

Effective July 19, 1998

Title 8: California Code of Regulations
Division 1: Department of Industrial Relations
Chapter 1: Industrial Medical Council
Article 4: Evaluation Methodology
Section 44: Method of Evaluation of Pulmonary Disability

I. PURPOSE

This document defines the following:

1. Criteria to be used for establishing the presence or absence of respiratory impairment;
2. Criteria for selecting appropriate use of laboratory data and for identifying inappropriate testing;
3. A method for the quantitative and objective assessment of the extent of respiratory disability.
4. Guidelines regarding the content of medical-legal reports for assessing respiratory disability.

II. GENERAL PRINCIPLES

A. Approach

1. Evaluation of subjective (dyspnea) must be subject to collateral evidence and the internal consistency of the history. The dyspnea criteria are used for rough estimates and cannot by themselves establish a level of impairment without one or more of the physiologic determinants listed below in the same class of impairments.
2. In any evaluation, the physician shall progress from the simple to the more complicated. Start with the history and physical examination, follow with basic pulmonary function tests, and then proceed as appropriate to more complicated procedures. Some patients will require only spirometry, but most will require determination of diffusing capacity for carbon monoxide (Dco), and many will need lung volume measurement.

Refer to Chapter 5, "The Respiratory System in "Guides to the Evaluation of Permanent Impairment" of the American Medical Association, 4th Edition, 1993. These guidelines shall be used in conjunction with the determinants discussed below.

B. Evaluation tests

1. Spirometry

- a. Spirometry must be performed according to the 1994 American Thoracic Society Recommendations. Equipment, calibration, and techniques must be according to these American Thoracic Society criteria.
- b. A spirogram representing the best effort of at least three attempts is used to calculate FEV1 and FVC. The two best efforts must be within 5% of each other, or additional efforts are needed. Hard copies of the spirogram must be incorporated in the report or maintained by the physician for review if needed.
- c. If wheezing or other evidence of bronchospasm is present or if the FEV1/FVC ratio is reduced, perform tests before and after bronchodilator. If albuterol, metaproterenol or isoetharine is used, wait 10 minutes or more before testing. The examiner shall comment on what treatment program the subject has been on during the two months before the testing.

A diagnosis of asthma must be supported by objective evidence of airway hyperresponsiveness such as abnormally low (below the 95% confidence level) FEV1 or FEV1/FVC ratio, which is reversible, or a positive methacholine challenge test. (Asthma may be present and the FEV1 and FEV1/FVC ratio not reversible, if examinee is on bronchodilator at time of testing.) If FEF 25-75% is abnormal (below the 95% confidence level) in a non-smoker, then asthma may be present, but additional testing such as methacholine or histamine challenge may be performed. Wherever possible, the patient should discontinue aerosol bronchodilator treatment at least 12 hours before testing.

- d. Compare test results to the tables of predicted normal values in the Chapter 5 of Guides to the Evaluation of Permanent Impairment of the American Medical Association, Fourth Edition, 1993. Where FEV1 or FVC value is outside the 95% confidence interval, it is considered abnormal. Where FEV1/FVC value is less than 0.70 or outside the 95% confidence interval, it is considered abnormal.
- e. Analysis should be based on the FEV1, FVC, the FEV1/FVC ratio.
- f. Tracings and all data must be submitted with the report or maintained on file for review.

2. Diffusing capacity

- a. Single-breath diffusing capacity for carbon monoxide (Dco) shall be performed routinely unless asthma has been established as the sole cause of dyspnea or spirometry alone establishes severe impairment.
- b. Dco measurement must be done according to the 1994 American Thoracic Society Epidemiology Standardization Project Recommendations.
- c. Dco tracings and all data must be submitted with report or maintained on file for review.

- d. Either Cotes, Crapo, or methods published in peer-reviewed journals for predicted values may be used.
- e. Dco less than 50% predicted indicates significant impairment. If spirometry is normal, exercise testing may be indicated to determine the extent of impairment.
- f. When the Dco is between 50-70% of predicted impairment, evaluation may require exercise testing.

3. Exercise testing

- a. The minimal requirements for performance of an adequate pulmonary exercise test include the following:
 - (1) Supervision and interpretation by a physician thoroughly trained in pulmonary physiology and with special expertise in clinical pulmonary exercise physiology.
 - (2) A standardized quantifiable exercise system (either a treadmill or a bicycle ergometer).
 - (3) Ability to measure heart rate, respiratory rate, minute ventilation, and oxygen consumption following appropriate quality control and validation procedures. (Note: oxygen consumption must be measured, not estimated, from the level of exercise.)
 - (4) Equipment for measuring arterial oxygenation by in-dwelling arterial catheter or pulse oximetry, and personnel appropriately qualified in its use. The blood gas measurements (pH, PCO₂, PO₂) must be made in a laboratory which successfully passes a professional society's proficiency testing program annually (e.g., program of California Thoracic Society or College of American Pathologists). In many instances, properly performed oximetry (to measure O₂ saturation of hemoglobin) can be used as a substitute for measurement of arterial PO₂.
 - (5) The exercise testing must be performed with cardiac monitoring in a medical facility capable of handling any complications and, in addition, capable of performing resting lung studies. An experienced physician must be on site.
- b. Written interpretation must include answers to the following questions:
 - (1) Was the test technically satisfactory?
 - (2) Describe the maximal exercise level achieved as the predicted percent of both heart rate and maximum oxygen consumption (VO₂max). Include in the report the source of the prediction values used.
 - (3) What is the estimate of the maximum exercise level which patient can sustain? Include a statement or literature reference which provides the rationale on which this prediction is based.
 - (4) If limitation of exercise is found, what is the cause (pulmonary or non-pulmonary)? In all cases, include a description of the specific symptoms which limited the maximal level of exercise.

- c. Indications for exercise testing
 - (1) If spirometry indicates Class 2 or Class 3 impairment (See Table 2) but there is dyspnea two levels higher (Class 4 or Class 5, respectively) and the dyspnea is not explained by tests for episodic bronchospasm, exercise testing may be indicated.
 - (2) If spirometry establishes Class 4 or Class 5 impairment, exercise testing is contra-indicated.
 - (3) If tests for airway hyperresponsiveness, exercise induced, antigen induced, or irritant induced episodic bronchospasm are positive and if the degree of impairment can be calculated from spirometric data demonstrating the most severe level of bronchospasm reached during the study, exercise testing is usually not needed since the most severe level of impairment in the presence of the inciting agent is known. The physician must provide specific information on the nature of the bronchospasm inducing agent and its prevalence in the job market.
 - (4) Exercise testing may be needed in some patients with episodic dyspnea to determine if exercise induced bronchospasm is present. If done for this purpose, spirometry must be performed immediately before and after the exercise.
 - (5) If spirometry and Dco are normal but there is marked dyspnea and there are significant clinical findings such as positive x-ray examinations showing interstitial disease (i.e., ILO category 1/0 or greater) or hypoxemia (PO₂ less than 80, according to the Guidelines for the Use of ILO Int'l Classification of Radiographs of Pneumoconioses, Geneva: ILO, 1980. Occupational Health and Safety Services No.22 Revised), exercise testing may be needed.

4. Airway hyperresponsiveness testing

- a. Tests of airway hyperresponsiveness are indicated when asthma is a consideration. This is particularly relevant when the patient complains of episodic dyspnea.
- b. In such instance, if the FEV₁/FVC ratio is reduced and the FEV₁ is less than 60% of predicted, an aerosolized bronchodilator shall be administered. A consistent response (based on accurate testing and maximal patient effort) with greater than 15% increase in FEV₁ indicates that airway reactivity is present.
- c. If the FEV₁/FVC ratio is normal or reduced, and the FEV₁ is greater than 70% of predicted, a provocation challenge test shall be considered if the clinical history suggests the presence of possible disability due to asthma. In such instances, a methacholine challenge or histamine challenge test shall be performed. Such tests shall only be performed by physicians with experience in their conduct. These tests require careful attention to technical detail. In particular, establishment and maintenance of precise concentrations of the methacholine agent is

requisite. False positive and false negative tests may occur if not performed well, and therefore spirometry tracings must be retained for review.

- d. Additional information about the specific techniques of the methacholine challenge may be determined from standard references.

5. Treatment

A careful history of the nature of ongoing treatment for pulmonary conditions must be obtained by the physician performing the evaluation. It is particularly important in cases of asthma to express an opinion about whether optimal therapy is being provided. If the examining physician feels that adequate therapy is not provided, this should be stated explicitly and suggested alternatives should be indicated. In addition, if the examining physician believes that the patient is not complying with treatment, this should be stated.

The National Institute of Health guidelines ("Medical Care", Vol.31. No.3, pp MS20-MS28, Supplement, 1993, "The National Asthma Education Program: Expert Panel Report Guidelines for Diagnosis and Management of Asthma") for the treatment of asthma shall be used as a reference standard for determining the adequacy of treatment. In general, a patient shall be treated with the minimal drug which is necessary to maintain control of the asthma. Additional guidance is available on the 1993 American Thoracic Society statement on Disability and Impairment from Asthma.

6. Chest radiography

Chest radiographic examinations are an essential part of most pulmonary disability evaluations. For evaluating possible pneumoconioses (dust diseases of the lung), it is essential that the radiographs be of high technical quality. Over or under penetration can lead to under or over diagnosis of the presence of pulmonary abnormality. The recommendations of the International Labor Organization (ILO) Committee on chest radiography, Guidelines for the Use of ILO Int'l Classification of Radiographs of Pneumoconioses, Geneva: ILO, 1980. Occupational Health and Safety Services No.22 Revised), shall serve as the reference guideline. The physician interpreting the radiographs must be experienced in evaluating occupational and environmental lung disease (e.g., such as by being an A or B reader as certified by the National Institute for Occupational Safety and Health).

CAT scans are not routinely necessary in the evaluation of dust exposed individuals. Their use shall be limited to those situations where a specific indication exists (e.g., to radiographically evaluate the parenchyma in the presence of extensive pleural abnormality). CAT scans are not indicated for the evaluation of individuals who have been dust exposed but have normal lung function and no symptoms. They are required only if finding the deviation from complete normality will affect the ratable disability.

III. PROCEDURES FOR ASSESSMENT

Clinical assessment for establishing disability under the Workers' Compensation system will proceed in an organized stepwise fashion. First, the history obtained from the patient shall include description of the presence or absence of symptoms shown in Table 1. For each symptom shown, the date of onset, previous severity, and current severity shall be described. Second, the evaluating physician shall personally obtain a history from the patient of the nature of work and possible chemical exposures. In addition, the physician shall personally inquire about any mitigating factors such as the use of respirators or industrial ventilation. Where appropriate, information obtained about exposures from the patient shall be supplemented by industrial hygiene or other information. Third, the physician shall personally obtain a history of cigarette smoking, including past and current practices. Other tobacco use shall also be determined. Fourth, the physician shall ask about non-occupational exposures (e.g., pets, hobbies with chemical exposure). Fifth, a careful history of current and previous treatment for pulmonary conditions shall be obtained by the physician. Sixth, the physician shall perform a careful physical examination. Seventh, the physician shall choose laboratory testing based upon the nature of exposures, the symptoms, and the examination. Guidelines for the utilization of such testing were presented in Section II.

IV. ASSESSMENT OF IMPAIRMENT AND DISABILITY RATING

A. General approach

The available clinical information and laboratory tests, particularly pulmonary function tests, shall be integrated into an assessment of disability. Tables 3 through 4 provide guidelines for this.

Based upon the physiologic findings, a patient is placed into one of five classes. If post-bronchodilator testing is performed, the best of the pre-bronchodilator or post-bronchodilator test results are used for classification. (Asthma is considered subsequently.) Because of the excellent reliability of properly performed pulmonary function testing for assessing impairment, symptoms alone (e.g., shortness of breath) do not warrant classification into a class indicating disability. However, the presence of dyspnea disproportionate to the corresponding physiologic findings indicates the need to consider more careful evaluation (e.g., exercise testing, methacholine challenge testing, search for a nonpulmonary explanation of dyspnea, or psychosocial evaluation).

Table 2, derived largely from the 1993 AMA Guides to Permanent Impairment, 4th Edition, assigns individuals to physiologic classes. Table 3 interconverts the classes to typical disability impact terms. The data have been derived to be consistent with Workers' Compensation recommendations for cardiac disability in the State of California. For each class, the typical corresponding maximum attainable oxygen consumption measurement is provided. For disability rating it is assumed that 45% of peak attainable oxygen consumption can be sustained throughout the workday. In many cases the sustainable oxygen consumption can be estimated from the bona fide pulmonary function testing. Although lifting ability is not directly determined by lung function, the Workers'

Compensation system uses a lifting base terminology. Therefore, a "preclusion equivalent" is included in Table 3. The "preclusion equivalent" is designed to interconvert these ratings to the terminology typically used in Workers' Compensation evaluations.

B. Special consideration for asthma evaluation

Unfortunately, physiologic testing alone may not, in some instances, provide complete information. For example, physiologic testing does not provide information on the impact of regular usage of medication. Table 4 provides a list of such modifying factors and the effect on the impairment schedule listed in Table 2. These must be considered in addition to the physiologic data.

Of particular importance is bona fide occupational asthma due to sensitization to a specific workplace chemical (e.g., TDI). An individual who has true sensitization shall be considered permanently disabled for any job which involves exposure to that agent. Numerous research studies have demonstrated that the diagnosis of true sensitization chemical specific occupational asthma is difficult, and there is considerable misdiagnosis. Because of the great impact on the individual involved, such diagnoses shall be made only by physicians with particular training and expertise in sensitization occupational asthma.

Asthma is particularly difficult to evaluate because the extent of disability depends upon the adequacy of treatment. Therefore, Table 4 provides supplemental guidelines for assessing asthmatics. Prior to use of this, the diagnosis itself must be firmly established by one of the following two methods:

- a. Abnormal FEV1 with a greater than 15% increase after aerosolized bronchodilator administration. (Note, this must be done extremely carefully and well documented to avoid false positives.)
- b. A methacholine challenge test showing a PC20 of less than 20 milligrams.

In Table 4, the need for medication may be considered an indication of severity of disease. In such instances, the need for medication must be carefully documented in order to assure that the patient is receiving the minimal medication necessary to maintain control of asthma. To make such an assessment, the evaluation physician must be skilled in the treatment of asthma. The National Institute for Health Guidelines "Medical Care", Vol.31, No.3, pp MS20-MS28, Supplement, 1993, "The National Asthma Education Program: Expert Panel Report Guidelines for Diagnosis and Management of Asthma" may be helpful as a reference standard.

PULMONARY DISABILITY EVALUATION (IMC)

The following pages are offered as an evaluation algorithm for injured workers with pulmonary disability.

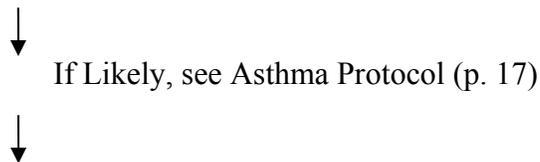
- ALGORITHM PROVIDES A STEPWISE APPROACH
- ALGORITHM IS FOR GENERAL GUIDANCE ONLY
- SEE "GUIDELINES FOR EVALUATION OF PULMONARY DISABILITY"
approved by IMC 12/4/97

PULMONARY DISEASE: BASIC STEPS

1. COLLECT BASIC DATE

- HISTORY (See Table 1)
- SPIROMETRY
 - ↓ FEV1/FVC Ratio or Wheeze
 - ↓ Repeat Post Bronchodilator (use best)
- DIFFUSING CAPACITY FOR CO (UNLESS DX IS ASTHMA)
- CHEST RADIO GRAPH

2. IS ASTHMA LIKELY?



3. PRELIMINARY INMPAIRMENT CLASSIFICATION (See Table 2)

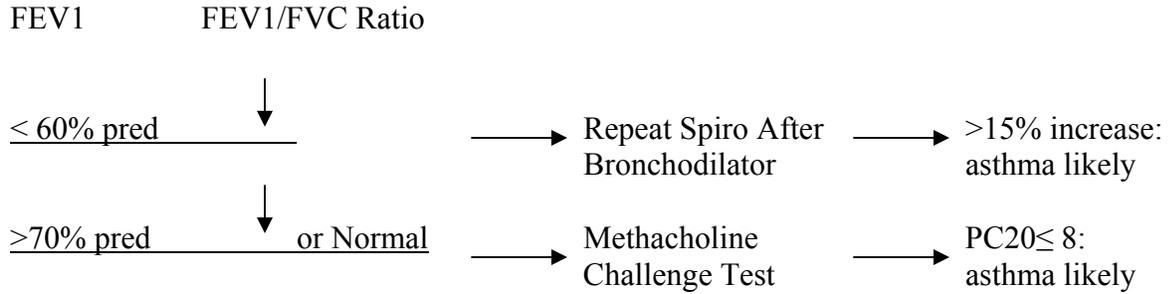
3a. SPECIAL TESTS

4. FIND EQUIVALENT LIFT PRECLUSION (See Table 3)

- **EXERCISE TESTING**
 - If Class 2 or 3 Impairment (Table 2) with unexplained dyspnea 2 classes greater
 - Not Needed for Classes 1, 4, 5
 - Not Needed if Asthma is DX
- **Airway Hyper-Responsiveness Tests**

ASTHMA DISEASE: BASIC STEPS

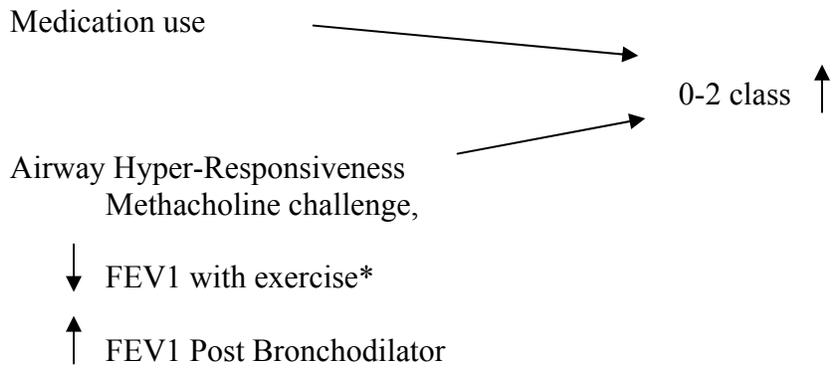
1. CONFIRM DIAGNOSIS



2. RATE IMPAIRMENT WITH Table 2

(based on POST bronchodilator spirometry results)

3. MODIFY RATING FOR ASTHMA (Table 4)



Sensitization to Specific Chemical – Specific Preclusions

*test only if definite exercise induces symptoms are seen

Table 1. Minimal Historical Information To Be Collected By Examining Physician

Dyspnea	Frequency Severity: At rest, walking on level, etc. Constant or Intermittent
Wheezing	Patient's description Associated with dyspnea?
Cough	Frequency Severity: eg., paroxysmal
Sputum Production	Frequency Timing: A.M./all day, etc. Duration: months/year Amount Quality (Thick/thin, purulence)
Sleep Problems	Snoring
Respiratory Infections	Frequency Severity
Medically Diagnosed Lung Disease	Asthma Pneumonia Other
Allergic History	Hay Fever Allergic Asthma
Limitations Due To Dyspnea	Work Home Other

SMOKING	
Current Status	
History	Starting Average Intensity (packs/day) Type: cigarette, pipe, cigar Use of filters
Periods Of Nonsmoking	List years of nonsmoking or reduced smoking. If an ex-smoker, list when stopped.
Cessation Efforts	Type Success?
Environmental Tobacco	Worksite Home (e.g., smoking spouse)

Workplace Questions	
Chemical Exposures	Name Level Duration
Dust Exposure	Asbestos Silica Other
Mitigating Factors	Respirator Use Exhaust Ventilation
Special Exams	X-ray Spirometry

Respiratory Medical History	
Hospitalizations	Date Location Reason
Chest Trauma	
Medical Diagnoses	
Tuberculosis History	Active Disease PPD Status
Respiratory Medications	Physician Prescribed Over The Counter (including inhalers)

Table 2. Impairment Schedule

CLASS 1

The subject may or may not have dyspnea. If dyspnea is present, it is for non-respiratory reasons or it is consistent with the circumstances of activity.

OR

Tests of ventilatory functions (FVC, FEV1, FEV1/FVC ratio as percent) above the lower limit of normal for the predicted value is defined by the 95 percent confidence interval. (See Chapter 5, "The Respiratory System" in Guides to the Evaluation of Permanent Impairment of the American Medical Association, 4th edition, 1993 for methods of calculation.)

OR

VO2 Max greater than 25 ml/(kg-min).

CLASS 2

Dyspnea with fast walking on level ground or when walking up a hill; patient can keep pace with persons of same age and body build on level ground but not on hills or stairs.

AND

Tests of pulmonary function (FVC, FEV1, FEV1/FVC ratio as percent) below the 95 percent confidence interval but greater than 60 percent predicted for FVC, FEV1, and FEV1/FVC ratio.

OR

VO2 Max between 20-25 ml/(kg-min).

CLASS 3

Dyspnea while walking on level ground with person of the same age or walking up one flight of stairs. Patient can walk a mile at own pace without dyspnea, but cannot keep pace on level ground with others of same age and body build.

AND

Tests of ventilatory function (FVC, FEV1, FEV1/FVC ratio as percent) less than 60% predicted, but greater than:

50% predicted for FVC,
40% predicted for FEV1,
40% actual value for FEV1/FVC ratio.

OR

VO2 Max between 15-20 ml/(kg-min).

CLASS 4

Dyspnea after walking more than 100 meters at own pace on level ground.

AND

Tests of pulmonary function (FVC, FEV1, FEV1/FVC ratio as percent):
less than 50 percent predicted but greater than 40 percent for FVC;
less than 40 percent predicted but greater than 30 percent for FEV1;
less than 40 percent predicted but greater than 30 percent for FEV1/FVC;
30-40 percent predicted for Dco.

OR

VO2 Max between 10-15 ml/(kg-min).

CLASS 5

Dyspnea after walking less than 30 meters at own pace or dyspnea at rest.

AND

Tests of ventilatory functions (FVC, FEV1, FEV1/FVC ratio as percent):

less than 40% for FVC;
less than 30% for FEV1;
less than 30% for FEV1/FVC;
less than 30% predicted for Dco.

OR

VO2 Max less than 10 ml/(kg-min).

NOTES:

1. To assess lung function for permanent rating purposes, the patient must be receiving optimal therapy.
2. Lung function testing must conform to 1987 American Thoracic Society Epidemiology Standardization Project Recommendation.
3. O2 consumption must be directly measured, not estimated by treadmill speed and grade (as is commonly done in cardiac stress testing).

Table 3. Impairment Table

CLASS	VO2 max ml/(Kg-min)	Peak METS	Preclusion Equivalent
1	>25	>7	
2	20-25	5.6-7	Very heavy lifting
3	15-20	4.2-5.6	Heavy lifting
4	10-15	2.8-4.2	Light work only
5	<10	<2.8	Sedentary work only

Table 4 Modifying Factors For Asthma

Medication Need (Documented)

Daily mandatory bronchodilator or anti-inflammatory medication		0-1 class
High dose inhaled bronchodilator (>800 ug beclomethasone or equivalent daily)		
Plus occasional course of systemic steroid (e.g., 1-3/year)		0-1 class
Regular systemic steroid use (e.g., >20 mgm prednisone/day)		
Noncompliance with proper treatment	subtract	0-1 class

Airway Hyperresponsiveness

Methacholine Challenge PC20		
<8 mgm		0-1 class
<0.5 mgm		0-2 class
Exercise Induced Bronchospasm - Decline in FEV1 with exercise		
>20%		0-1 class
>40%		0-2 class
Post Bronchodilator Increase in FEV1		
>20%		0-1 class
>30%		0-2 class

Sensitization to Specific Workplace Chemical

Preclusion from a job with exposure to the chemical

*Modifying factors for asthma patients are applied because the routine approach may underestimate disability. The single most significant factor should be used.