

## American College of Radiology ACR Appropriateness Criteria®

**Clinical Condition:** Chronic Dyspnea — Suspected Pulmonary Origin

**Variant 1:** Any age, positive physical examination.

Radiologic Procedure	Rating	Comments	<a href="#">RRL*</a>
X-ray chest	9		⊕
<b>Rating Scale:</b> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

**Variant 2:** Older than age 40, negative physical examination.

Radiologic Procedure	Rating	Comments	<a href="#">RRL*</a>
X-ray chest	8	A negative chest radiograph does not rule out infiltrative lung disease.	⊕
<b>Rating Scale:</b> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

**Variant 3:** Younger than age 40, negative physical exam. Positive with other symptom, severe dyspnea, or other risk factors.

Radiologic Procedure	Rating	Comments	<a href="#">RRL*</a>
X-ray chest	8		⊕
<b>Rating Scale:</b> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

**Variant 4:** Younger than age 40, negative physical examination.

Radiologic Procedure	Rating	Comments	<a href="#">RRL*</a>
X-ray chest	8	A negative chest radiograph does not rule out infiltrative lung disease.	⊕
<b>Rating Scale:</b> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

**Variant 5:** Any age, nonrevealing or nondiagnostic clinical, standard radiography, and laboratory studies.

Radiologic Procedure	Rating	Comments	<a href="#">RRL*</a>
CT chest without contrast	9	In the setting of chronic dyspnea, the most appropriate imaging study is a thin section high resolution chest CT. If a patient has dyspnea not clearly of pulmonary origin, other entities such as chronic or acute pulmonary embolism may need to be excluded. In that setting, a thin section chest CT with intravenous contrast is appropriate. See the ACR Appropriateness Criteria® topic on " <a href="#">Acute Chest Pain — Suspected Pulmonary Embolism</a> ".	⊕ ⊕ ⊕
<b>Rating Scale:</b> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

## CHRONIC DYSPNEA — SUSPECTED PULMONARY ORIGIN

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### **Summary of Literature Review**

Dyspnea is generally defined as a subjective experience of breathing discomfort [1]. It is often described as breathlessness or shortness of breath. The cause for dyspnea is usually cardiopulmonary disease. Common cardiovascular causes are myocardial infarction and congestive heart failure. Common pulmonary causes include asthma, emphysema, pneumothorax, pulmonary embolism, upper airway obstruction and interstitial lung disease. The clinical signs and symptoms often determine whether the cause is cardiac or pulmonary. The distinction between cardiac and pulmonary causes is however, not always obvious. Furthermore, the etiology has been reported to be multifactorial in up to one-third of patients [2]. Certain lab and ancillary tests are helpful such as hemoglobin, brain natriuretic peptide (BNP) test, Pro BNP, pulse oximetry, six minute walk test, and pulmonary function tests. It is important to distinguish whether the dyspnea is acute (lasting a few minutes to a few hours) or chronic (duration greater than one month). Two important causes for acute dyspnea, pulmonary embolism and congestive heart failure, are not included in this section as they are reviewed in other ACR Appropriateness Criteria<sup>®</sup> topics. This section addresses chronic dyspnea of pulmonary origin, particularly chronic obstructive pulmonary disease and interstitial lung disease.

### **Chest Radiography**

The literature is sparse on whether a chest radiograph is justified in patients with acute or chronic dyspnea. Two studies [3,4] suggest that the chest radiograph adds enough additional useful information to recommend its routine use in patients with chronic and acute dyspnea. Another study [5] found that acute dyspnea was a strong

predictor of radiographic abnormality in patients older than age 40 (only 14% had normal chest radiographs). In dyspneic patients younger than age 40, chest radiographs were normal in 68% and revealed acute and chronic findings in 13% and 18%, respectively. Of the patients with acute findings, the vast majority had either a positive physical examination or hemoptysis. The authors concluded that the chest radiograph was not warranted in patients younger than age 40 unless the physical examination was positive or the patient had hemoptysis.

It is recognized that the decision-making process in the individual patient is affected by factors other than just the presence or absence of dyspnea, including the severity of dyspnea and the presence or absence of other symptoms and other risk factors (cardiovascular, pulmonary, and neoplastic diseases). In clinical practice, chest radiography is usually performed as part of the initial evaluation of dyspnea. A review by Morgan and Hodge [6] stated that the most useful methods for evaluating dyspnea are the electrocardiogram (ECG) and chest radiograph. In another study [7], chest radiographs were helpful in making a diagnosis in 66% of the hospitalized patients admitted for other reasons and referred to respiratory physicians for breathlessness. In a review of an evidence based approach Soto and Varkey [8] recommended chest radiography in the initial assessment of patients with acute exacerbation of chronic obstructive pulmonary disease (COPD).

### **Computed Tomography**

Although computed tomography (CT) is not recommended for the initial evaluation of patients with dyspnea (except for patients with suspected pulmonary embolism), it is frequently appropriate in patients when the results of the clinical, radiographic, and laboratory studies are either nonrevealing or nondiagnostic [9,10]. High-resolution CT (HRCT) is considered the best imaging tool for diffuse lung disease [11,12]. Many diseases, including bronchiectasis, sarcoidosis, emphysema, pneumoconiosis, idiopathic pulmonary fibrosis, Langerhans cell histiocytosis, hypersensitivity pneumonitis, bronchiolitis obliterans, and lymphangitic cancer, have features characteristic enough to enable experienced radiologists to make a confident, probable, or limited differential diagnosis in most cases [11,13-23]. Biopsy and additional diagnostic testing are often unnecessary [24,25]. HRCT may reveal an abnormality even when the chest radiograph is normal [12]. There is a good correlation between the extent of disease on HRCT and the level of dyspnea in patients [26]. HRCT is also a sensitive indicator of disease progression [27]. Expiratory HRCT is a powerful adjunct to inspiratory HRCT in the diagnosis of diffuse lung disease [28,29]. Expiratory scans are useful in the differentiation of causes of inhomogeneous lung attenuation [28]. In COPD, expiratory CT reflects airflow limitation and correlates well with levels of dyspnea [29]. Inspiratory high resolution CT images are typically 1-2 mm in thickness,,

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done in the supine and, if necessary, prone positions. Noncontiguous thin section expiratory imaging is added in patients with known or suspected air flow limitation. CT scans with a slice thickness of >5 mm are NOT adequate to demonstrate fine detail in the lungs.

### Summary

- Based on a limited number of studies, chest radiography seems indicated when dyspnea is chronic or severe or when there are associated risk factors (older than age 40, cardiovascular, pulmonary, or neoplastic disease), other signs or symptoms, or positive findings on the physical examination.
- The rationale for performing chest radiography in acutely dyspneic patients younger than age 40 is less compelling, and there does not appear to be strong support in the literature for either performing or not performing chest radiography when there are no other symptoms or risk factors and when the physical examination is normal.
- HRCT is recommended when the initial evaluation of the dyspneic patient is nonrevealing or when it reveals abnormality but no definitive diagnosis. Expiratory HRCT is indicated in patients with known or suspected air trapping.

### 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, both because of 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 to those specified for adults (see Table below). Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® [Radiation Dose Assessment Introduction](#) document.

Relative Radiation Level Designations		
Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
☼	<0.1 mSv	<0.03 mSv
☼ ☼	0.1-1 mSv	0.03-0.3 mSv
☼ ☼ ☼	1-10 mSv	0.3-3 mSv
☼ ☼ ☼ ☼	10-30 mSv	3-10 mSv
☼ ☼ ☼ ☼ ☼	30-100 mSv	10-30 mSv
*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (eg, region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as NS (not specified).		

### Supporting Document(s)

- [ACR Appropriateness Criteria® Overview](#)
- [Procedure Information](#)
- [Evidence Table](#)

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The ACR Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the FDA have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.