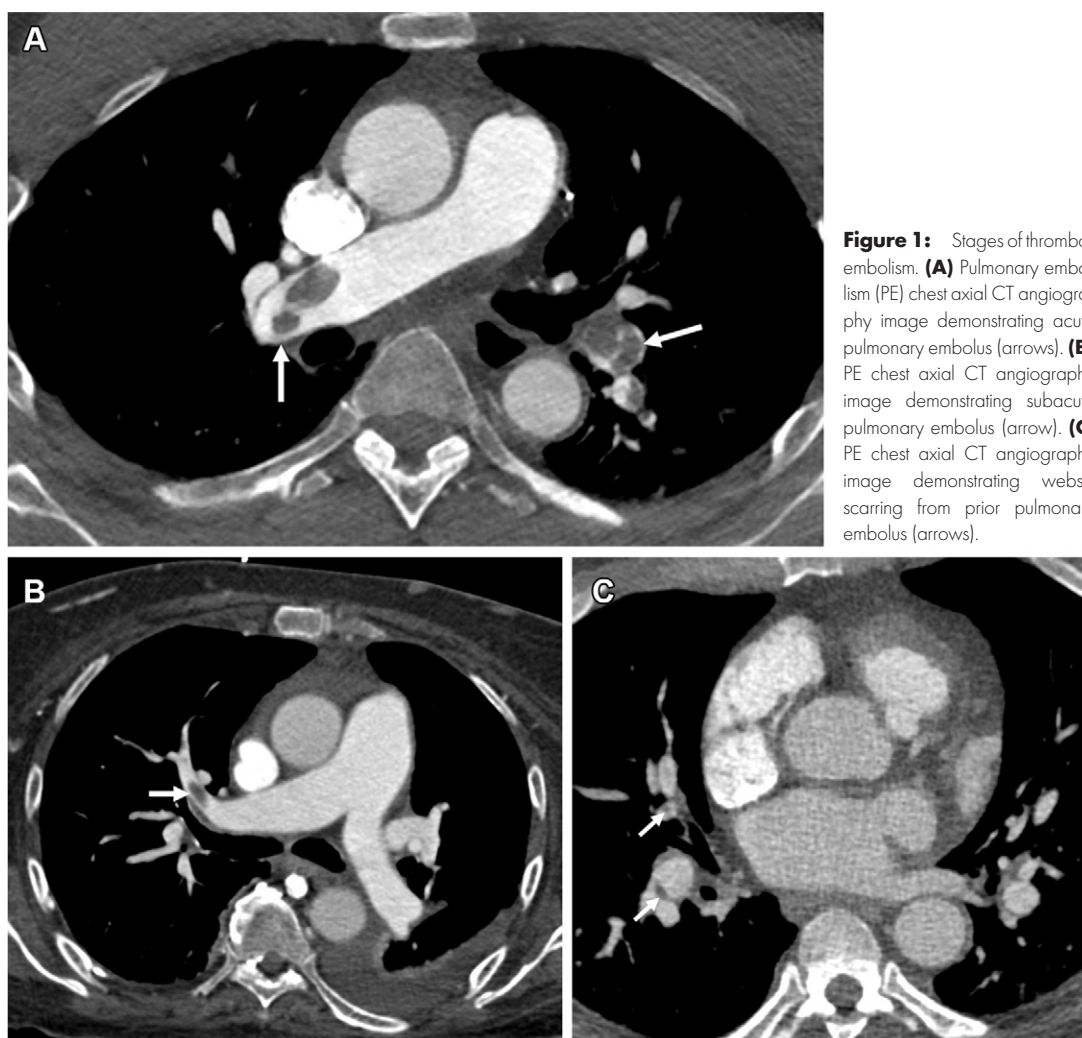


Figure 1: Stages of thromboembolism. **(A)** Pulmonary embolism (PE) chest axial CT angiography image demonstrating acute pulmonary embolus (arrows). **(B)** PE chest axial CT angiography image demonstrating subacute pulmonary embolus (arrow). **(C)** PE chest axial CT angiography image demonstrating webs/scarring from prior pulmonary embolus (arrows).

the prognostic value of thrombus location in acute PE on the clinical status of the patient and suggest that central location portends worse outcomes including increased mortality and hemodynamic compromise (24,25). Several studies (26–29) have shown that patients with saddle PE have a very high in-hospital mortality and that acute saddle (thrombus located in the main pulmonary artery and in both the left and right pulmonary arteries) or central PE (thrombus located in at least two sites: the main pulmonary artery, left or right pulmonary arteries) is the strongest imaging predictor of occult shock compared with unilateral PE (thrombus present in only the left or right pulmonary arteries). The presence of a central clot also outperformed the right ventricle (RV)/left ventricle (LV) ratio, derived by comparing RV and LV size. The RV/LV ratio alone in predicting occult shock, and moderate to severely reduced RV function (as determined by CT or MR angiography) demonstrated a high odds ratio of 6.5 (95% CI: 2.42, 17.45) compared with normal or mildly reduced RV function (26–29). Identifying a central clot location is a critical finding with important implications for the overall prognosis of a patient with acute PE.

The use of a hierarchical anatomic scheme allows clear communication of the most proximal clot location and aligns reporting with treatment options based on vessel size and burden on

heart function. Unlike other quantitative and semiquantitative schemes (eg, Qanadli et al [30], Mastora et al [31]) that address the presence or absence of occlusive clot and overall clot burden, these imaging features are not included in this version of PE-RADS. Their absence does not diminish their value; rather it reflects a focus on simplicity and practicality in this first version of PE-RADS. PE-RADS does not incorporate quantitative assessments of total embolic burden or degree of occlusion of involved pulmonary arteries, as these features have not been shown to consistently correlate with patient outcomes and would add a level of complexity to reporting (32).

PE-RADS 1 and 2 are defined by the most proximal embolus lodged in subsegmental or segmental pulmonary arteries, respectively. In PE-RADS 3, the most proximal embolus is present either in a lobar artery or past the takeoff of the upper lobe artery, as in the interlobar artery and basal trunk to the lower lobe. PE-RADS 4 refers to the proximal embolus involving the central pulmonary arteries, which are defined in this categorization system as the main, right, or left pulmonary arteries.

PE-RADS Modifiers and Accessory Findings

Three modifiers and two accessory features were selected, based on image quality and alternative diagnoses of disease in the pulmonary arterial system.

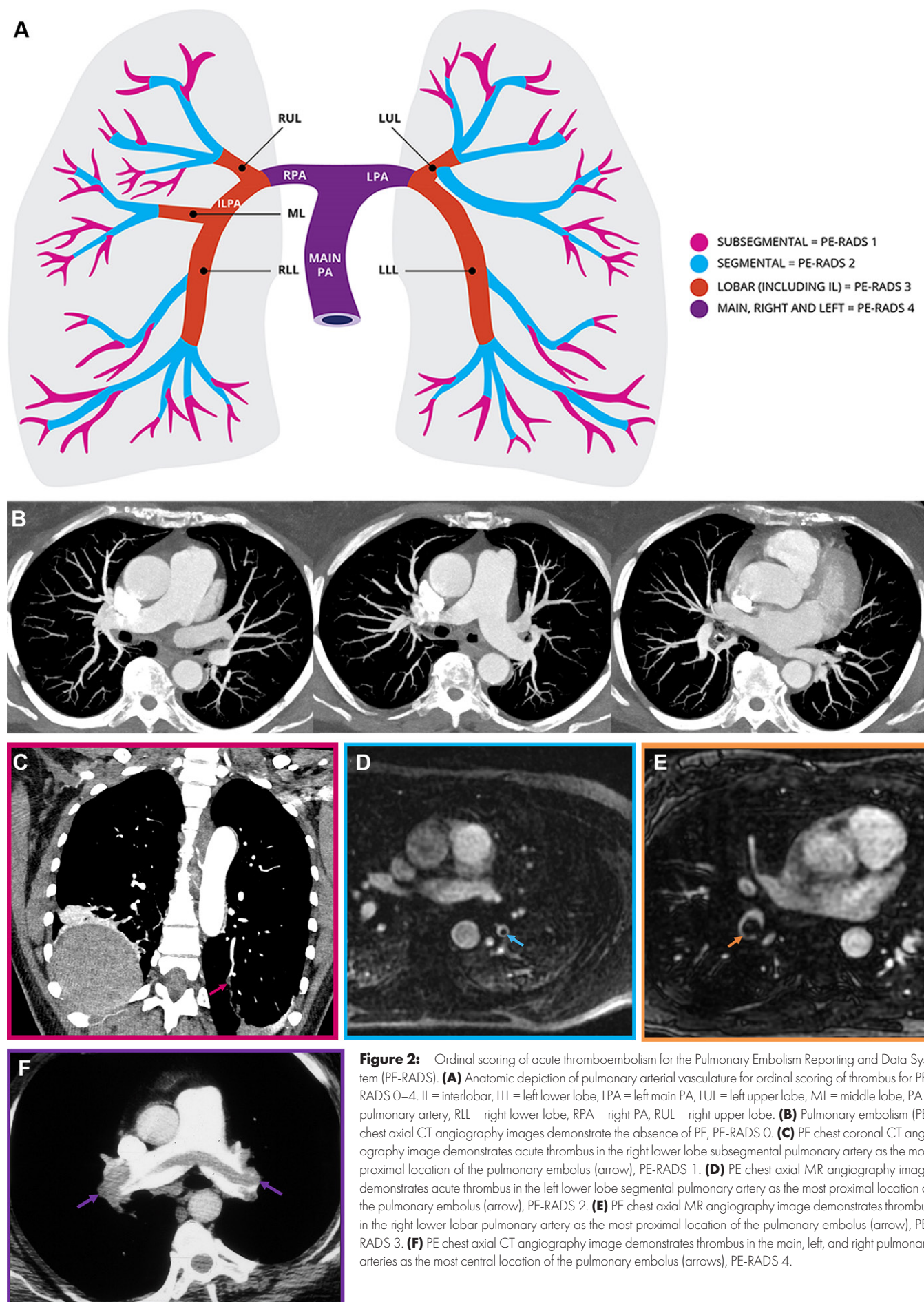


Image Quality

“N” is the modifier to delineate a non-diagnostic study that cannot exclude the presence of acute PE in the central pulmonary arteries; its use is limited to ordinal classification. A CT pulmonary angiogram that is non-diagnostic (eg, poor contrast opacification and/or excessive motion artifact) and cannot reliably exclude emboli in

Table 2: Pulmonary Embolism Reporting and Data System (PE-RADS): Ordinal Anatomic Grading

Score	Pulmonary Arterial Location of Most Proximal Embolus
0	None
1	Subsegmental
2	Segmental
3	Lobar or interlobar artery (past takeoff of upper lobe artery)
4	Central (main, right, left)
N	Nondiagnostic study

Note.—Tables provided courtesy of the American College of Radiology. Modifiers to ordinal grade are to be used in conjunction with a primary ordinal grade. L: Limited image quality is to be used in conjunction with a 0 ordinal grade. If image quality is adequate centrally but inadequate at the segmental and/or subsegmental levels, and no pulmonary embolism (PE) is identified, the study should be labeled OL as limited. E: Exception is to be used in conjunction with a 0–4 or N ordinal grade if a filling defect other than an acute PE is identified to be present. Use of limited or non-diagnostic should not be used if a definitive pulmonary embolus is identified.

the central pulmonary arteries should be graded PE-RADS N; this study cannot be used to guide patient management, and further evaluation is required. If a clot is identified in the pulmonary arterial system, then the N modifier should not be used.

“L” is the modifier for a suboptimal study if a study is not fully diagnostic (ie, not all segmental and/or subsegmental pulmonary arteries can be interpreted with confidence) and no pulmonary embolus is identified in central arteries. For example, an examination in a patient with a suboptimal study allowing confident evaluation only to the level of the lobar arteries and no detected emboli should be graded PE-RADS OL, where L indicates limited study. The report should document that segmental and subsegmental pulmonary arteries are suboptimally evaluated to indicate the level to which the vessels are visualized; clinical judgement then determines the need for further evaluation. The use of the L modifier is applied following a PE-RADS ordinal score of 0 (Fig 3).

Exceptions

“E” is used to indicate the presence of pulmonary arterial filling defects that do not represent acute thromboemboli. “E” is used as a modifier to the ordinal PE-RADS category. For example, a patient with an enhancing soft tissue mass in the main pulmonary artery concerning for sarcoma should be graded PE-RADS 0/E if no acute PE is present (Fig 4). A patient who is found to have proximal acute embolus in the right interlobar artery and multiple narrowed lobar and segmental arteries containing webs consistent with chronic thromboemboli should be graded PE-RADS 3/E. Reports of all examinations that are given an E modifier should include a description of the intravascular filling defects, including location with identification of their presumptive type (Table 3, Fig 4) in the Findings and Impression sections, respectively.

Cardiac Status

PE-RADS ordinal categories are complemented by an accessory modifier to include cardiac status that is defined by specific cardiac chamber size and the presence of clot in the right-sided chambers. These accessory findings address the importance of identifying patients who have pressure overload and are at risk of cardiac decompensation as well as identification of the source of PE to guide patient management. Given the mechanism of

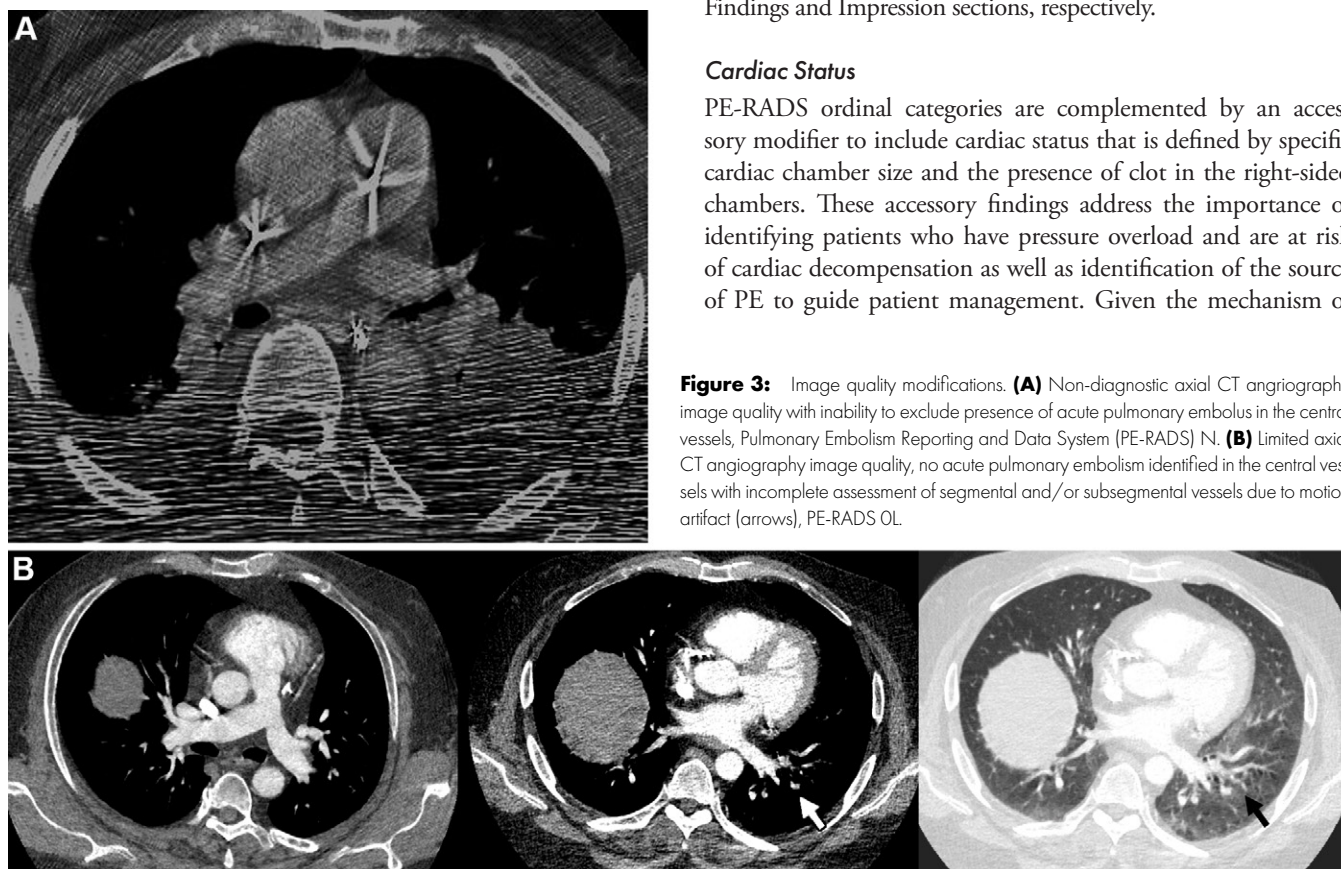


Figure 3: Image quality modifications. **(A)** Non-diagnostic axial CT angiography image quality with inability to exclude presence of acute pulmonary embolus in the central vessels, Pulmonary Embolism Reporting and Data System (PE-RADS) N. **(B)** Limited axial CT angiography image quality, no acute pulmonary embolism identified in the central vessels with incomplete assessment of segmental and/or subsegmental vessels due to motion artifact (arrows), PE-RADS OL.

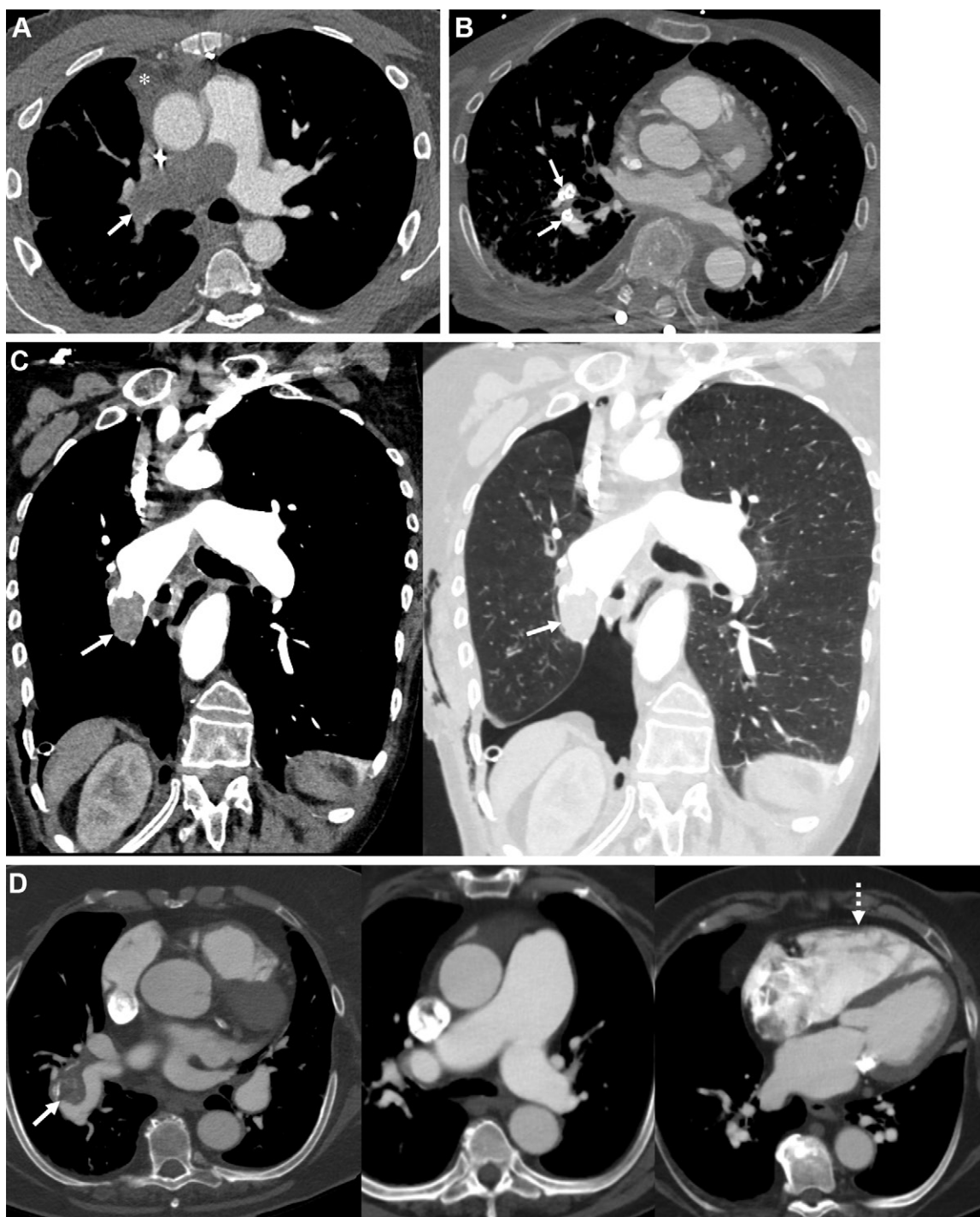


Figure 4: Non-acute thromboembolic filling defects in the pulmonary arterial system. Pulmonary Embolism Reporting and Data System (PE-RADS) E. **(A)** Pulmonary embolism (PE) chest axial CT angiography image demonstrates an expansile mass in the right artery (arrow) and mediastinal lymphadenopathy (*) consistent with pulmonary artery angiosarcoma. **(B)** PE chest axial CT angiography image demonstrates cement emboli in the pulmonary arteries (arrows). **(C)** PE chest coronal CT angiography images demonstrate thrombus in situ in the right pulmonary artery after right lung partial resection (arrows). **(D)** Chronic thromboembolic pulmonary hypertension PE chest axial CT angiography images demonstrate sequelae of prior thromboembolism (solid arrow) with findings of pulmonary arterial hypertension with right ventricular enlargement (dotted arrow).

decompensation from PE being linked to right heart failure, special attention should be paid to signs of acute pressure overload. CT signs such as elevated RV/LV ratio, flattening or bowing of the interventricular septum, and reflux of contrast media into the inferior vena cava are markers that may indicate right heart strain, a diagnosis made by combination of laboratory findings and dedicated cardiac imaging (33–41).

Identification of RV enlargement using anatomic measurements can be limited on routine non-electrocardiographically gated chest CT or MR angiography examinations. A surrogate for absolute RV enlargement that has been validated to outcomes is the RV/LV ratio, derived by comparing RV and LV size. The RV/LV ratio can be calculated by various methods: (a) measurement of RV/LV size ratio on axial (transverse) CT or MR angiography

images with the maximal distance between the RV endocardium and the interventricular septum (aligned perpendicular to the septum) compared with the maximal distance between the interventricular septum; (b) measurement of RV/LV ratio in the

Table 3: Pulmonary Embolism Reporting and Data System (PE-RADS): Exception (E)

Examples of Types of Filling Defects to Be Included in PE-RADS E

Chronic thromboembolism

In situ thrombus

Pulmonary artery sarcoma

Tumor embolus

Cement (or other exogenous material) embolus

Air embolus

Note.—Tables provided courtesy of the American College of Radiology. Please note that this is not a comprehensive list. Exceptions should be used denote the presence of an intravascular filling defect that is not an acute pulmonary embolus.

four-chamber plane of the heart, wherein a dedicated four-chamber view of the heart is created and maximal distance from the RV endocardium and the interventricular septum (aligned perpendicular to the septum) is measured at maximal distance from the LV endocardium and the interventricular septum; or (c) RV/LV volumetric assessment, for which the total three-dimensional RV and LV volumes are calculated and compared (Fig 5). There is no evidence favoring one method of measuring RV/LV ratio over another in terms of outcome prediction. Therefore, the selection of measurement technique can be based on institutional or local preference. Among the three options, measurement on axial imaging may be the simplest and most efficient approach in routine clinical practice.

RV enlargement is an independent predictor of adverse in-hospital outcome both in the population with PE (hazard ratio, 3.5 [95% CI: 1.6, 7.7]) and in patients who are hemodynamically stable and do not have PE (hazard ratio, 3.8 [95% CI: 1.3, 10.9]) (42–44). Increasing RV/LV diameter ratios are associated with rising prognostic specificity; various studies and guidelines use 0.9–1.0 as discriminatory values for classifying abnormal RV enlargement, and this working group chose to value specificity over sensitivity and use a ratio of 1.0 as the threshold for PE-RADS

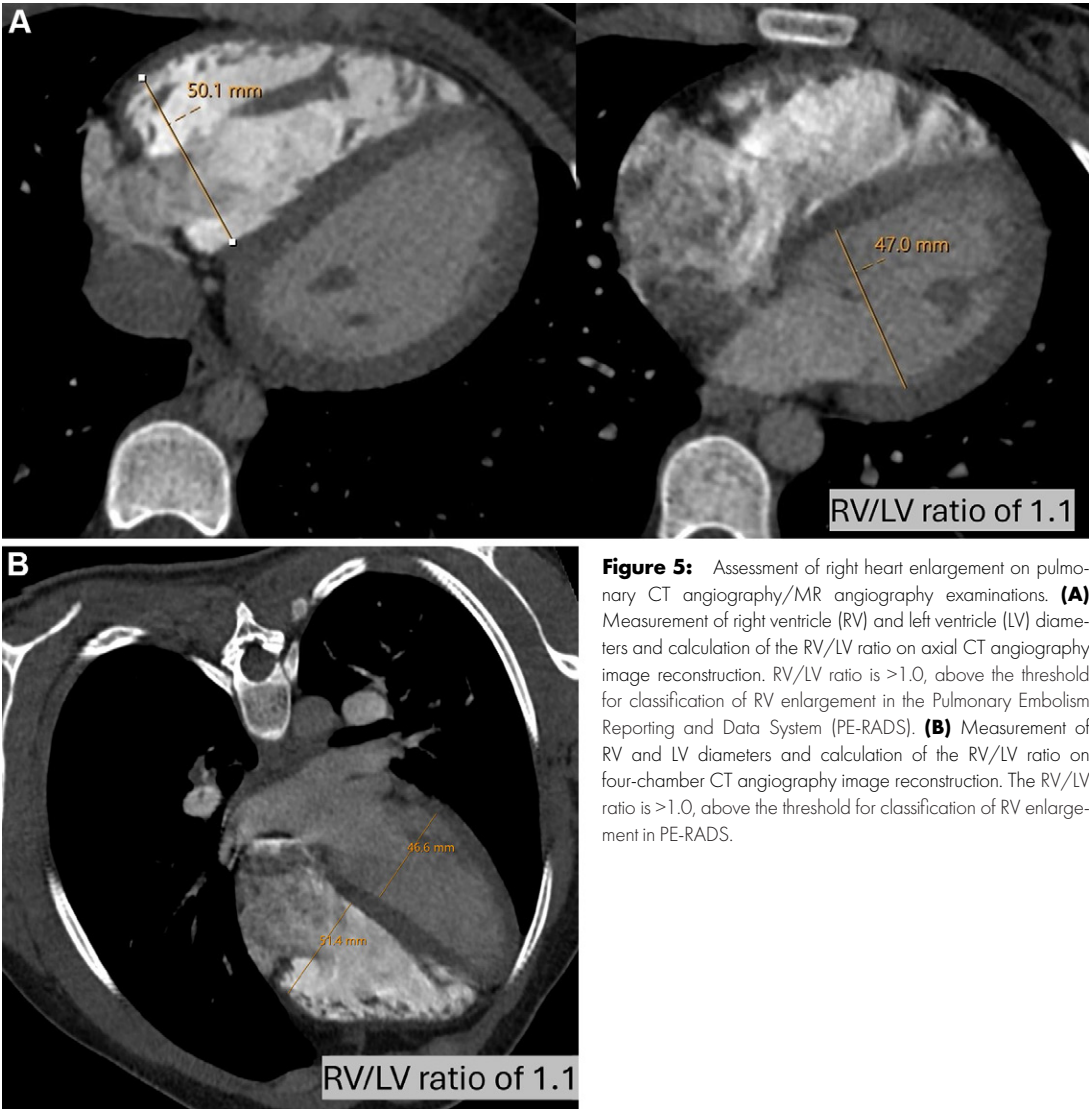


Figure 5: Assessment of right heart enlargement on pulmonary CT angiography/MR angiography examinations. **(A)** Measurement of right ventricle (RV) and left ventricle (LV) diameters and calculation of the RV/LV ratio on axial CT angiography image reconstruction. RV/LV ratio is >1.0, above the threshold for classification of RV enlargement in the Pulmonary Embolism Reporting and Data System (PE-RADS). **(B)** Measurement of RV and LV diameters and calculation of the RV/LV ratio on four-chamber CT angiography image reconstruction. The RV/LV ratio is >1.0, above the threshold for classification of RV enlargement in PE-RADS.

classification of right heart enlargement. The presence of right heart enlargement accompanying PE is strongly associated with adverse outcome, and in PE-RADS, a modifier (RV+) indicating the presence of right heart enlargement should accompany each positive category (PE-RADS 1–4). For example, a patient with the most proximal embolus in the right pulmonary artery and an RV/LV ratio of 1.1 should be graded PE-RADS 4/RV+ (Table 4). We have chosen the term RV enlargement instead of RV strain because many PE examinations are often read without prior examinations, making it difficult to distinguish acute from longstanding enlargement. In addition, echocardiographic imaging features used to define RV strain cannot be consistently identified on PE CT and MR angiography.

Cardiac Thrombus

Right heart thrombus may occasionally be found in the setting of acute PE. The true prevalence is not well known, though the reported rate was 2.0%–4.9% among patients with acute PE in two separate large registries (45,46). While the presence of RV thrombus has not been independently associated with outcomes, the presence of clot in transit through the right heart chambers with or without transit through a patent foramen ovale impacts treatment management and, as such, should be reported, if identified (Fig 6). The exclusion of clot in the right atrium or RV can often be challenging due to variable enhancement of the right heart chambers on PE CT and MR angiography examinations and the presence of non-uniform

trabeculation and cardiac motion. However, the positive identification of definitive clot in the right-sided cardiac chambers directs the next step in patient care (47,48). In PE-RADS, the confident diagnosis of clot in the right atrium or RV should be noted with thrombus positive (T+) as a modifier, with note that the lack of using T+ does not indicate that there is no clot present in these chambers (Table 4).

Other imaging findings of note, which are not currently included as unique modifiers, include absolute left atrial size, right atrial/left atrial ratio, enlarged pulmonary artery (which may indicate pulmonary arterial hypertension), and pulmonary infarcts. Secondary signs of right heart dysfunction, including contrast reflux into the hepatic veins and inferior vena cava and deviation of the interventricular septum toward the LV, were not included as unique modifiers because these findings lack reliable, reproducible anatomic values and vary with imaging technique and patient-specific factors (Appendix S1; 49–60). We recognize that these findings are used at individual sites, and their exclusion from PE-RADS does not indicate opposition to including them in individual patient reports according to local practice.

Recommendations for Patient Management

The management of acute PE incorporates imaging findings, patient’s clinical status, and relevant risk factors, none of which alone can independently guide patient management. Guidance in this document is intended for population-based management, recognizing that individual treatment sites, available resources, and patient-specific factors must also be assessed. This version of PE-RADS seeks to build a foundation for standardization of reporting PE based on anatomic location central to distal in the pulmonary arterial system and impact on right heart function as the primary points for next-step patient management. Stratification of acute PE based on anatomic location provides a readily accessible reporting framework for all imagers and, in conjunction with assessment of the right heart, aligns with escalation pathways for treatment options (none, medical only, or medical plus interventional) (Table 5).

Table 4: Pulmonary Embolism Reporting and Data System (PE-RADS): Accessory Findings	
Accessory Findings Related to Cardiac Status	Definition
RV+	Right ventricle enlarged -RV to LV ratio greater than or equal to 1.0 -Measured axial, four-chamber, or volumetric
T+	Definitive thrombus identified in the right atrium and/or right ventricle
Note.---Tables provided courtesy of the American College of Radiology.	

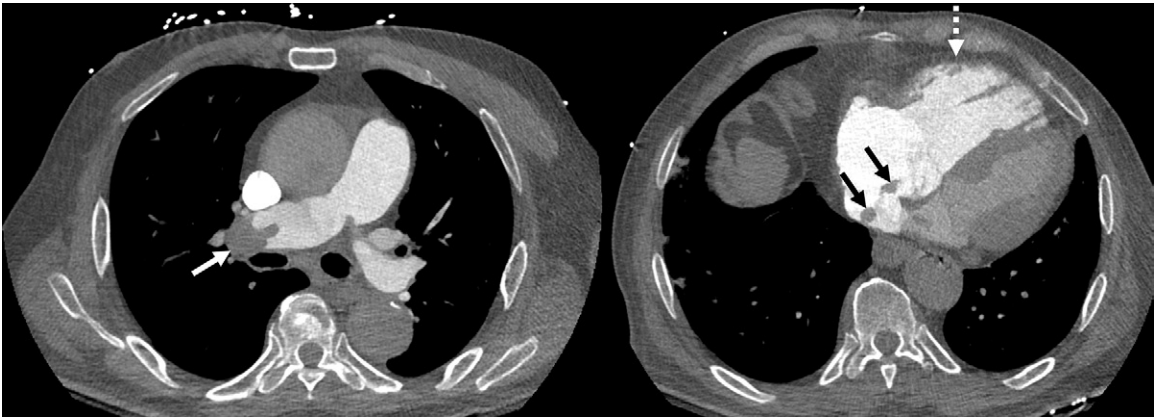


Figure 6: Acute pulmonary embolism (PE) with right ventricle (RV) enlargement and clot-in-transit. PE chest axial CT angiography images demonstrate pulmonary embolus in the right pulmonary artery (white solid arrow), an enlarged RV (dotted arrow), and thrombus transiting through the right atrium (black arrows), Pulmonary Embolism Reporting and Data System (PE-RADS) 4/RV+/T+. The “4” refers to the PE-RADS ordinal category for the most proximal clot location (central arteries). “RV+” indicates RV enlargement (RV to left ventricle ratio ≥ 1.0). “T+” indicates definitive thrombus identified in the right atrium and/or RV.

Imaging findings alone cannot define treatment decisions for acute PE. Centrally located clot at the main and lobar pulmonary arterial level should include consideration for medical treatment in conjunction with bleeding risk assessment with consideration for interventional options based on underlying

cardiac function, which may be identified on CT or MR angiography performed for PE. Thrombus at the segmental levels may have a more nuanced consideration depending on the cumulative volume of clot and number of segmental arteries involved. The presence of an acute PE at any location should

Table 5: Pulmonary Embolism Reporting and Data System (PE-RADS) Assessment Categories

PE-RADS Score	Modifier	Findings	Management and Referral Considerations*	Additional Investigations Specific to PE Management
0		No acute PE present	Acute PE is not the cause of the patient's symptoms Consider alternative diagnosis	
1: Subsegmental				
	...	Acute PE is present	1) Anticoagulation and bleeding risk [†] 2) Assessment of clinical symptoms and VTE risk factors	Consider lower extremity venous imaging in isolated subsegmental PE to inform anticoagulation management vs surveillance
	RV+	Acute PE is present Acute PE is unlikely the sole cause of RV enlargement	1) Anticoagulation and bleeding risk [†] 2) Assessment of clinical symptoms and VTE risk factors 3) Assessment of clinical symptoms including signs of RV failure and hemodynamic instability	Consider dedicated workup for etiology of RV enlargement (eg, echocardiography and electrocardiogram)
2: Segmental				
	...	Acute PE is present	1) Anticoagulation and bleeding risk [†] 2) Assessment of clinical symptoms and VTE risk factors	
	RV+	Acute PE is present Acute PE may be the cause of RV enlargement if there is extensive obstructive thrombus present	1) Anticoagulation and bleeding risk [†] 2) Assessment of clinical symptoms and VTE risk factors 3) Assessment of clinical symptoms including signs of RV failure and hemodynamic instability	Consider dedicated cardiovascular assessment (eg, echocardiography and electrocardiogram)
3: Lobar				
	...	Acute PE is present	1) Anticoagulation and bleeding risk [†] 2) PE risk stratification [‡]	
	RV+	Acute PE is present Acute PE may be the major contributing cause of RV enlargement	1) Anticoagulation and bleeding risk [†] 2) Assessment of clinical symptoms including signs of RV failure and hemodynamic instability 3) PE risk stratification [‡] 4) Assessment for reperfusion therapy [†] 5) PE specialist consultation [§]	Recommend dedicated cardiovascular assessment (eg, echocardiography and electrocardiogram)
4: Central				
	...	Acute PE is present	1) Anticoagulation and bleeding risk [†] 2) PE risk stratification [‡]	
	RV+	Acute PE is present Acute PE is likely a major contributing cause of RV enlargement	1) Anticoagulation and bleeding risk [†] 2) Assessment of clinical symptoms, including signs of RV failure and hemodynamic instability 3) PE risk stratification [‡] 4) Assessment for reperfusion therapy [†] 5) PE specialist consultation [§]	Recommend dedicated cardiovascular assessment (eg, echocardiography and electrocardiogram)
Any	T+	Thrombus identified in the RA and/or RV	PE specialist consultation [§] Cardiac intervention or surgical or vascular interventional radiology consultation if thrombus is traversing patent foramen ovale	Recommend dedicated cardiovascular assessment (eg, echocardiography and electrocardiogram)
Non-diagnostic	N	Cannot exclude presence of PE at any level		Consider alternative imaging or repeat CT/MR angiography
Limited	L	No PE identified but study is limited at the segmental or subsegmental arteries	Per definition, classified as PE-RADS 0L; determine next steps based on clinical assessment	

(Table 5 continues)

Table 5 (continued): Pulmonary Embolism Reporting and Data System (PE-RADS) Assessment Categories

Note.—Tables provided courtesy of the American College of Radiology. Ordinal score for anatomic location/exception/right ventricle (RV)/thrombus (T) would be preferred order for reporting. Exceptions should be used in place of an anatomic location if no acute pulmonary embolism (PE) is present or can be added if acute PE is present and there is an additional exception also present, in which case the pathology for the exception should be clearly stated and included in the final classification. Use of non-diagnostic instead of an ordinal number or limited in conjunction with an ordinal number of 0 should only be used if no definitive acute PE is identified: N/(RV/T) or 0L/(RV/T). 0L indicates no acute PE identified, with the study limited in assessment at segmental or subsegmental levels. If there are limitations in image quality (ie, noise, artifacts, etc.) and acute PE is identified, the N notation should not be used. RV enlargement (RV+) and thrombus present in the RV or right atrium (T+) descriptors are only used if RV to left ventricle ratio is equal to or greater than 1.0 or a thrombus is definitely identified. VTE = venous thromboembolism. RA = right atrium.

* Management considerations are on a population basis to provide guidance for next step management; management for specific patients must include patient-specific factors.

† Anticoagulation and/or reperfusion therapy should be considered in the context of individual patient bleeding risk assessment.

‡ PE risk stratification performed with a clinical risk prediction score to guide treatment.

§ PE specialist consultation (ie, critical care, pulmonary, hematology, cardiology, interventional radiology, or PE response team).

include consideration for anticoagulation in conjunction with bleeding risk assessment and clinical risk stratification. It may be appropriate for some patients with isolated subsegmental PE to be managed with observation alone, whereas others with subsegmental PE may require anticoagulation depending on clinical factors.

Utilization of PE-RADS

Similar to other RADS, the PE-RADS classification should accompany a full interpretation of the CT and/or MR angiography examination performed specifically for the assessment of PE. The order of nomenclature should be as follows: (a) ordinal value for the most proximal location of clot: 0–4; (b) status of RV; and (c) presence of thrombus. For nondiagnostic examinations, N should be used instead of an ordinal value, and for limited examinations, L should be used with the ordinal value of 0 (Table 5).

PE-RADS is set up for use for acute PE assessment. The panel recognizes that patients may be reimaged and endorses the use of modifying PE-RADS classification as imaging findings change. The panel endorses the inclusion of specific items in PE CT and MR angiography reports that relate to PE-RADS. Ongoing clinical trials and registries will provide further information to inform patient care and imaging data.

Future Directions

PE-RADS version 2026 provides a framework for a standardized reporting scheme for acute PE merging anatomic findings in the pulmonary arteries and the right heart. While simple in construct, with a 0–4 ordinal scale, two accessory features, and three modifiers, the authors prioritized ease of early adoption while allowing room for future expansion. PE-RADS offers an opportunity to assess economic impact (time to treatment and resource use) and disease distribution in patients with suspected acute PE, as well as initial treatment decisions and patient outcomes that can be compared across various patient care sites. Current multicenter trials (46,61–70) will help guide further refinement of management schemes and additional imaging findings that directly impact outcomes.

The Pulmonary Embolism Reporting and Data System (PE-RADS) is a first step toward standardizing reporting of acute pulmonary embolism at CT and MR angiography. This

standardization aims to guide treatment considerations based on clot location and right heart imaging features. This reporting system incorporates imaging findings within the context of patient-specific clinical features and aligns them with population-based treatment guidelines to support consistent management recommendations.

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