

**American College of Radiology
ACR Appropriateness Criteria®
Diffuse Lung Disease**

Variant: 1 Suspected diffuse lung disease. Initial Imaging.

Procedure	Appropriateness Category	Relative Radiation Level
Radiography chest	Usually Appropriate	☢
CT chest without IV contrast	Usually Appropriate	☢☢☢
CT chest with IV contrast	May Be Appropriate	☢☢☢
MRI chest without and with IV contrast	Usually Not Appropriate	○
MRI chest without IV contrast	Usually Not Appropriate	○
CT chest without and with IV contrast	Usually Not Appropriate	☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢

Variant: 2 Confirmed diffuse lung disease. Suspected acute exacerbation or acute deterioration. Initial Imaging.

Procedure	Appropriateness Category	Relative Radiation Level
Radiography chest	Usually Appropriate	☢
CT chest without IV contrast	Usually Appropriate	☢☢☢
CT chest with IV contrast	May Be Appropriate	☢☢☢
MRI chest without and with IV contrast	Usually Not Appropriate	○
MRI chest without IV contrast	Usually Not Appropriate	○
CT chest without and with IV contrast	Usually Not Appropriate	☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢

Variant: 3 Confirmed diffuse lung disease without acute clinical deterioration. Routine follow-up imaging clinically indicated.

Procedure	Appropriateness Category	Relative Radiation Level
CT chest without IV contrast	Usually Appropriate	☢☢☢
Radiography chest	May Be Appropriate (Disagreement)	☢
CT chest with IV contrast	May Be Appropriate	☢☢☢
MRI chest without and with IV contrast	Usually Not Appropriate	○
MRI chest without IV contrast	Usually Not Appropriate	○
CT chest without and with IV contrast	Usually Not Appropriate	☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢

Panel Members

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Summary of Literature Review

Introduction/Background

Diffuse lung diseases (DLD) may also be referred to as diffuse parenchymal lung diseases or interstitial lung diseases. These terms represent a diverse array of disorders affecting the lung parenchyma that are grouped together due to similar clinical, radiographic, or pathologic mechanisms [1,2]. The term “interstitial” is misleading in many cases as a majority of these pathologies demonstrate involvement of the alveola, airways, or both, in addition to the pulmonary interstitium. The potential causes of DLD are broad and include multiple idiopathic diseases, connective tissue diseases, vasculitides, granulomatous diseases, inhalational exposures, genetic conditions, and drug reactions with several hundred established clinical syndromes and pathologies currently identified [1,2]. Imaging of these diseases can be complicated by overlap of imaging patterns with other disease processes, such as infection or malignancy, which are outside the scope of this discussion. See the ACR Appropriateness Criteria® topics on “[Acute Respiratory Illness in Immunocompetent Patients](#)” [3], “[Acute Respiratory Illness in Immunocompromised Patients](#)” [4], and “[Noninvasive Clinical Staging of Primary Lung Cancer](#)” [5] for further imaging guidance.

Clinical suspicion of DLD is frequently seen in patients with chronic dyspnea (see the ACR Appropriateness Criteria® topic on “[Chronic Dyspnea-Noncardiovascular Origin](#)” [6]), nonproductive cough, established inhalational exposures (see the ACR Appropriateness Criteria® topic on “[Occupational Lung Diseases](#)” [7]), or a diagnosis of another systemic disease that is known to be associated with lung involvement, such as connective tissue disease or vasculitis. Treatment and prognosis of DLD is highly varied and depends greatly on the underlying cause of lung injury as well as any associated conditions. Imaging and other biomarker testing play a critical role in diagnosis and follow-up of many of these diseases, although multidisciplinary discussion involving pulmonologists, radiologists, pathologists, and other clinical specialists is the current standard for diagnosis of several DLDs [2,8-10].

Some of the DLDs, such as idiopathic pulmonary fibrosis, demonstrate episodes of acute exacerbation or acute deterioration as a result of the intrinsic DLD itself. These episodes typically manifest with a 1 to 2 month prodrome of worsening dyspnea or cough and progressive lung disease [11-16]. The development of acute exacerbations is not rare and has significant impact on mortality [17]. Clinically, these episodes frequently overlap with other causes of respiratory illness, such as infection, pulmonary embolism, heart failure, or malignancy. These other causes of acute clinical decline are outside the scope of this work and are best addressed in other ACR Appropriateness Criteria documents.

Special Imaging Considerations

CT imaging for DLDs requires special consideration. CT protocols should be tailored to meet individual needs based on the clinically suspected DLDs. Specifically, utilizing a high-resolution CT (HRCT) protocol (see the [ACR–STR Practice Parameter for the Performance of High-Resolution Computed Tomography \(HRCT\) of the Lungs in Adults](#) [18]) that uses thin-section images of the lung parenchyma is essential, and adjunct sequences including expiratory images and prone images are frequently of benefit in evaluating these conditions [19-22]. Additionally, volumetric CT data acquisition can facilitate multiplanar thin-section reconstructions, which aids evaluation of DLD distribution [23-26]. In this document, statements regarding the appropriateness of

noncontrast CT include the use of such HRCT sequences based on the suspected diffuse lung disease and clinical questions.

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 wherein each procedure provides unique clinical information to effectively manage the patient's care).

Discussion of Procedures by Variant

Variant 1: Suspected diffuse lung disease. Initial Imaging.

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A. CT Chest

CT findings and patterns in DLD are often sufficient to permit either a limited differential or confident single diagnosis and play a role in multiple clinical diagnosis algorithms [9,10,27]. Imaging pattern characterization on HRCT is especially important in the diagnosis of usual interstitial pneumonia [9,27-31]. Incorporation of HRCT interpretation into multidisciplinary discussions of DLD result in improved diagnostic accuracy and confidence [2,10,32-37]. In cases in which tissue confirmation is required, the location of imaging abnormalities on CT may help guide appropriate biopsy sites [9,27]. Numerous studies support the increased sensitivity and specificity of CT over chest radiography for lung parenchymal changes related to DLD [38-51]. Adequate correlation has been reported between CT disease extent and severity of symptoms and physiologic testing for several DLDs [44,52-57]. The presence and extent of HRCT imaging features of DLD may also serve as important prognostic variables [58-76]. Multiple quantitative imaging techniques evaluating diagnosis and prognosis are based on CT imaging [68,77-83]. There is no relevant literature to support the use of CT with intravenous (IV) contrast for initial imaging of DLD; however, IV contrast may be of use in evaluation of alternative diagnoses with overlapping clinical features or conditions that also involve the pleura, mediastinum, and pulmonary vessels (see the ACR Appropriateness Criteria® topics on "[Acute Respiratory Illness in Immunocompetent Patients](#)" [3], "[Chronic Dyspnea-Noncardiovascular Origin](#)" [6], "[Noninvasive Clinical Staging of Primary Lung Cancer](#)" [5], and "[Suspected Pulmonary Embolism](#)" [84]).

Variant 1: Suspected diffuse lung disease. Initial Imaging.

B. FDG-PET/CT Skull Base to Mid-Thigh

There is limited research supporting the use of fluorine-18-2-fluoro-2-deoxy-D-glucose (FDG)-PET/CT in some DLDs, which does not currently support the use of FDG-PET/CT for initial imaging. FDG-PET/CT may have a secondary role for evaluation of some DLDs because of increased FDG activity that correlates with disease severity and prognosis. A majority of relevant studies focus on

sarcoidosis and a minority on fibrotic DLD, including idiopathic pulmonary fibrosis [85-105].

Variante 1: Suspected diffuse lung disease. Initial Imaging.

C. MRI Chest

There is limited research supporting the use of MRI in DLDs, which does not currently support the use of MRI for initial imaging. Small studies have shown adequate concordance of MRI findings with CT in established cases of DLD utilizing a variety of specialized MRI sequences. Some MRI sequences in the setting of DLD may provide additional functional information, such as tissue characterization, gas transfer efficiency, and lung elasticity [106-118].

Variante 1: Suspected diffuse lung disease. Initial Imaging.

D. Radiography Chest

A normal chest radiograph in the setting of suspected DLD does not exclude the possibility of clinically important DLD [119]. Multiple studies demonstrate the increased sensitivity and specificity of CT over radiographs for evaluation of DLD [38-47,49-51,120,121]. Chest radiography serves the primary function of evaluating for alternative diagnoses, such as infection or cardiogenic edema (see the ACR Appropriateness Criteria® topics on "[Acute Respiratory Illness in Immunocompetent Patients](#)" [3], "[Acute Respiratory Illness in Immunocompromised Patients](#)" [4], "[Chronic Dyspnea-Noncardiovascular Origin](#)" [6], and "[Rib Fractures](#)" [122]). Obtaining a baseline chest radiograph at time of initial diagnosis of DLD may assist with diagnosis of these other conditions via radiograph on follow-up.

Variante 2: Confirmed diffuse lung disease. Suspected acute exacerbation or acute deterioration. Initial Imaging.

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A. CT Chest

CT can confirm the presence of airspace abnormalities consistent with acute exacerbation or acute deterioration of DLD [11-16,123,124]. Additionally, CT may help exclude alternative causes for worsening clinical symptoms, such as pneumothorax, infection, or malignancy. For suspected cases of acute exacerbation of idiopathic pulmonary fibrosis, development of new airspace disease on CT is a required diagnostic feature [14]. Additionally, the distribution and extent of findings on CT in the setting of acute exacerbation of idiopathic pulmonary fibrosis has demonstrated prognostic value [12]. There is no relevant literature to support the use of CT with IV contrast for imaging of suspected acute exacerbation or acute deterioration of confirmed DLD, although IV contrast may help in the evaluation for alternative diagnoses with overlapping clinical features (see the ACR Appropriateness Criteria® topics on "[Acute Respiratory Illness in Immunocompetent Patients](#)" [3] and "[Suspected Pulmonary Embolism](#)" [84]).

Variante 2: Confirmed diffuse lung disease. Suspected acute exacerbation or acute deterioration. Initial Imaging.

B. FDG-PET/CT Skull Base to Mid-Thigh

There is limited research supporting the use of FDG-PET/CT in some DLDs, which does not currently support FDG-PET/CT for imaging of acute exacerbation or acute deterioration of DLD.

Variante 2: Confirmed diffuse lung disease. Suspected acute exacerbation or acute deterioration. Initial Imaging.

C. MRI Chest

There is limited research supporting the use of MRI in some DLDs, none of which currently supports the use of MRI for imaging of acute exacerbation or acute deterioration of DLD.

Variant 2: Confirmed diffuse lung disease. Suspected acute exacerbation or acute deterioration. Initial Imaging.

D. Radiography Chest

There is no research supporting the use of chest radiography for imaging of acute exacerbation or acute deterioration in DLD. Numerous studies demonstrate the increased sensitivity and specificity of CT over radiographs for evaluation of DLD [38-47,49-51,120,121]. In this setting, chest radiography serves the primary function of evaluating for alternative diagnoses, such as pneumothorax, infection, or cardiogenic edema (see the ACR Appropriateness Criteria® topic on [“Acute Respiratory Illness in Immunocompetent Patients”](#) [3]).

Variant 3: Confirmed diffuse lung disease without acute clinical deterioration. Routine follow-up imaging clinically indicated.

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A. CT Chest

There are no data to support routine follow-up or surveillance imaging of confirmed DLD. However, a variety of clinical scenarios may warrant such repeat imaging. Longitudinal data available from multiple serial CT examinations can provide improvements in diagnostic accuracy, evaluation of disease reversibility, stability, or progression, and an estimation of prognosis for a number of pathologies [8,10,69,70,125-152]. Several DLDs demonstrate temporal evolution of their imaging findings on HRCT, which allows for a more specific diagnosis on follow-up imaging than on initial imaging [9,27,59-64,67,68,72,73,76,142,145,147,150,153,154]. Numerous studies support the increased sensitivity and specificity of CT over chest radiography for lung parenchymal changes related to DLD [38-51]. There is no research to support the use of CT with IV contrast for follow-up imaging of DLD; however, IV contrast may be of use in evaluation of alternative diagnosis with overlapping clinical features or conditions that also involve the pleura, mediastinum, and pulmonary vessels (see the ACR Appropriateness Criteria topics on [“Chronic Dyspnea-Noncardiovascular Origin”](#) [6], [“Noninvasive Clinical Staging of Primary Lung Cancer”](#) [5], and [“Suspected Pulmonary Embolism”](#) [84]).

Variant 3: Confirmed diffuse lung disease without acute clinical deterioration. Routine follow-up imaging clinically indicated.

B. FDG-PET/CT Skull Base to Mid-Thigh

There is limited research supporting the use of FDG-PET/CT in DLDs. In sarcoidosis, FDG-PET/CT can be used as a marker of disease extent and severity, and it can assist in follow-up and monitoring of treatment response [86,87,89,92,93,95,96,98-100]. Research supporting the use of FDG-PET/CT is more limited in other DLDs but has been evaluated in some studies of lung fibrosis [90,91,102].

Variant 3: Confirmed diffuse lung disease without acute clinical deterioration. Routine follow-up imaging clinically indicated.

C. MRI Chest

There is limited research supporting the use of MRI in DLD, none of which currently supports the use of MRI for follow-up imaging. Small studies have shown adequate concordance of MRI findings with CT in established cases of DLD utilizing a variety of specialized MRI sequences. Some

MRI sequences in the setting of DLD may provide additional functional information, such as tissue characterization, gas transfer efficiency, and lung elasticity. [106-118].

Variant 3: Confirmed diffuse lung disease without acute clinical deterioration. Routine follow-up imaging clinically indicated.

D. Radiography Chest

There is no research supporting the use of chest radiography over CT for follow-up imaging of confirmed DLD without acute clinical deterioration. Multiple studies demonstrate the increased sensitivity and specificity of CT over radiographs for evaluation of DLD [38-47,49-51,120,121].

Summary of Highlights

- **Variant 1:** Radiography chest or CT chest without IV contrast is usually appropriate as the initial imaging of patients with suspected DLD. 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 2:** Radiography chest or CT chest without IV contrast is usually appropriate as the initial imaging of patients with suspected acute exacerbation or acute deterioration of confirmed DLD. 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:** CT chest without IV contrast is usually appropriate as the routine follow-up for patients with confirmed DLD without acute clinical deterioration. The panel did not agree on radiography chest for this clinical scenario. There is insufficient medical literature to conclude whether or not these patients would benefit from radiography chest. This procedure is controversial in this patient population but may be appropriate.

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
○	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."

References

1. Bradley B, Branley HM, Egan JJ, et al. Interstitial lung disease guideline: the British Thoracic Society in collaboration with the Thoracic Society of Australia and New Zealand and the Irish Thoracic Society. *Thorax* 2008;63 Suppl 5:v1-58.
2. Travis WD, Costabel U, Hansell DM, et al. An official American Thoracic Society/European Respiratory Society statement: Update of the international multidisciplinary classification of the idiopathic interstitial pneumonias. *American Journal of Respiratory & Critical Care Medicine*. 188(6):733-48, 2013 Sep 15.
3. Jokerst C, Chung JH, Ackman JB, et al. ACR Appropriateness Criteria® Acute Respiratory Illness in Immunocompetent Patients. *J Am Coll Radiol* 2018;15:S240-S51.

4. Lee C, Colletti PM, Chung JH, et al. ACR Appropriateness Criteria® Acute Respiratory Illness in Immunocompromised Patients. *J Am Coll Radiol* 2019;16:S331-S39.
5. de Groot PM, Chung JH, Ackman JB, et al. ACR Appropriateness Criteria® Noninvasive Clinical Staging of Primary Lung Cancer. *J Am Coll Radiol* 2019;16:S184-S95.
6. McComb BL, Ravenel JG, Steiner RM, et al. ACR Appropriateness Criteria® Chronic Dyspnea-Noncardiovascular Origin. *J Am Coll Radiol* 2018;15:S291-S301.
7. Cox CW, Chung JH, Ackman JB, et al. ACR Appropriateness Criteria® Occupational Lung Diseases. *J Am Coll Radiol* 2020;17:S188-S97.
8. Lynch DA, Godwin JD, Safrin S, et al. High-resolution computed tomography in idiopathic pulmonary fibrosis: diagnosis and prognosis. *Am J Respir Crit Care Med* 2005;172:488-93.
9. Raghu G, Remy-Jardin M, Myers JL, et al. Diagnosis of Idiopathic Pulmonary Fibrosis. An Official ATS/ERS/JRS/ALAT Clinical Practice Guideline. *American Journal of Respiratory & Critical Care Medicine*. 198(5):e44-e68, 2018 09 01.
10. Raghu G, Remy-Jardin M, Ryerson CJ, et al. Diagnosis of Hypersensitivity Pneumonitis in Adults. An Official ATS/JRS/ALAT Clinical Practice Guideline. *Am J Respir Crit Care Med* 2020;202:e36-e69.
11. Silva CI, Muller NL, Fujimoto K, et al. Acute exacerbation of chronic interstitial pneumonia: high-resolution computed tomography and pathologic findings. *Journal of Thoracic Imaging*. 22(3):221-9, 2007 Aug.
12. Akira M, Kozuka T, Yamamoto S, Sakatani M. Computed tomography findings in acute exacerbation of idiopathic pulmonary fibrosis. *American Journal of Respiratory & Critical Care Medicine*. 178(4):372-8, 2008 Aug 15.
13. Tachikawa R, Tomii K, Ueda H, et al. Clinical features and outcome of acute exacerbation of interstitial pneumonia: collagen vascular diseases-related versus idiopathic. *Respiration*. 83(1):20-7, 2012.
14. Collard HR, Ryerson CJ, Corte TJ, et al. Acute Exacerbation of Idiopathic Pulmonary Fibrosis. An International Working Group Report. *Am J Respir Crit Care Med* 2016;194:265-75.
15. Arai T, Kagawa T, Sasaki Y, et al. Heterogeneity of incidence and outcome of acute exacerbation in idiopathic interstitial pneumonia. *Respirology*. 21(8):1431-1437, 2016 11.
16. Kawamura K, Ichikado K, Ichiyasu H, et al. Acute exacerbation of chronic fibrosing interstitial pneumonia in patients receiving antifibrotic agents: incidence and risk factors from real-world experience. *BMC Pulmonary Medicine*. 19(1):113, 2019 Jun 25.
17. Kim DS, Park JH, Park BK, Lee JS, Nicholson AG, Colby T. Acute exacerbation of idiopathic pulmonary fibrosis: frequency and clinical features. *Eur Respir J* 2006;27:143-50.
18. American College of Radiology. ACR–STR Practice Parameter for the Performance of High-Resolution Computed Tomography (HRCT) of the Lungs in Adults. Available at: <https://gravitas.acr.org/PPTS/GetDocumentView?docId=83+&releaseId=2>
19. Hodnett PA, Naidich DP. Fibrosing interstitial lung disease. A practical high-resolution computed tomography-based approach to diagnosis and management and a review of the literature. *Am J Respir Crit Care Med* 2013;188:141-9.
20. Honda O, Takenaka D, Matsuki M, et al. Image quality of 320-detector row wide-volume

computed tomography with diffuse lung diseases: comparison with 64-detector row helical CT. *J Comput Assist Tomogr* 2012;36:505-11.

21. Schoepf UJ, Bruening RD, Hong C, et al. Multislice helical CT of focal and diffuse lung disease: comprehensive diagnosis with reconstruction of contiguous and high-resolution CT sections from a single thin-collimation scan. *AJR Am J Roentgenol*. 2001 Jul;177(1):179-84.
22. Studler U, Gluecker T, Bongartz G, Roth J, Steinbrich W. Image quality from high-resolution CT of the lung: comparison of axial scans and of sections reconstructed from volumetric data acquired using MDCT. *AJR Am J Roentgenol* 2005;185:602-7.
23. Beigelman-Aubry C, Hill C, Guibal A, Savatovsky J, Grenier PA. Multi-detector row CT and postprocessing techniques in the assessment of diffuse lung disease. *Radiographics* 2005;25:1639-52.
24. Johkoh T, Muller NL, Nakamura H. Multidetector spiral high-resolution computed tomography of the lungs: distribution of findings on coronal image reconstructions. *J Thorac Imaging* 2002;17:291-305.
25. Prosch H, Schaefer-Prokop CM, Eisenhuber E, Kienzl D, Herold CJ. CT protocols in interstitial lung diseases--a survey among members of the European Society of Thoracic Imaging and a review of the literature. *Eur Radiol* 2013;23:1553-63.
26. Remy-Jardin M, Campistrone P, Amara A, et al. Usefulness of coronal reformations in the diagnostic evaluation of infiltrative lung disease. *J Comput Assist Tomogr* 2003;27:266-73.
27. Lynch DA, Sverzellati N, Travis WD, et al. Diagnostic criteria for idiopathic pulmonary fibrosis: a Fleischner Society White Paper. [Review]. *Lancet Respir Med*. 6(2):138-153, 2018 02.
28. Chung JH, Chawla A, Peljto AL, et al. CT scan findings of probable usual interstitial pneumonitis have a high predictive value for histologic usual interstitial pneumonitis. *Chest*. 2015;147(2):450-459.
29. Elicker B, Pereira CA, Webb R, Leslie KO. High-resolution computed tomography patterns of diffuse interstitial lung disease with clinical and pathological correlation. *J Bras Pneumol*. 2008;34(9):715-744.
30. Sundaram B, Gross BH, Martinez FJ, et al. Accuracy of high-resolution CT in the diagnosis of diffuse lung disease: effect of predominance and distribution of findings. *AJR. American Journal of Roentgenology*. 191(4):1032-9, 2008 Oct.
31. Verrastro CG, Antunes VB, Jasinowodolinski D, D'Ippolito G, Meirelles GS. High-Resolution Computed Tomography in the Diagnosis of Diffuse Parenchymal Lung Diseases: Is it Possible to Improve Radiologist's Performance?. *Journal of Computer Assisted Tomography*. 40(2):248-55, 2016 Mar-Apr.
32. Johkoh T, Fukuoka J, Tanaka T. Rare idiopathic interstitial pneumonias (IIPs) and histologic patterns in new ATS/ERS multidisciplinary classification of the IIPs. *European Journal of Radiology*. 84(3):542-546, 2015 Mar.
33. Chung JH, Lynch DA. The Value of a Multidisciplinary Approach to the Diagnosis of Usual Interstitial Pneumonitis and Idiopathic Pulmonary Fibrosis: Radiology, Pathology, and Clinical Correlation. [Review]. *AJR. American Journal of Roentgenology*. 206(3):463-71,

2016 Mar.

34. Walsh SLF, Wells AU, Desai SR, et al. Multicentre evaluation of multidisciplinary team meeting agreement on diagnosis in diffuse parenchymal lung disease: a case-cohort study. *The Lancet Respiratory Medicine*. 4(7):557-565, 2016 07.
35. Walsh SLF.. Multidisciplinary evaluation of interstitial lung diseases: current insights: Number 1 in the Series "Radiology" Edited by Nicola Sverzellati and Sujal Desai. [Review]. *European Respiratory Review*. 26(144), 2017 Jun 30.
36. Ishii H, Watanabe K, Kushima H, et al. Pleuroparenchymal fibroelastosis diagnosed by multidisciplinary discussions in Japan. *Respiratory Medicine*. 141:190-197, 2018 08.
37. Ovcharenko SI, Son EA, Kapustina VA. Multidisciplinary approach in the diagnosis of idiopathic nonspecific interstitial pneumonia. *Terapevticheskii Arkhiv*. 91(3):101-106, 2019 Mar 30.
38. Grenier P, Chevret S, Beigelman C, Brauner MW, Chastang C, Valeyre D. Chronic diffuse infiltrative lung disease: determination of the diagnostic value of clinical data, chest radiography, and CT and Bayesian analysis. *Radiology*. 191(2):383-90, 1994 May.
39. Grenier P, Valeyre D, Cluzel P, Brauner MW, Lenoir S, Chastang C. Chronic diffuse interstitial lung disease: diagnostic value of chest radiography and high-resolution CT. *Radiology*. 179(1):123-32, 1991 Apr.
40. Klein JS, Gamsu G, Webb WR, Golden JA, Muller NL. High-resolution CT diagnosis of emphysema in symptomatic patients with normal chest radiographs and isolated low diffusing capacity. *Radiology*. 182(3):817-21, 1992 Mar.
41. Martin SG, Kronek LP, Valeyre D, et al. High-resolution computed tomography to differentiate chronic diffuse interstitial lung diseases with predominant ground-glass pattern using logical analysis of data. *Eur Radiol*. 20(6):1297-310, 2010 Jun.
42. Mathieson JR, Mayo JR, Staples CA, Muller NL. Chronic diffuse infiltrative lung disease: comparison of diagnostic accuracy of CT and chest radiography. *Radiology*. 171(1):111-6, 1989 Apr.
43. Miller A, Warshaw R, Nezamis J. Diffusing capacity and forced vital capacity in 5,003 asbestos-exposed workers: relationships to interstitial fibrosis (ILO profusion score) and pleural thickening. *Am J Ind Med*. 56(12):1383-93, 2013 Dec.
44. Muller NL, Mawson JB, Mathieson JR, Abboud R, Ostrow DN, Champion P. Sarcoidosis: correlation of extent of disease at CT with clinical, functional, and radiographic findings. *Radiology*. 171(3):613-8, 1989 Jun.
45. Padley SP, Hansell DM, Flower CD, Jennings P. Comparative accuracy of high resolution computed tomography and chest radiography in the diagnosis of chronic diffuse infiltrative lung disease. *Clinical Radiology*. 44(4):222-6, 1991 Oct.
46. Remy-Jardin M, Degreef JM, Beuscart R, Voisin C, Remy J. Coal worker's pneumoconiosis: CT assessment in exposed workers and correlation with radiographic findings. *Radiology*. 177(2):363-71, 1990 Nov.
47. Sener MU, Simsek C, Ozkara S, Evran H, Bursali I, Gokcek A. Comparison of the International Classification of High-resolution Computed Tomography for occupational and environmental respiratory diseases with the International Labor Organization

International Classification of Radiographs of Pneumoconiosis. *Industrial Health*. 57(4):495-502, 2019 Aug 03.

48. Sverzellati N, Lynch DA, Hansell DM, Johkoh T, King TE Jr, Travis WD. American Thoracic Society-European Respiratory Society Classification of the Idiopathic Interstitial Pneumonias: Advances in Knowledge since 2002. *Radiographics*. 35(7):1849-71, 2015 Nov-Dec.
49. Tamura T, Suganuma N, Hering KG, et al. Relationships (I) of International Classification of High-resolution Computed Tomography for Occupational and Environmental Respiratory Diseases with the ILO International Classification of Radiographs of Pneumoconioses for parenchymal abnormalities. *Industrial Health*. 53(3):260-70, 2015.
50. Tiwari RR.. Agreement between chest radiography and high-resolution computed tomography in diagnosing dust-related interstitial lung fibrosis. *Toxicol Ind Health*. 31(3):235-8, 2015 Mar.
51. Xing J, Huang X, Yang L, Liu Y, Zhang H, Chen W. Comparison of high-resolution computerized tomography with film-screen radiography for the evaluation of opacity and the recognition of coal workers' pneumoconiosis. *J Occup Health*. 56(4):301-8, 2014.
52. Jacob J, Bartholmai BJ, Rajagopalan S, et al. Mortality prediction in idiopathic pulmonary fibrosis: evaluation of computer-based CT analysis with conventional severity measures. *European Respiratory Journal*. 49(1), 2017 01.
53. Papiris SA, Daniil ZD, Malagari K, et al. The Medical Research Council dyspnea scale in the estimation of disease severity in idiopathic pulmonary fibrosis. *Respir Med*. 2005; 99(6):755-761.
54. Robbie H, Daccord C, Chua F, Devaraj A. Evaluating disease severity in idiopathic pulmonary fibrosis. [Review]. *European Respiratory Review*. 26(145), 2017 Sep 30.
55. Staples CA, Muller NL, Vedral S, Abboud R, Ostrow D, Miller RR. Usual interstitial pneumonia: correlation of CT with clinical, functional, and radiologic findings. *Radiology*. 1987; 162(2):377-381.
56. Tamura T, Suganuma N, Hering KG, et al. Relationships (II) of International Classification of High-resolution Computed Tomography for Occupational and Environmental Respiratory Diseases with ventilatory functions indices for parenchymal abnormalities. *Industrial Health*. 53(3):271-9, 2015.
57. Terriff BA, Kwan SY, Chan-Yeung MM, Muller NL. Fibrosing alveolitis: chest radiography and CT as predictors of clinical and functional impairment at follow-up in 26 patients. *Radiology*. 1992; 184(2):445-449.
58. Best AC, Meng J, Lynch AM, et al. Idiopathic pulmonary fibrosis: physiologic tests, quantitative CT indexes, and CT visual scores as predictors of mortality. *Radiology* 2008;246:935-40.
59. Choi SH, Lee HY, Lee KS, et al. The value of CT for disease detection and prognosis determination in combined pulmonary fibrosis and emphysema (CPFE). *PLoS ONE*. 9(9):e107476, 2014.
60. Hochegger B, Sanches FD, Altmayer SPL, et al. Air trapping in usual interstitial pneumonia pattern at CT: prevalence and prognosis. *Scientific Reports*. 8(1):17267, 2018 11 22.

61. Hozumi H, Nakamura Y, Johkoh T, et al. Nonspecific interstitial pneumonia: prognostic significance of high-resolution computed tomography in 59 patients. *Journal of Computer Assisted Tomography*. 35(5):583-9, 2011 Sep-Oct.
62. Hwang JH, Misumi S, Curran-Everett D, Brown KK, Sahin H, Lynch DA. Longitudinal follow-up of fibrosing interstitial pneumonia: relationship between physiologic testing, computed tomography changes, and survival rate. *Journal of Thoracic Imaging*. 26(3):209-17, 2011 Aug.
63. Iwasawa T, Takemura T, Okudera K, et al. The importance of subpleural fibrosis in the prognosis of patients with idiopathic interstitial pneumonias. *European Journal of Radiology*. 90:106-113, 2017 May.
64. Kim HC, Ji W, Kim MY, et al. Interstitial pneumonia related to undifferentiated connective tissue disease: pathologic pattern and prognosis. *Chest*. 147(1):165-172, 2015 Jan.
65. Lee JS, Lynch DA, Sharma S, Brown KK, Muller NL. Organizing pneumonia: prognostic implication of high-resolution computed tomography features. *J Comput Assist Tomogr* 2003;27:260-5.
66. Ley B, Elicker BM, Hartman TE, et al. Idiopathic pulmonary fibrosis: CT and risk of death. *Radiology*. 273(2):570-9, 2014 Nov.
67. Martinez FJ, Flaherty KR. Comprehensive and Individualized Patient Care in Idiopathic Pulmonary Fibrosis: Refining Approaches to Diagnosis, Prognosis, and Treatment. *Chest*. 151(5):1173-1174, 2017 05.
68. Moon JW, Bae JP, Lee HY, et al. Perfusion- and pattern-based quantitative CT indexes using contrast-enhanced dual-energy computed tomography in diffuse interstitial lung disease: relationships with physiologic impairment and prediction of prognosis. *European Radiology*. 26(5):1368-77, 2016 May.
69. Mooney JJ, Elicker BM, Urbania TH, et al. Radiographic fibrosis score predicts survival in hypersensitivity pneumonitis. *Chest*. 144(2):586-592, 2013 Aug.
70. Oda K, Ishimoto H, Yatera K, et al. High-resolution CT scoring system-based grading scale predicts the clinical outcomes in patients with idiopathic pulmonary fibrosis. *Respir Res* 2014;15:10.
71. Park JH, Kim DS, Park IN, et al. Prognosis of fibrotic interstitial pneumonia: idiopathic versus collagen vascular disease-related subtypes. *Am J Respir Crit Care Med* 2007;175:705-11.
72. Ryerson CJ, Urbania TH, Richeldi L, et al. Prevalence and prognosis of unclassifiable interstitial lung disease. *Eur Respir J*. 42(3):750-7, 2013 Sep.
73. Tokgoz Akyil F, Sevim T, Akman C, et al. The predictors of mortality in IPF - Does emphysema change the prognosis?. *Sarcoidosis Vasc Diffuse Lung Dis*. 33(3):267-274, 2016 Oct 07.
74. Travis WD, Matsui K, Moss J, Ferrans VJ. Idiopathic nonspecific interstitial pneumonia: prognostic significance of cellular and fibrosing patterns: survival comparison with usual interstitial pneumonia and desquamative interstitial pneumonia. *Am J Surg Pathol* 2000;24:19-33.
75. Vehmas T, Oksa P. Chest HRCT signs predict deaths in long-term follow-up among

asbestos exposed workers. *Eur J Radiol.* 83(10):1983-7, 2014 Oct.

76. Zhang L, Zhang C, Dong F, et al. Combined pulmonary fibrosis and emphysema: a retrospective analysis of clinical characteristics, treatment and prognosis. *BMC Pulmonary Medicine.* 16(1):137, 2016 11 03.
77. Best AC, Lynch AM, Bozic CM, Miller D, Grunwald GK, Lynch DA. Quantitative CT indexes in idiopathic pulmonary fibrosis: relationship with physiologic impairment. *Radiology* 2003;228:407-14.
78. Humphries SM, Swigris JJ, Brown KK, et al. Quantitative high-resolution computed tomography fibrosis score: performance characteristics in idiopathic pulmonary fibrosis. *Eur Respir J* 2018;52.
79. Humphries SM, Yagihashi K, Huckleberry J, et al. Idiopathic Pulmonary Fibrosis: Data-driven Textural Analysis of Extent of Fibrosis at Baseline and 15-Month Follow-up. *Radiology* 2017;285:270-78.
80. Kim HJ, Brown MS, Chong D, et al. Comparison of the quantitative CT imaging biomarkers of idiopathic pulmonary fibrosis at baseline and early change with an interval of 7 months. *Acad Radiol* 2015;22:70-80.
81. Lee SM, Seo JB, Oh SY, et al. Prediction of survival by texture-based automated quantitative assessment of regional disease patterns on CT in idiopathic pulmonary fibrosis. *European Radiology.* 28(3):1293-1300, 2018 Mar.
82. Milanese G, Mannil M, Martini K, Maurer B, Alkadhi H, Frauenfelder T. Quantitative CT texture analysis for diagnosing systemic sclerosis: Effect of iterative reconstructions and radiation doses. *Medicine.* 98(29):e16423, 2019 Jul.
83. Nakagawa H, Nagatani Y, Takahashi M, et al. Quantitative CT analysis of honeycombing area in idiopathic pulmonary fibrosis: Correlations with pulmonary function tests. *European Journal of Radiology.* 85(1):125-130, 2016 Jan.
84. American College of Radiology. ACR Appropriateness Criteria®: Suspected Pulmonary Embolism. Available at: <https://acsearch.acr.org/docs/69404/Narrative/>.
85. Adams H, Keijsers RG, Korenromp IH, Grutters JC. FDG PET for gauging of sarcoid disease activity. *SEMIN. RESPIR. CRIT. CARE MED.* 35(3):352-61, 2014 Jun.
86. Ambrosini V, Zompatori M, Fasano L, et al. (18)F-FDG PET/CT for the assessment of disease extension and activity in patients with sarcoidosis: results of a preliminary prospective study. *Clinical Nuclear Medicine.* 38(4):e171-7, 2013 Apr.
87. Capitanio S, Nordin AJ, Noraini AR, Rossetti C. PET/CT in nononcological lung diseases: current applications and future perspectives. [Review]. *EUR. RESPIR. REV.* 25(141):247-58, 2016 Sep.
88. Costabel U, Bonella F, Ohshimo S, Guzman J. Diagnostic modalities in sarcoidosis: BAL, EBUS, and PET. *Seminars in Respiratory & Critical Care Medicine.* 31(4):404-8, 2010 Aug.
89. Cremers JP, Van Kroonenburgh MJ, Mostard RL, et al. Extent of disease activity assessed by 18F-FDG PET/CT in a Dutch sarcoidosis population. *Sarcoidosis Vasculitis & Diffuse Lung Diseases.* 31(1):37-45, 2014 Apr 18.
90. Groves AM, Win T, Screaton NJ, et al. Idiopathic pulmonary fibrosis and diffuse parenchymal lung disease: implications from initial experience with 18F-FDG PET/CT.

Journal of Nuclear Medicine. 50(4):538-45, 2009 Apr.

- 91.** Jacquelin V, Mekinian A, Brillet PY, et al. FDG-PET/CT in the prediction of pulmonary function improvement in nonspecific interstitial pneumonia. A Pilot Study. *European Journal of Radiology*. 85(12):2200-2205, 2016 Dec.
- 92.** Keijsers RG, Grutters JC, Thomeer M, et al. Imaging the inflammatory activity of sarcoidosis: sensitivity and inter observer agreement of (67)Ga imaging and (18)F-FDG PET. *The Quarterly Journal of Nuclear Medicine & Molecular Imaging*. 55(1):66-71, 2011 Feb.
- 93.** Koo HJ, Kim MY, Shin SY, et al. Evaluation of Mediastinal Lymph Nodes in Sarcoidosis, Sarcoid Reaction, and Malignant Lymph Nodes Using CT and FDG-PET/CT. *Medicine (Baltimore)*. 94(27):e1095, 2015 Jul.
- 94.** Milman N, Graudal N, Loft A, Mortensen J, Larsen J, Baslund B. Effect of the TNF-alpha inhibitor adalimumab in patients with recalcitrant sarcoidosis: a prospective observational study using FDG-PET. *The clinical respiratory journal*. 6(4):238-47, 2012 Oct.
- 95.** Mostard RL, van Kroonenburgh MJ, Drent M. The role of the PET scan in the management of sarcoidosis. *Curr Opin Pulm Med*. 2013;19(5):538-544.
- 96.** Mostard RL, Voo S, van Kroonenburgh MJ, et al. Inflammatory activity assessment by F18 FDG-PET/CT in persistent symptomatic sarcoidosis. *Respiratory Medicine*. 105(12):1917-24, 2011 Dec.
- 97.** Nobashi T, Kubo T, Nakamoto Y, et al. 18F-FDG Uptake in Less Affected Lung Field Provides Prognostic Stratification in Patients with Interstitial Lung Disease. *J Nucl Med*. 2016;57(12):1899-1904.
- 98.** Rubini G, Cappabianca S, Altini C, et al. Current clinical use of 18FDG-PET/CT in patients with thoracic and systemic sarcoidosis. *Radiologia Medica*. 119(1):64-74, 2014 Jan.
- 99.** Sobic-Saranovic D, Grozdic I, Videnovic-Ivanov J, et al. The utility of 18F-FDG PET/CT for diagnosis and adjustment of therapy in patients with active chronic sarcoidosis. *Journal of Nuclear Medicine*. 53(10):1543-9, 2012 Oct.
- 100.** Sobic-Saranovic DP, Grozdic IT, Videnovic-Ivanov J, et al. Responsiveness of FDG PET/CT to treatment of patients with active chronic sarcoidosis. *Clinical Nuclear Medicine*. 38(7):516-21, 2013 Jul.
- 101.** Treglia G, Annunziata S, Sobic-Saranovic D, Bertagna F, Caldarella C, Giovanella L. The role of 18F-FDG-PET and PET/CT in patients with sarcoidosis: an updated evidence-based review. [Review]. *Academic Radiology*. 21(5):675-84, 2014 May.
- 102.** Uehara T, Takeno M, Hama M, et al. Deep-inspiration breath-hold 18F-FDG-PET/CT is useful for assessment of connective tissue disease associated interstitial pneumonia. *Modern Rheumatology*. 26(1):121-7, 2016.
- 103.** Umeda Y, Demura Y, Morikawa M, et al. Prognostic Value of Dual-Time-Point 18F-FDG PET for Idiopathic Pulmonary Fibrosis. *Journal of Nuclear Medicine*. 56(12):1869-75, 2015 Dec.
- 104.** Win T, Thomas BA, Lambrou T, et al. Areas of normal pulmonary parenchyma on HRCT exhibit increased FDG PET signal in IPF patients. *European Journal of Nuclear Medicine & Molecular Imaging*. 41(2):337-42, 2014 Feb.
- 105.** Yakar A, Yakar F, Sezer M, et al. Use of PET-CT for the assessment of treatment results in patients with sarcoidosis. *Wiener Klinische Wochenschrift*. 127(7-8):274-82, 2015 Apr.

- 106.** Brady D, Lavelle LP, McEvoy SH, et al. Assessing fibrosis in pulmonary sarcoidosis: late-enhanced MRI compared to anatomic HRCT imaging. *QJM* 2016;109:257-64.
- 107.** Hekimoglu K, Sancak T, Tor M, Besir H, Kalaycioglu B, Gundogdu S. Fast MRI evaluation of pulmonary progressive massive fibrosis with VIBE and HASTE sequences: comparison with CT. *Diagnostic & Interventional Radiology*. 16(1):30-7, 2010 Mar.
- 108.** Lavelle LP, Brady D, McEvoy S, et al. Pulmonary fibrosis: tissue characterization using late-enhanced MRI compared with unenhanced anatomic high-resolution CT. *Diagn Interv Radiol*. 23(2):106-111, 2017 Mar-Apr.
- 109.** Mammarappallil JG, Rankine L, Wild JM, Driehuys B. New Developments in Imaging Idiopathic Pulmonary Fibrosis With Hyperpolarized Xenon Magnetic Resonance Imaging. [Review]. *Journal of Thoracic Imaging*. 34(2):136-150, 2019 Mar.
- 110.** Mirsadraee S, Tse M, Kershaw L, et al. T1 characteristics of interstitial pulmonary fibrosis on 3T MRI-a predictor of early interstitial change?. *Quant. imaging med. surg.* 6(1):42-9, 2016 Feb.
- 111.** Ohno Y, Nishio M, Koyama H, et al. Pulmonary MR imaging with ultra-short TEs: utility for disease severity assessment of connective tissue disease patients. *European Journal of Radiology*. 82(8):1359-65, 2013 Aug.
- 112.** Ohno Y, Nishio M, Koyama H, et al. Oxygen-enhanced MRI for patients with connective tissue diseases: comparison with thin-section CT of capability for pulmonary functional and disease severity assessment. *Eur J Radiol*. 2014;83(2):391-397.
- 113.** Pinal-Fernandez I, Pineda-Sanchez V, Pallisa-Nunez E, et al. Fast 1.5 T chest MRI for the assessment of interstitial lung disease extent secondary to systemic sclerosis. *Clin Rheumatol*. 35(9):2339-45, 2016 Sep.
- 114.** Pusterla O, Sommer G, Santini F, et al. Signal enhancement ratio imaging of the lung parenchyma with ultra-fast steady-state free precession MRI at 1.5T. *J Magn Reson Imaging*. 48(1):48-57, 2018 07.
- 115.** Renne J, Lauermann P, Hinrichs JB, et al. Chronic Lung Allograft Dysfunction: Oxygen-enhanced T1-Mapping MR Imaging of the Lung. *Radiology*. 276(1):266-73, 2015 Jul.
- 116.** Torres L, Kammerman J, Hahn AD, et al. "Structure-Function Imaging of Lung Disease Using Ultrashort Echo Time MRI". [Review]. *Academic Radiology*. 26(3):431-441, 2019 03.
- 117.** Wang JM, Robertson SH, Wang Z, et al. Using hyperpolarized ¹²⁹Xe MRI to quantify regional gas transfer in idiopathic pulmonary fibrosis. *Thorax*. 73(1):21-28, 2018 01.
- 118.** Yi CA, Lee KS, Han J, Chung MP, Chung MJ, Shin KM. 3-T MRI for differentiating inflammation- and fibrosis-predominant lesions of usual and nonspecific interstitial pneumonia: comparison study with pathologic correlation. *AJR Am J Roentgenol*. 2008; 190(4):878-885.
- 119.** Epler GR, McCloud TC, Gaensler EA, Mikus JP, Carrington CB. Normal chest roentgenograms in chronic diffuse infiltrative lung disease. *New England Journal of Medicine*. 298(17):934-9, 1978 Apr 27.
- 120.** Laney AS, Petsonk EL, Attfield MD. Intramodality and intermodality comparisons of storage phosphor computed radiography and conventional film-screen radiography in the recognition of small pneumoconiotic opacities. *Chest*. 140(6):1574-1580, 2011 Dec.

- 121.** Larson TC, Holiday DB, Antao VC, et al. Comparison of digital with film radiographs for the classification of pneumoconiotic pleural abnormalities. *Academic Radiology*. 19(2):131-40, 2012 Feb.
- 122.** Henry TS, Donnelly EF, Boisselle PM, et al. ACR Appropriateness Criteria® Rib Fractures. *J Am Coll Radiol* 2019;16:S227-S34.
- 123.** Churg A, Wright JL, Tazelaar HD. Acute exacerbations of fibrotic interstitial lung disease. [Review]. *Histopathology*. 58(4):525-30, 2011 Mar.
- 124.** Simon-Blancal V, Freynet O, Nunes H, et al. Acute exacerbation of idiopathic pulmonary fibrosis: outcome and prognostic factors. *Respiration* 2012;83:28-35.
- 125.** Akira M, Inoue Y, Arai T, Okuma T, Kawata Y. Long-term follow-up high-resolution CT findings in non-specific interstitial pneumonia. *Thorax* 2011;66:61-5.
- 126.** Akira M, Kozuka T, Inoue Y, Sakatani M. Long-term follow-up CT scan evaluation in patients with pulmonary sarcoidosis. *Chest* 2005;127:185-91.
- 127.** Akira M, Yamamoto S, Hara H, Sakatani M, Ueda E. Serial computed tomographic evaluation in desquamative interstitial pneumonia. *Thorax* 1997;52:333-7.
- 128.** Araki T, Putman RK, Hatabu H, et al. Development and Progression of Interstitial Lung Abnormalities in the Framingham Heart Study. *Am J Respir Crit Care Med* 2016;194:1514-22.
- 129.** Brauner MW, Grenier P, Tijani K, Battesti JP, Valeyre D. Pulmonary Langerhans cell histiocytosis: evolution of lesions on CT scans. *Radiology* 1997;204:497-502.
- 130.** Dhariwal J, Tennant RC, Hansell DM, et al. Smoking cessation in COPD causes a transient improvement in spirometry and decreases micronodules on high-resolution CT imaging. *Chest*. 145(5):1006-1015, 2014 May.
- 131.** Gafa G, Sverzellati N, Bonati E, et al. Follow-up in pulmonary sarcoidosis: comparison between HRCT and pulmonary function tests. *Radiol Med* 2012;117:968-78.
- 132.** Hartman TE, Primack SL, Kang EY, et al. Disease progression in usual interstitial pneumonia compared with desquamative interstitial pneumonia. Assessment with serial CT. *Chest* 1996;110:378-82.
- 133.** Jeong YJ, Lee KS, Muller NL, et al. Usual interstitial pneumonia and non-specific interstitial pneumonia: serial thin-section CT findings correlated with pulmonary function. *Korean J Radiol* 2005;6:143-52.
- 134.** Kawabata Y, Takemura T, Hebisawa A, et al. Desquamative interstitial pneumonia may progress to lung fibrosis as characterized radiologically. *Respirology* 2012;17:1214-21.
- 135.** Kawano-Dourado L, Baldi BG, Kay FU, et al. Pulmonary involvement in long-term mixed connective tissue disease: functional trends and image findings after 10 years. *Clin Exp Rheumatol* 2015;33:234-40.
- 136.** Kim EY, Lee KS, Chung MP, Kwon OJ, Kim TS, Hwang JH. Nonspecific interstitial pneumonia with fibrosis: serial high-resolution CT findings with functional correlation. *AJR Am J Roentgenol* 1999;173:949-53.
- 137.** Kim MY, Song JW, Do KH, Jang SJ, Colby TV, Kim DS. Idiopathic nonspecific interstitial pneumonia: changes in high-resolution computed tomography on long-term follow-up. *J*

Comput Assist Tomogr 2012;36:170-4.

- 138.** Lazor R, Vandevenne A, Pelletier A, Leclerc P, Court-Fortune I, Cordier JF. Cryptogenic organizing pneumonia. Characteristics of relapses in a series of 48 patients. The Groupe d'Etudes et de Recherche sur les Maladies "Orphelines" Pulmonaires (GERM"O"P). *Am J Respir Crit Care Med* 2000;162:571-7.
- 139.** Lee HY, Lee KS, Jeong YJ, et al. High-resolution CT findings in fibrotic idiopathic interstitial pneumonias with little honeycombing: serial changes and prognostic implications. *AJR Am J Roentgenol* 2012;199:982-9.
- 140.** Lee JW, Lee KS, Lee HY, et al. Cryptogenic organizing pneumonia: serial high-resolution CT findings in 22 patients. *AJR Am J Roentgenol* 2010;195:916-22.
- 141.** Murdoch J, Muller NL. Pulmonary sarcoidosis: changes on follow-up CT examination. *AJR Am J Roentgenol* 1992;159:473-7.
- 142.** Nagao T, Nagai S, Hiramoto Y, et al. Serial evaluation of high-resolution computed tomography findings in patients with idiopathic pulmonary fibrosis in usual interstitial pneumonia. *Respiration* 2002;69:413-9.
- 143.** Nakanishi M, Demura Y, Mizuno S, et al. Changes in HRCT findings in patients with respiratory bronchiolitis-associated interstitial lung disease after smoking cessation. *Eur Respir J* 2007;29:453-61.
- 144.** Nishiyama O, Kondoh Y, Taniguchi H, et al. Serial high resolution CT findings in nonspecific interstitial pneumonia/fibrosis. *J Comput Assist Tomogr* 2000;24:41-6.
- 145.** Nishiyama O, Taniguchi H, Kondoh Y, et al. Familial idiopathic pulmonary fibrosis: serial high-resolution computed tomography findings in 9 patients. *J Comput Assist Tomogr* 2004;28:443-8.
- 146.** Nogueira CR, Napolis LM, Bagatin E, et al. Lung diffusing capacity relates better to short-term progression on HRCT abnormalities than spirometry in mild asbestosis. *Am J Ind Med* 2011;54:185-93.
- 147.** Remy-Jardin M, Remy J, Wallaert B, Muller NL. Subacute and chronic bird breeder hypersensitivity pneumonitis: sequential evaluation with CT and correlation with lung function tests and bronchoalveolar lavage. *Radiology* 1993;189:111-8.
- 148.** Screaton NJ, Hiorns MP, Lee KS, et al. Serial high resolution CT in non-specific interstitial pneumonia: prognostic value of the initial pattern. *Clin Radiol* 2005;60:96-104.
- 149.** Silva CI, Muller NL, Hansell DM, Lee KS, Nicholson AG, Wells AU. Nonspecific interstitial pneumonia and idiopathic pulmonary fibrosis: changes in pattern and distribution of disease over time. *Radiology* 2008;247:251-9.
- 150.** Tateishi T, Ohtani Y, Takemura T, et al. Serial high-resolution computed tomography findings of acute and chronic hypersensitivity pneumonitis induced by avian antigen. *J Comput Assist Tomogr*. 35(2):272-9, 2011 Mar-Apr.
- 151.** Tsushima K, Sone S, Yoshikawa S, Yokoyama T, Suzuki T, Kubo K. The radiological patterns of interstitial change at an early phase: over a 4-year follow-up. *Respir Med* 2010;104:1712-21.
- 152.** Yamauchi H, Bando M, Baba T, et al. Clinical Course and Changes in High-Resolution Computed Tomography Findings in Patients with Idiopathic Pulmonary Fibrosis without

Honeycombing. PLoS One 2016;11:e0166168.

153. Hoffmann-Vold AM, Aalokken TM, Lund MB, et al. Predictive value of serial high-resolution computed tomography analyses and concurrent lung function tests in systemic sclerosis. *Arthritis & Rheumatology*. 67(8):2205-12, 2015 May.
154. Lee G, Kim KU, Lee JW, Suh YJ, Jeong YJ. Serial changes and prognostic implications of CT findings in combined pulmonary fibrosis and emphysema: comparison with fibrotic idiopathic interstitial pneumonias alone. *Acta Radiologica*. 58(5):550-557, 2017 May.
155. American College of Radiology. ACR Appropriateness Criteria® Radiation Dose Assessment Introduction. Available at: <https://edge.sitecorecloud.io/americancoldf5f-acrorgf92a-productioncb02-3650/media/ACR/Files/Clinical/Appropriateness-Criteria/ACR-Appropriateness-Criteria-Radiation-Dose-Assessment-Introduction.pdf>.

Disclaimer

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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