



Workers' Compensation Board

January 13, 2022

New York Workers' Compensation Medical Treatment Guidelines for Occupational Interstitial Lung Disease Training Module

A Training Module Developed by the Medical Director's Office

Occupational Interstitial Lung Disease Training Module

■ Medical Care

- Medical care and treatment required as a result of a work-related injury should be focused on restoring the patient's functional ability to perform their daily and work activities with a focus on return to work, while striving to restore the patient's health to its pre-injury status in so far as is feasible.
- Any medical provider rendering services to a workers' compensation patient must utilize the Workers' Compensation Board's *New York Medical Treatment Guidelines (MTGs)* as provided for with respect to all work-related injuries and/or illnesses.

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- Positive results are defined primarily as functional gains that can be objectively measured. Objective functional gains include, but are not limited to, positional tolerances, range of motion, strength, endurance, activities of daily living (ADL), cognition, psychological behavior, and efficiency/velocity measures that can be quantified. Subjective reports of pain and function may be considered and given relative weight when the pain has anatomic and physiologic correlation in proportion to the injury.

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- If a given treatment or modality is not producing positive results within a well-defined time frame, the provider should either modify or discontinue the treatment regime. The provider should evaluate the efficacy of the treatment or modality two to three weeks after the initial visit and three to four weeks thereafter. These time frames may be slightly longer in the context of conditions that are inherently mental health issues, and shorter for other non-musculoskeletal medical conditions (e.g., pulmonary, dermatologic etc.). Recognition that treatment failure is at times attributable to an incorrect diagnosis, a failure to respond should prompt the clinician to reconsider the diagnosis in the event of an unexpected poor response to an otherwise rational intervention.

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- Education of the patient and family, as well as the employer, insurer, policy makers and the community, should be a primary emphasis in the treatment of a work-related injury or illness. Practitioners should develop and implement effective educational strategies and skills. An education-based paradigm should always start with communication providing reassuring information to the patient. No treatment plan is complete without addressing issues of individual and/or group patient education as a means of facilitating self-management of symptoms and prevention of future injury.

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■ Acuity

- Acute, subacute and chronic are generally defined as time frames for disease stages:
 - Acute – Less than one month
 - Subacute – One to three months, and
 - Chronic – Longer than three months

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■ Time Frames

- Diagnostic time frames for conducting diagnostic testing commence on the date of injury.
- Treatment time frames for specific interventions commence once treatments have been initiated, not on the date of injury.
- Clinical judgment may substantiate the need to accelerate or decelerate the time frames discussed in this training module.
- Specific durations of treatments and number of treatment visits (e.g., physical therapy/occupational therapy (PT/OT)) are beyond the scope of this training module and the provider should refer to the recommendations in the *MTGs*.

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■ Delayed Recovery

- For those patients who fail to make expected progress 6-12 weeks after an injury and whose subjective symptoms do not correlate with objective signs and tests, reexamination in order to confirm the accuracy of the diagnosis and reevaluation of the treatment program should be performed. When addressing a clinical issue that is not inherently a mental health issue, assessment for potential barriers to recovery (yellow flags/psychological issues) should be ongoing throughout the care of the patient. At 6-12 weeks, alternate treatment programs, including formal psychological or psychosocial evaluation should be considered. Clinicians must be vigilant for any pre-existing mental health issues or subsequent, consequential mental health issues that may be impacting recovery.

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■ Delayed Recovery

- Active interventions emphasizing patient responsibility, such as therapeutic exercise and/or functional treatment, are generally emphasized over passive modalities, especially as treatment progresses. Generally, passive and palliative interventions are viewed as a means to facilitate progress in an active rehabilitation program with concomitant attainment of objective functional gains.

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■ Active Interventions

- Active interventions emphasizing patient responsibility, such as therapeutic exercise and/or functional treatment, are generally emphasized over passive modalities, especially as treatment progresses. Generally, passive and palliative interventions are viewed as a means to facilitate progress in an active rehabilitation program with concomitant attainment of objective functional gains.

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■ Diagnostic Imaging and Testing Procedures

- Clinical information obtained by history taking and physical examination should be the basis for selection of imaging procedures and interpretation of results.
- It may be of value to repeat diagnostic procedures (e.g., imaging studies) during the course of care to reassess or stage the pathology when there is progression of symptoms or findings, prior to surgical interventions and therapeutic injections when clinically indicated, and post-operatively to follow the healing process.

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■ Surgical Interventions

- Consideration of surgery should be within the context of expected functional outcome. The concept of "cure" with respect to surgical treatment by itself is generally a misnomer. All operative interventions must be based upon positive correlation of clinical findings, clinical course, imaging, and other diagnostic tests.

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■ Surgical Interventions

- For surgery to be performed to treat pain, there must be clear correlation between the pain symptoms and objective evidence of its cause. In all cases, shared decision making with the patient is advised.

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■ Pre-Authorization

- All diagnostic imaging, testing procedures, non-surgical and surgical therapeutic procedures within the criteria of the *MTGs* and based on a correct application of the *MTGs* are considered authorized, with the exception of the procedures listed in section 324.3(1)(a) of Title 12 NYCRR.

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■ Pre-Authorization

- Second or subsequent procedures (the repeat performance of a surgical procedure due to failure of, or incomplete success from, the same surgical procedure performed earlier, if the *MTGs* do not specifically address multiple procedures) also require pre-authorization.

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■ Personality/Psychological/Psychosocial Evaluations

- In select patients, mental health evaluations are essential to make, secure or confirm a diagnosis. Of course, the extent and duration of evaluations and/or interventions by mental health professionals may vary, particularly based on whether: the underlying clinical issue in the claim is inherently a mental health issue; there is a mental health issue that is secondary or consequential to the medical injury or illness that is at issue in the claim in question; or there is a pre-existing, unrelated mental health issue that has been made worse by, and/or is impeding the recovery from the medical injury or illness that is at issue in the claim in question.

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■ Personality/Psychological/Psychosocial Evaluations

- When assessing for a pre-existing, unrelated mental health issue that has been made worse by and/or is impeding the recovery from a work-related, medical injury or illness, then a one-time visit for initial psychiatric/psychological encounter should be sufficient, as care would normally be continued by the prior treating provider.
- If psychometric testing is indicated by findings in the initial encounter, time for such testing should not exceed an additional three hours of professional time.

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■ Personality/Psychological/Psychosocial Evaluations

- For conditions in which a mental health issue is a central part of the initial claim, or in which there is a mental health issue that is secondary or consequential to the work-related, medical injury or illness, that is part of the claim in question, then more extensive diagnostic and therapeutic interventions may be clinically indicated and are discussed in detail in the *MTGs* for such mental health conditions.

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■ Functional Capacity Evaluation (FCE)

- Functional capacity evaluation is a comprehensive or more restricted evaluation of the various aspects of function as they relate to the patient's ability to return to work.
 - In most cases, the question of whether a patient can return to work can be answered without an FCE.
 - An FCE may be considered at time of maximum medical improvement (MMI), following reasonable prior attempts to return to full duty throughout course of treatment, when the treating physician is unable to make a clear determination on work status on case closure. An FCE is not indicated early during a treatment regime for any reason including one to support a therapeutic plan.

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■ Functional Capacity Evaluation (FCE)

- When an FCE is being used to determine return to a specific job site, the treating provider is responsible for understanding and considering the job duties. FCEs cannot be used in isolation to determine work restrictions. The authorized treating provider must interpret the FCE in light of the individual patient's presentation and medical and personal perceptions. FCEs should not be used as the sole criteria to diagnose malingering.

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■ Functional Capacity Evaluation (FCE)

- An FCE may be considered at time of MMI, following reasonable prior attempts to return to full duty throughout the course of treatment, when the treating provider is unable to make a clear determination on work status on case closure.

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■ Return To Work

- For purposes of the *MTGs*, return to work is defined as any work or duty that the patient is able to perform safely. It may not be the patient's regular work. Ascertaining a return-to-work status is part of medical care and should be included in the treatment and rehabilitation plan. It is normally addressed at every outpatient visit.

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■ Return To Work

- A description of the patient's status and task limitations is part of any treatment plan and should provide the basis for restriction of work activities when warranted. Early return to work should be a prime goal in treating occupational injuries. The emphasis within the *MTGs* is to move patients along a continuum of care and return to work, since the likelihood of returning an injured worker to work drops progressively the longer the worker has been out of work.

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■ Return To Work

- When returning to work at the patient's previous job task/setting is not feasible given the clinically determined restrictions on the patient's activities, inquiry should be made about modified duty work settings.

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■ Occupational Lung Disease

- Occupational lung disease is often classified into several different categories, of which Interstitial Lung Disease (ILD) is one of the main categories and work-related asthma is another. (Work related asthma will be addressed in the upcoming NY WC MTG for Occupational Asthma/Work Related Asthma).

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- The NY WC MTG for Interstitial Lung Disease is intended as an evidence-based approach to the diagnosis and treatment of occupational ILD. The guidelines cover inorganic dust-related diseases (e.g., silicosis, asbestosis, and coal workers' pneumoconiosis (CWP)), and the immunologically mediated diseases such as chronic beryllium disease (CBD) or hypersensitivity pneumonitis (HP). Occupational exposure history, presentation, and diagnostic and screening test results form the foundation for diagnosis and treatment plans.

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- ILDs are a heterogeneous group of more than 100 diseases that inflame and/or scar the lung parenchyma and which are classified together because of similar clinical, roentgenographic, physiologic, and/or pathologic features. ILD describes disorders affecting the lung interstitium. Acute injury to the interstitium is manifested mostly by edema and inflammation, while chronic injury is characterized by fibrosis, the end stage of chronic inflammation. ILD, sometimes referred to as “pulmonary fibrosis” or “interstitial fibrosis,” is a group of chronic, generally irreversible conditions manifested by a vigorous immune and/or inflammatory response and exuberant fibroblast activity that results in excessive collagen deposition.

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■ Introduction

- Occupationally related ILD falls into four often clinically overlapping categories:
 - Pneumoconiosis
 - Hypersensitivity pneumonitis (HP)
 - Other granulomatous diseases
 - Toxic inhalation injury

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■ Introduction

ILD associated with pneumoconioses and autoimmune processes tends to progress through stages, ultimately reaching a similar “end stage” condition. This condition is characterized by:

- restrictive disease
- pulmonary hypertension
- cor pulmonale
- congestive heart failure
- lung infections due to loss of host defense mechanisms

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Most Common ILD Conditions, Etiologic Agents, Latency

Category	Condition/Examples	Occupational Exposure (Etiologic Agent)	Latency (Time of exposure to onset of symptoms)
Pneumoconiosis (Three most common)	Silicosis	Crystalline silica	Years to decades
	Asbestosis	Asbestos Minerals	
	Coal Workers	Coal Mine Dust, Graphite	Decades
Hypersensitivity Pneumonitis (Organic Respirable Dusts/Low Molecular Weight) Sensitizing Chemicals	Farmers Lung Bird Fanciers Lung	Animal proteins, plant proteins, bacteria, fungi and plants, foam, PVC fumes, diisocyanates	Defined as acute, subacute and chronic. As early as hours in acute.
Other Granulomatous Diseases	Berylliosis Hard Metal Disease (Cobalt, Tin)	Beryllium, Cobalt Tin. Hard Metal	Years to decades
Toxic Inhalation Injury	Irritant inhalation injury (diffuse alveolar related to nitrogen oxide) ex. Nitrogen Dioxide, Ozone, Phosgene or ionizing radiation (Gases)	ex. Nitrogen Dioxide, Ozone, Phosgene or ionizing radiation (Gases)	Hours

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Industrial Exposure

Category	Industry	Occupational Activities
Pneumoconiosis (Three most common) Silicosis Pneumoconiosis Asbestosis	Mining, oil and gas, construction, foundry, pottery, manufacturing, sandblasting, foundry workers, tunnel diggers, ceramic workers, power plant, foundry, demolition, ship building, brake and clutch linings, asbestos cement, asbestos textile, fireproofing, insulation	Drilling, mining, excavating, abrasive blasting, grinding, cutting Removal of disturbing old asbestos-containing construction materials (e.g., insulation), insulation application, brake and clutch work
Pneumoconiosis Coal Workers	Mining, electricity generation and storage, metals	Coal mining/handling, battery manufacture, pencil making
Hypersensitivity Pneumonitis	Wood and food products, animal rearing, farming, painting, chemicals manufacturing	Cleaning, water sprays, shredding
Other Granulomatous Diseases Toxic Inhalation Injury	Nuclear, aircraft, tools, electronics Chemical production, manufacturing, transportation	Machining, grinding, smelting, metal product manufacturing Generally acute exposure in the course of accidents or other disasters

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■ Key Concepts

- Latency
 - Latency can be defined as the time interval between initial exposure and onset of symptoms/clinical diagnosis. The concept of latency is important in occupational ILD as most of the occupational ILDs have a long latency time.

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■ Key Concepts

- Comorbidities
 - As per the International Agency for Research on Cancer (IARC), asbestos exposure is associated with an increased risk for lung cancer (with far greater risk, or interaction, with cigarette smoking), mesothelioma (involving pleural or peritoneal serosal membranes), laryngeal and ovarian. Other studies show that asbestos may be associated with increases in cancers in other sites such as pharyngeal, stomach, colon, and kidney cancers. Asbestos exposure has also been associated with risk for airway disease.

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■ Key Concepts

- Comorbidities
 - CWP is associated with an elevated risk of autoimmune disorders, principally rheumatoid arthritis (aka, “Caplan’s syndrome”). Thus, workers with CWP may have associated autoimmune disorders and develop systemic clinical manifestations. CWP has also been associated with risk for airway disease.
 - Silicosis increases risk for lung cancer, pulmonary tuberculosis, autoimmune disease, renal disease, and airway diseases. There is also an interaction of increased lung cancer and cigarette smoking, although not as strong as the one for asbestos exposure.

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■ Silicosis

- Exposure to sufficient respirable silica leads to silicosis, an irreversible disease which is associated with a variety of systemic and pulmonary conditions. Patients with silicosis or silica exposure have an increased risk for lung cancer. The IARC reclassified silica as a Group I substance (“carcinogenic to humans”) in October 1996.
- Silicosis is the most common occupational disease worldwide and at least 1.7 million U.S. workers are exposed to respirable crystalline silica.

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■ Silicosis

- Silicosis results from exposure to crystalline silicon dioxide. Exposure to silica in other forms such as glass and other amorphous forms of silica has not been associated with silicosis.
- Silica exposure occurs in a variety of industries and occupations, including construction, sandblasting, and mining.

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■ Silicosis

- Exposure to silica can result in one of three different disease patterns: chronic silicosis, subacute/accelerated silicosis and acute silicosis. The most common form is chronic silicosis, which is usually seen after more than ten years of exposure. Subacute silicosis results from shorter, heavier exposures, usually after two to five years of latency. Acute silicosis is often seen following intense exposure to fine silica-containing dust over a period of several months.

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■ Silicosis

- Chronic silicosis may progress to massive, accreted fibrotic zones in the lung (“conglomerative silicosis”) that result in:
 - Respiratory failure
 - Pulmonary HTN
 - Cor pulmonale with right heart failure
- Patients with silicosis also have increased risk for chronic bronchitis, emphysema, lung cancer, pulmonary tuberculosis, autoimmune disease, renal disease.

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■ Silicosis

- Silicosis typically becomes clinically apparent over a period of years, exceptions are rare but include accelerated silicosis.
- The diagnosis of silicosis is typically made clinically, based on occupational history of sufficient exposure with appropriate latency, objective radiographic evidence (chest radiograph and/or high resolution computed tomography (HRCT)), assessment of pulmonary function and consideration of alternative differential diagnoses.

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■ Asbestosis

- Asbestosis refers to the diffuse type of pulmonary fibrosis that results from inhaling asbestos fibers. Pleural thickening, in the form of discrete pleural plaques (calcified or uncalcified) is the most common manifestation of asbestos exposure. Diffuse pleural thickening, rounded atelectasis and non-malignant asbestos-related pleural effusion are other manifestations of pleural disease caused by asbestos exposure.

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■ Asbestosis

- Asbestos exposure is associated with an increased risk for lung cancer (especially in patients with a cigarette smoking history), mesothelioma, laryngeal and ovarian cancer.
- Individuals with asbestosis experience variable rates of disease progression, ranging from mild to severe respiratory impairment. Asbestosis symptoms and radiographic findings are worsened by cigarette smoking history and other exposures such as diesel fuel fumes.

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■ Asbestosis

- The symptoms of asbestosis can take decades after exposure to present.
- The diagnosis of asbestosis and other asbestos-related diseases is typically made clinically, based on occupational history of sufficient exposure with appropriate latency, objective radiographic evidence (chest radiograph and/or HRCT), assessment of pulmonary function, and consideration of alternative differential diagnoses.

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■ Coal Workers' Pneumoconiosis

- Coal dust is a mixture of carbon and complex organic materials and minerals, including variable amounts of silica and silicates.
- CWP is a distinct disease, distinguishable pathologically from silicosis, although the two may occur together particularly in miners who drilled or cut through rock.
- CWP is often associated with bronchitis and some degree of airway obstruction.
- CWP may progress to large intrathoracic fibrotic masses, usually visible on chest X-rays in the upper and mid lung fields (“progressive massive fibrosis”), which are associated with severe respiratory impairment.

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■ Coal Workers' Pneumoconiosis

- CWP typically becomes clinically apparent over a period of decades but can rarely occur earlier with high exposure levels.
- The diagnosis of CWP is typically made clinically, based on occupational history of sufficient exposure with appropriate latency, objective radiographic evidence (chest radiograph and/or HRCT), assessment of pulmonary function, and consideration of alternative differential diagnoses.

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■ Hypersensitivity Pneumonitis

- Hypersensitivity pneumonitis (HP), also known as extrinsic allergic alveolitis, can be caused by inhalation of organic dust with antigenic properties or exposure to low-molecular weight sensitizing chemicals.
- HP is a large family of disorders of immune response often associated with granulomatous pathological changes. HPs tend to be highly specific to occupation or environmental settings.

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■ Hypersensitivity Pneumonitis

- Inhaled causative agents include:
 - Animal proteins
 - Plant proteins
 - Bacteria
 - Fungi
 - Diisocyanates.
 - Paints
 - Trimellitic anhydride
 - Epoxy resins
 - “Bordeaux mixture” (a pesticide made from copper sulfate used in vineyards)

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■ Hypersensitivity Pneumonitis

- These dusts arise from:
 - Renovation of buildings (especially demolition or exposing damp interior walls), exposure to contaminated water or persistently wet spaces (humidifiers, hot tubs, saunas, and unventilated showers)
 - Handling birds
 - Occasionally from sensitization to other animals (such as farmer's lung)
 - Insects (such as miller's lung, the antigen to which is a wheat weevil protein)
 - Amoebae (humidifier lung)
 - Pesticide powder (pyrethrum HP)
 - Spores of a thermophilic actinomycete bacteria resulting in furrier's lung
 - Animal-derived dusts
 - Grain dusts
 - Mold spores

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■ Hypersensitivity Pneumonitis

- HP often begins with wheezing and airway obstruction. Untreated and unmanaged, it may progress to respiratory insufficiency and profound impairment.
- In HP, sensitization may occur in the first few weeks after beginning exposure; in others it may be delayed for months or years.
- The acute, predominant airway symptoms of HP develop in a sensitized individual over days to weeks and may progress over weeks to interstitial inflammation and ultimately to fibrosis.
- Rarely, hyperacute or sudden in onset, similar to some eosinophilic pneumonias or some drug-induced pneumonitis.

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■ Other Granulomatous Diseases

- ILD caused by chronic immune and foreign-body responses to antigens in the lung, which may be metal dusts and, therefore, also considered pneumoconioses.
- Prominent examples include:
 - Beryllium (beryllium disease)
 - Cobalt in cemented tungsten carbide (hard metal disease)
 - Work-related sarcoidosis

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■ Other Granulomatous Diseases

- The clinical manifestations of hard metal disease are overall similar to other pneumoconioses. The pathological findings of hard metal disease are that of a giant cell interstitial pneumonia. The interstitial fibrosis is accompanied by activated macrophages that fill the alveoli and are part of a dysfunctional foreign body reaction.
- Chronic beryllium disease is a systemic granulomatous inflammatory disorder that is very similar to sarcoidosis.

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■ Other Granulomatous Diseases

- These disorders are uncommon; problems develop at different exposure levels in different people. It can be decades before these disorders become clinically apparent and the clinical presentations are variable.
- This condition usually results from irritant inhalation injury (e.g., diffuse alveolar injury related to nitrogen oxides).
- Extensive fibrosis, which may occur following recovery from diffuse alveolar damage by toxic inhalation, is refractory to direct management.

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■ Toxic Inhalation Injury

- ILD due to toxic inhalation injury is generally the result of severe lung injury after an acute exposure to high concentration of noxious gases, fumes or mists.

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■ History of Present Illness

- The history of present illness should document:
 - Occupational and non-occupational pulmonary exposures.
 - Occupation: current/past and types of work activities (such as construction, demolition, mining, manufacturing, drilling).
 - Time spent at each job, including jobs held years to decades in the past.
 - Exposures to dusts, metals, fumes, gases should be documented, as should the intensity of the exposure.

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■ History of Present Illness

- The history of present illness should document:
 - The types of symptoms (e.g., cough, shortness of breath (SOB), etc.) and the timing of symptom development.
 - Duration, onset and frequency of symptoms.
 - Pulmonary imaging and testing and previous treatments.

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■ History of Present Illness

- The history of present illness should document:
 - Relationship to work: This includes a statement of the probability that the illness, or injury is work related.
 - Ability to perform job duties and activities of daily living.

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■ Past Medical History

- An accurate past medical history includes documentation of prior pulmonary exposures and treatments, as well as a detailed smoking history and medication history.
- A comprehensive review of systems (ROS) should be performed including a history of allergies.

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■ Physical Examination

- An occupational pulmonary physical examination should include the following elements:
 - Vital signs, including measured respiratory rate, O2 saturation.
 - Overall functional abilities, including ease of movement, walking and changing positions, dressing and undressing while assessing signs and symptoms of dyspnea.
 - Assessment of respiratory status (e.g., rate, depth, use of accessory muscles, nasal flaring).

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■ Physical Examination

- An occupational pulmonary physical examination should include the following elements:
 - Inspection for stigmata of pulmonary disease as well as potential etiologies including:
 - Mucous membrane abnormalities
 - Nasal polyps/swelling/discharge
 - Clubbing (asbestosis, idiopathic pulmonary fibrosis, some hypersensitivity pneumonitides)
 - Anterior-posterior diameter
 - Scoliosis

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■ Physical Examination

- An occupational pulmonary physical examination should include the following elements:
 - Palpation for:
 - Aeration
 - Chest wall abnormalities
 - Adenopathy and neck masses
 - Percussion for resonance to identify:
 - Aeration
 - Diaphragm level
 - Suggestion for fluid interface or consolidation

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■ Physical Examination

- An occupational pulmonary physical examination should include the following elements:
 - Auscultation for:
 - Inspiration to expiration ratio
 - Adventitious breath sounds (crackles, wheeze [often a secondary manifestation of HP and a primary manifestation of eosinophilic pneumonia] rales, rhonchi)
 - Pleural rubs, as well as timing, location and persistence of lung findings
 - Cardiac examination with attention to findings of cor pulmonale and heart failure.

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■ Diagnostic Criteria and Differential Diagnosis

- The diagnoses of occupational ILD typically is made clinically, based on occupational history of sufficient exposure with appropriate latency, objective radiographic evidence (chest radiograph and/or HRCT), assessment of pulmonary function (including consistent changes in ventilatory capacity, static lung volumes or gas-exchange), and consideration of alternative differential diagnoses.

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■ Diagnostic Criteria and Differential Diagnosis

- In a worker with a typical clinical picture (including exposure history, latency, and radiographic presentation), lung biopsy is rarely needed to provide a diagnosis of occupational ILD. Pathologic examination of lung tissue may at times be required in settings where clinical or radiographic features are inconclusive or atypical.

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■ Medical Follow-up and Evaluation

- **Recommendation** - Periodic medical follow up, including pulmonary function tests and imaging studies in the medical evaluation of pulmonary occupational disease.

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■ Diagnostic Testing and Procedures

- Spirometry
 - Spirometry is a useful initial test of lung function. Spirometry provides physiologic evidence for occupational ILD and differentiates between obstructive and restrictive lung patterns of lung function. Spirometry should be performed on all patients as a key component in the diagnosis and monitoring of occupational interstitial lung disease. However, ILD is not defined by spirometry. Abnormal spirometry results should lead to further testing, including confirmation by lung volume testing according to American Thoracic Society (ATS) accepted recommendations or referral to a specialist.

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■ Diagnostic Testing and Procedures

- Spirometry
 - Ideally, the modern diagnostic evaluation of pulmonary occupational disease should include measurements of lung volumes and diffusing capacity. As per clinical necessity, further analysis of gas exchange physiology, cardiopulmonary exercise testing and/or six-minute walk test should be used to supplement the diagnostic and therapeutic evaluations of occupational lung disease.

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■ Diagnostic Testing and Procedures

- Spirometry
 - When diagnostic spirometry is abnormal, testing should first be repeated on another occasion.
 - If results remain abnormal, short-term reversibility of the spirometry results should be assessed, most often by repeating the spirometry testing after the individual has undergone a standardized short-acting bronchodilator inhalation protocol.

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■ Diagnostic Testing and Procedures

- Spirometry
 - Interpretation – There are several steps in the interpretation of spirometry testing performed as part of the evaluation of workers at risk of occupational ILD. First, the interpreter must review and comment on test quality and determine whether acceptability criteria are met. If the test is considered adequate for interpretation, then adjust for age, height, gender and race/ethnicity using appropriate reference tables for normal or predicted values.
 - For patients who have previously completed spirometry, changes in test results are evaluated over time.

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■ Diagnostic Testing and Procedures

- Spirometry
 - **Recommended** – In the diagnostic work-up and monitoring of individuals with occupationally related interstitial lung diseases.
 - **Indications – *Diagnostic***: Patients with history and/or chest radiography consistent with ILD and workplace exposure consistent with plausible etiologies (e.g., worker complaining of chronic or intermittent cough, shortness of breath, or decreased physical abilities). Spirometry should generally be postponed if there has been recent surgery, respiratory infections, or recent cardiac problems.

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■ Diagnostic Testing and Procedures

- Spirometry
 - **Indications – Monitoring/Surveillance:** Periodic spirometry (yearly) with longitudinal evaluation of loss of pulmonary function is recommended for workers in occupations with exposures that are either known or thought to be associated with development of occupational lung disease. Longitudinal evaluation is accomplished by tracking FEV1 loss over a period of time, since the FEV1 is the most repeatable lung function parameter. Such evaluation should be calculated when spirometry tests are of adequate technical quality. In general, a loss of FEV1 in excess of 50 ml/year is considered a loss of pulmonary function in excess of the aging effect. The American College of Occupational Medicine (ACOEM), the American Thoracic Society (ATS) and the National Institute of Occupational Safety and Health (NIOSH) all have different proposed methodologies to calculate the loss of pulmonary function and determine if such loss is above the expected age-related loss of pulmonary function. Computerized software is available to calculate trends over time, such as NIOSH's Spirola.

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■ Diagnostic Testing and Procedures

- Static (Full) Lung Volumes
 - Measurement of static lung volumes, including total lung capacity (TLC), functional residual capacity (FRC) and residual volume (RV), is indicated to complement the information obtained on a spirometry test when further clarification of diagnosis is indicated.
 - The finding of a reduced forced vital capacity (FVC) on spirometry could be due to several disease processes. In order to fully clarify a reduced FVC on spirometry, measurement of static lung volumes is required to confirm the diagnosis of a true restrictive disorder, i.e., a reduced TLC below lower limits of normal.

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■ Diagnostic Testing and Procedures

- Static (Full) Lung Volumes
 - Static lung volumes can be used in obstructive diseases as well to assess the existence of air trapping, for example in emphysema or asthma. In these conditions, the TLC is increased as is the RV/TLC ratio.
 - Measurement of static lung volumes can be accomplished by inert gas dilution or body plethysmography.

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■ Diagnostic Testing and Procedures

- Static (Full) Lung Volumes
 - **Recommended** and ***Indicated*** – In the assessment of occupational ILD to clarify a reduced FVC on spirometry, especially when the FEV1/FVC ratio is normal.

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■ Diagnostic Testing and Procedures

- Measurement of Oxygenation
 - Measurement of oxygenation can be accomplished by non-invasive oximetry or by arterial blood gas sampling.
 - Non-invasive oximetry measures oxyhemoglobin or oxygen saturation of the hemoglobin. It is a simple method commonly used in the outpatient setting.
 - Arterial blood gas is helpful in accurately measuring the partial pressure and saturation of oxygen and allows the calculation of alveolar-arterial oxygen gradient.

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■ Diagnostic Testing and Procedures

- Measurement of Oxygenation
 - **Recommended** – Non-invasive oximetry measurements of oxygenation (pulse oximetry) in the evaluation and management of occupational ILD.
 - **Recommended** – Arterial blood gas measurements in select patients where accurately measuring the partial pressure and saturation of oxygen and calculation of alveolar-arterial oxygen gradient is indicated.
 - **Indications** – Measurements of oxygenation are recommended in the assessment of occupational ILD.

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■ Diagnostic Testing and Procedures

- Chest Radiographs
 - Evaluation of pulmonary occupational disease should include imaging studies.
 - **Recommended** – At minimum, a chest radiograph (PA and lateral) should be part of the diagnostic work-up. It is preferable that chest radiographs should be interpreted according to the International Labor Organization Classification for Pneumoconiosis.

Occupational Interstitial Lung Disease Training Module

■ Diagnostic Testing and Procedures

- Chest Radiographs
 - Radiographs provide anatomic information about the lung parenchyma and pleura that influences the differential diagnosis of occupational ILD and also provide information about the extent of involvement and progression of disease; however, while radiographs may assist in the diagnosis of occupational lung diseases, they are less sensitive and specific than computed tomography (CT) and HRCT scans.

Occupational Interstitial Lung Disease Training Module

■ Diagnostic Testing and Procedures

- Chest Radiographs
 - Radiographs should be interpreted by a physician with appropriate training, experience, and skills in interpretation of radiographs for diagnosis of ILD and occupational lung disease. To document the patterns and severity of radiographic appearances of pneumoconiosis, radiographs are preferably interpreted according to the International Labour Organization (ILO) classification (80) by readers who have "B" reader certification for this classification system or individuals with appropriate training and skills. The Board recognizes that other standard-setting organizations require "B" reader qualifications for interpretation of radiographs in certain situations.

Occupational Interstitial Lung Disease Training Module

■ Diagnostic Studies

- High Resolution Computed Tomography and Computed Tomography Scans (HRCT/CT)
 - HRCT/CT should be considered in the evaluation of occupational ILD, when additional diagnostics are required based on clinical findings (including spirometry and chest X-ray).
 - When indicated, HRCT/CT of the chest should include lung, mediastinal and high-resolution windows, and may include inspiratory/expiratory imaging.
 - HRCT/CT is generally performed in the supine position, but prone imaging may be of use in certain circumstances, for example, confirmation that subtle peripheral and/or basilar findings represent interstitial abnormality.

Occupational Interstitial Lung Disease Training Module

■ Diagnostic Studies

- High Resolution Computed Tomography and Computed Tomography Scans (HRCT/CT)
 - **Recommended** – In the diagnostic work up of pneumoconiosis and other pulmonary occupational diseases, especially in those lung diseases that result in increased risk for lung cancer, as this imaging study not only has diagnostic value but can be used as a screening test for early detection of lung cancer.

Occupational Interstitial Lung Disease Training Module

■ Diagnostic Studies

- Magnetic Resonance Imaging (MRI) of the chest
 - **Not Recommended** – As a primary diagnostic tool for occupational ILD.
- PET/CT scans of the chest
 - **Recommended** – In select cases in the evaluation of cancer associated with ILD (lung cancer and mesothelioma) and certain other comorbid conditions.

Occupational Interstitial Lung Disease Training Module

■ Diagnosis Studies

- Carbon Monoxide Diffusing Capacity (DL_{co})
 - DL_{co} (diffusing capacity of the lungs) is a test that measures the movement of gas from the lungs (alveoli/air spaces) to blood flowing in the pulmonary capillaries. DL_{co} is typically used to describe the single breath diffusing capacity test, which measures this diffusion. In this test the patient inhales a known amount of CO and the difference between what is inhaled and the carbon monoxide (CO) measured in the exhaled gas is measured as the diffusing capacity (for a gas) of the lungs into blood. The test indirectly assesses the ability of the lungs to transfer oxygen to blood through the use of a calibrated test gas, CO.

Occupational Interstitial Lung Disease Training Module

■ Diagnostic Studies

- Carbon Monoxide Diffusing Capacity (DLco)
 - Using appropriate methods for the test and adjustments for the results, the test can be used to assess lung function and the presence of several lung diseases including ILD.
 - At least two DLco tests should be performed and the average reported.
 - The two measurements for the DLco should agree within 10%.
 - It is important to obtain smoking status as cigarette smoking may cause measurable baseline levels of CO causing an increased back-pressure and carboxyhemoglobin.
 - It is important to have the patient's hemoglobin available, as anemia will lower the measured diffusion. Equations for correction of anemia are available.

Occupational Interstitial Lung Disease Training Module

■ Diagnostic Studies

- Carbon Monoxide Diffusing Capacity (DLco)
 - **Recommended** – DLco may be used to help in diagnosing gas exchange abnormalities in patients with lung disease.
 - **Advantages and Limitations** – DLco may be affected by different diseases and exposures. These must be considered when interpreting the test results.

Diseases/Conditions that Decrease DLco

Reduced effort or respiratory muscle weakness

Thoracic deformity preventing full inflation

Anemia

Pulmonary emboli

Hb binding changes (e.g., HbCO, increased FI, O₂)

Valsalva maneuver

Lung resection

Emphysema

Interstitial lung disease (e.g., IPF, sarcoidosis)

Chronic beryllium disease (CBD)

Pulmonary edema

Pulmonary vasculitis

Pulmonary hypertension

Occupational Interstitial Lung Disease Training Module

■ Diagnostic Studies

- Biological Sampling
 - Invasive Procedures
 - Including, but not limited to, bronchoscopy, bronchoalveolar lavage analysis and lung biopsy are not routinely required to diagnose occupational lung disease, but should be included as part of the diagnostic armamentarium when clinically indicated and/or necessary to confirm or exclude a specific diagnosis. Often specific CT findings are considered diagnostic in certain conditions.

Occupational Interstitial Lung Disease Training Module

■ Diagnostic Studies

- Sputum Samples and Bronchoalveolar Lavage (BAL)
 - **Recommended** and ***Indicated*** – If there is insufficient objective clinical evidence obtained from physical examination, chest radiographs and spirometry, additional testing including biological sampling may be indicated to confirm the diagnosis of occupational ILD.
 - Sampling is done by having the patient cough to attempt to produce the sputum from deep within the lungs. It is recommended that each sample be at least 15mL to help increase the sensitivity of the sample.

Occupational Interstitial Lung Disease Training Module

■ Diagnostic Studies

- Bronchoalveolar Lavage
 - **Recommended** – In select patients as an aid for the diagnosis of occupational lung disease.
 - **Indications/Technique** – To assist in the diagnosis of occupationally-related interstitial lung disease. BAL may support the diagnosis but is not required given the availability of modern testing (i.e., HRCT).

Occupational Interstitial Lung Disease Training Module

■ Diagnostic Studies

- Bronchoscopy and/or Lung Biopsy
 - **Recommended** – In very select patients to confirm or exclude diagnosis in specific cases.

Occupational Interstitial Lung Disease Training Module

■ Management of Occupational Interstitial Lung Disease

- Management of workers diagnosed with occupational ILD is aimed at preventing further loss of lung function by decreasing inflammation and preventing the progression of lung scarring.
 - Avoid additional provocative exposure to protect from disease progression.
 - Exposure assessment for workers diagnosed with occupational ILD to determine whether a worker might return to a specific job/exposure with the recommended use of personal protective equipment (PPE).
 - Avoid the source of the problem.
 - Stop smoking and avoid passive smoke exposure.
 - Avoid airway irritants such as fragrances, solvents and dust.

Occupational Interstitial Lung Disease Training Module

■ Management of Occupational Interstitial Lung Disease

- Pharmacological treatment
 - Follow established guidelines for treatment of ILD.
 - Bronchodilators, inhaled corticosteroids, cytotoxic drugs or immunotherapy.
 - Monitor Progress
 - Periodic medical follow-up, including pulmonary function tests and imaging studies for pulmonary ILD.
 - Six-minute walk test as a means to monitor response to treatment or progression of disease.

Occupational Interstitial Lung Disease Training Module

■ Management of Occupational Interstitial Lung Disease

- Minimize and manage potential complications of ILDo immunization against pneumococcal pneumonia and influenza.
 - Immunization against pneumococcal pneumonia and influenza.
 - Monitor for acute flare up.
 - Aggressive management of respiratory infections with a low threshold for hospitalization.
 - Specific management of comorbidities (including potential opportunistic infections, cancer).
 - Supportive (supplemental) oxygenation if desaturation is documented during exertion or sleep.
 - Management of cardiac complications (e.g., pulmonary hypertension, right-sided heart failure, congestive heart failure).

Occupational Interstitial Lung Disease Training Module

■ Management of Occupational Interstitial Lung Disease

- Pulmonary rehabilitation to improve functional capacity, including:
 - Alternate efficient breathing methods.
 - Evaluate and maximize home environment to save exertional energy.
 - Maintain caloric intake.
- Screen for lung cancer.

Occupational Interstitial Lung Disease Training Module

■ Management of Occupational Interstitial Lung Disease

- Lung Transplantation
 - **Recommended** – In advanced or rapidly progressive cases, evaluation for lung transplantation should be performed.
- Pharmacological Treatment
 - **Recommended** – The goal of pharmacologic treatment for occupational ILD primarily addresses symptoms and limitations; it cannot reduce fibrosis. Recommendations for the pharmacological treatment of ILD should follow those of the ATS or similarly recognized guideline-issuing organizations.

Occupational Interstitial Lung Disease Training Module

■ Management of Occupational Interstitial Lung Disease

- Exposure Assessment
 - Exposure Assessment for Workers with Occupational ILD – Exposure data from industrial hygiene surveys and Safety Data Sheets (formerly known as Material Safety Data Sheets) and other sources such as area or personal monitoring data should be reviewed and considered for each worker diagnosed with occupational ILD to determine past and present exposures to specific agents, to ascertain the degree of respiratory hazards that exist, and to identify appropriate PPE to reduce exposure.

Occupational Interstitial Lung Disease Training Module

■ Management of Occupational Interstitial Lung Disease

- The ability of a worker to use appropriate PPE to protect from further exposure is dependent upon pulmonary function and the physical demands of the job. Generally speaking, workers with severe to very severe respiratory impairment may not have sufficient inspiratory capacity to work while wearing respirators that increase the work of breathing (such as half- or full-face filtering respirators), and likewise may not be able to perform the functions of an occupation requiring moderate physical activity.

Occupational Interstitial Lung Disease Training Module

■ Management of Occupational Interstitial Lung Disease

- The six-minute walk test is a prognostic tool used for monitoring individuals to assess performance/functional ability over time. The test measures the distance a patient can walk on a flat, hard surface in a period of six minutes.
 - **Recommended** – In individuals with ILD as a means to monitor response to treatment or progression of the disease.

Occupational Interstitial Lung Disease Training Module

■ Management of Occupational Interstitial Lung Disease

- Six-Minute Walk Test (6MWT)
 - Absolute contraindications for the 6MWT include:
 - History of unstable angina
 - Heart attack within the previous month
 - Relative contraindications for the 6MWT include:
 - Resting tachycardia (>120 beats/minute)
 - Uncontrolled hypertension

Occupational Interstitial Lung Disease Training Module

■ Management of Occupational Interstitial Lung Disease

- Six-Minute Walk Test (6MWT)
 - Reasons for immediately stopping of the test are chest pain, intolerable dyspnea, leg cramps, staggering, excessive diaphoresis, and pale or ashen appearance.

Occupational Interstitial Lung Disease Training Module

- For additional questions, please email MTGTrainings@wcb.ny.gov.

Thank You