COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF INDUSTRIAL ACCIDENTS

WORK-RELATED ASTHMA TREATMENT GUIDELINE

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INTRODUCTION:

This clinical guideline has been created to consistently improve health care services for injured workers by outlining the appropriate evaluation and treatment processes for the management of work-related asthma which includes occupational asthma and work exacerbated asthma. Each has the potential for acute morbidity, long term disability, and adverse social and economic impacts. The guideline should be used as a tool to guide health care providers of different professional disciplines to provide quality care to injured workers. The guideline is not intended to be a substitute for appropriate medical judgment and is written to be broad enough to allow for a wide range of diagnostic and treatment modalities, and to purposely allow for philosophical and practice differences among professional disciplines of health care practitioners who provide care to injured workers with work-related asthma. This guideline does not include parameters of care for long term management of either occupational or occupationally exacerbated asthma. It is expected that approximately 10% of cases may fall outside of this guideline and may be reviewed and approved on a case-by-case basis. If objective clinical improvement is delayed or slower than expected, the treating provider must justify the necessity of continued care with a valid clinical rationale, with supporting objective clinical findings. Timeframes for specific interventions commence once treatments have been initiated, not on the date of injury.

I. BACKGROUND AND DEFINITIONS

A. Asthma is a respiratory condition defined by the following characteristics:

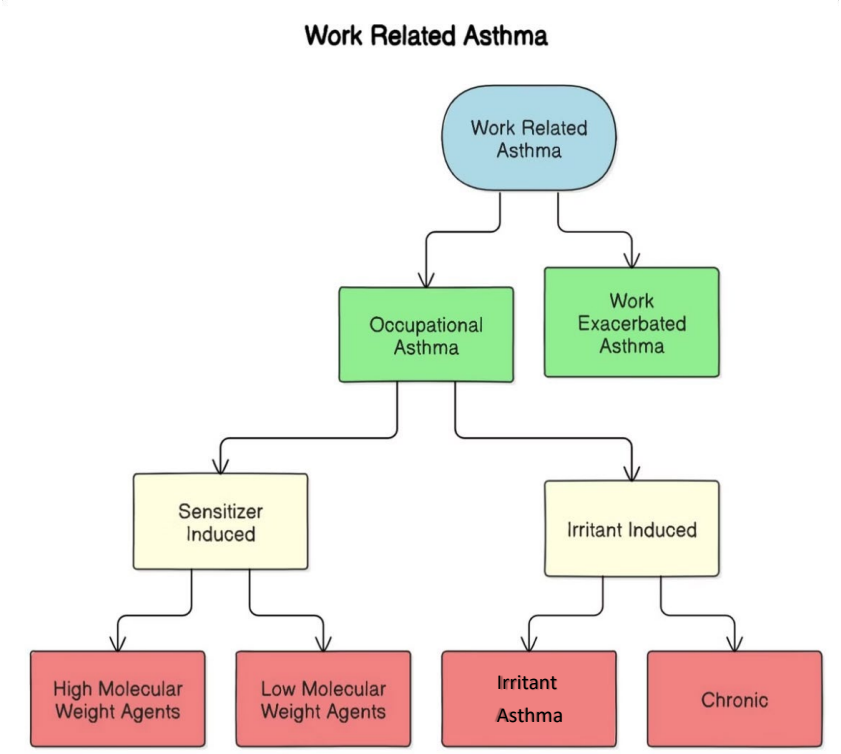
1. Airway inflammation.
2. Increased airway responsiveness to various stimuli.
3. Reversible airway obstruction, either spontaneously or with treatment.

B. Work-Related Asthma (WRA): Refers to asthma that is caused or exacerbated by conditions or exposures in the workplace. It is a broad term that encompasses several subsets.

- **Occupational Asthma (OA):** Asthma that develops directly due to workplace exposure to sensitizers or irritants, with *new onset* linked to specific work-related agents.
    - Sensitizer Induced: Most common type of OA. Triggered by an immune response to high- or low- molecular-weight (HMW/LMW) agents. HMW agents include animal proteins (e.g., in laboratories), flour, and enzymes. LMW agents include chemicals like isocyanates and epoxy resins.
    - Irritant Induced: Can arise from a single, high intensity exposure to irritants (e.g. Irritant asthma, also referred to as Reactive Airway Dysfunction Syndrome) with immediate response, or from chronic low-level exposure.
- **Work Exacerbated Asthma:** *Pre-existing* asthma diagnosis exacerbated (returns to baseline character of symptoms) or aggravated (does not regain prior baseline) by work Exposure.

C. Importance of Early Recognition and Diagnosis

Delayed diagnosis with continued exposure, even to minute amounts of sensitizers, can result in irreversible airway disease or fatal complications. Timely removal from exposure and treatment are critical.



II. DIAGNOSTIC CRITERIA FOR OCCUPATIONAL ASTHMA

A. Diagnostic Requirements

1. The diagnosis of asthma should be supported by objective evidence, such as reversible airway obstruction demonstrated through pulmonary function testing, or airway hyperresponsiveness confirmed by a non-specific bronchial challenge test (e.g., methacholine challenge). Additional diagnostic tools such as fractional exhaled nitric oxide (FeNO) measurement may also be considered by specialists to further support the diagnosis.
2. Historical and Temporal Association: After conclusive evidence of asthma is obtained, association between symptom onset and workplace exposure can help to diagnose WRA.
3. Diagnostic Confirmation: Establishing history of exposure with at least one of the following:
    - Define Workplace Exposure: Confirmation of exposure to known asthma-causing agents (from Safety Data Sheets, employer records, or industrial hygiene data) to the extent feasible.

- Work-Related Variability in Lung Function: Evidence of work-related change in FEV1 or peak expiratory flow (PEF) over time and associated with work.
- Acute Exposure Episode (Irritant asthma): Respiratory symptoms following a high-level inhalation exposure to an irritant.

B. Diagnosis of Work Exacerbated Asthma:

For individuals with pre-existing asthma, the diagnosis follows similar criteria as new-onset OA but requires a documented history of asthma before the occupational exposure.

III. MEDICAL DIAGNOSIS

A. Diagnostic Workup

1. **Medical History**:
   - Symptoms: Wheeze, cough, chest tightness, and/or dyspnea.
   - Past respiratory history, including allergies, eczema, and respiratory responses to minor irritants, infections, exercise, or cold air.
   - Family and social history (e.g., smoking history).
   - Differential diagnosis to be considered includes bronchitis, chronic obstructive pulmonary disease (COPD), hypersensitivity pneumonitis, gastroesophageal reflux disease (GERD), congestive heart failure, anxiety, amongst others.

2. **Occupational History**:
   - Detailed description of work tasks and exposures for current and past employments.
   - Temporal relationship between symptoms and work schedules (e.g., symptom changes on weekends or vacations).
     - Asthma may develop during exposure, or hours or days after exposure. Symptoms may also develop after months to years of continuous or intermittent exposure to sensitizers.
   - Documentation of exposure, ideally through Safety Data Sheets or industrial hygiene assessments.
   - For information on common causes of asthma:
     A. Canadian Center for Occupational Health and Safety (CCOHS) section on work related asthma has a table of common agents based on occupation: https://www.ccohs.ca/oshanswers/diseases/asthma.html#section-7-hdr
     B. Association of Occupational and Environmental Clinics has a database where users can search for specific chemicals of concern with identification and coding of chemicals that can cause or exacerbate asthma by sensitization or irritation: http://www.aoecdata.org/ExpCodeLookup.aspx
   - See also MA Department of Public Health Occupational Lung Disease Bulletin for Healthcare providers for surveillance findings of WRA cases by industry, occupation, and exposures: https://www.mass.gov/lists/occupational-lung-disease-bulletins#2024-Summary

3. **Physical Examination**:
   - Vital Signs.
   - General distress, posture (use of accessory muscles).
   - Oxygen Saturation.
   - Examination for nasal polyps, rhinitis, conjunctivitis, or sinusitis.
   - Auscultation for wheezing or abnormal lung sounds (wheezing, variable expiratory airflow limitation).
   - Heart auscultation for cardiogenic causes.
   - Skin exam for atopic dermatitis.

4. **Diagnostic Testing**:
   - Spirometry: Recommended with both pre- and post-bronchodilator assessments. Series of spirometry may be required at different times to establish temporal cause and disease progression based on clinician discretion.
   - PEF Monitoring: Conducted 4–5 times daily over 2–4 weeks, with records of peak readings.
   - Non-Specific Bronchial Challenge Test: Recommended if symptoms are present but spirometry is normal. i.e. discordance between history and test results.
   - Allergy Testing: Recommended RAST and/or skin testing particularly if sensitization to HMW antigen is suspected. It should be noted that a positive test result indicates sensitization, but not necessarily a diagnosis of asthma (see criteria for asthma diagnosis above).
   - Chest X-Ray: Helpful in early work-up to rule out other potential causes of respiratory symptoms.

5. **Reportability**
   - Health care providers are mandated to report suspected and confirmed cases of WRA or other work-related respiratory disease to the Massachusetts Department of Public Health in no later than ten days after diagnosis or identification. Instructions on how to report a suspected or confirmed cases can be found here: https://www.mass.gov/how-to/report-an-occupational-disease-or-injury

IV. INITIAL TREATMENT PROGRAM

A. Prevention of further exposure to causal or precipitating agent(s):

1. When caused by a sensitizing agent, workplace should optimize efforts first to eliminate, then substitute, followed by utilizing engineering or administrative controls to minimize all further exposure to the causal agent (consistent with the hierarchy of controls) due to the increased risk for irreversible airways obstruction, severe bronchospasm, and/or death.

2. When caused by an irritant, elimination of exposure is desirable but significant reduction of exposure may be sufficient. When elimination of exposure is not possible, alternative approaches may include, in order of preference:
   - Engineering controls such as local exhaust ventilation
   - Appropriate use of respiratory protection provided by the employer

B. Where these approaches fail and the clinical condition warrants, removal of the worker from the workplace may be necessary.

C. Medications:

1. Medications should be used as clinically indicated but are not an alternative to the prevention of further exposure as outlined in section IV.A. above.

2. The recommended therapeutic approach is as follows:
   - Step 1: As-needed low dose inhaled corticosteroid (ICS)-formoterol combination for control of symptoms of asthma occurring less than 4-5 days a week. If this fails, then:
   - Step 2: Low dose maintenance ICS-formoterol daily and as needed to control symptoms of asthma. If this fails, then:
   - Step 3: Medium dose maintenance ICS-formoterol daily and as needed low dose ICS-formoterol to control symptoms of asthma. Consider referral to asthma specialist for therapeutic options, and to an Occupational Medicine specialist for input on assessing and mitigating workplace exposures. If this fails, then:
   - Step 4: Add on long-acting muscarinic antagonists (LAMA) and consider high dose maintenance ICS-formoterol in addition to as needed low dose ICS-formoterol. Consider anti-IgE or anti-IL5 to control symptoms of asthma if indications for these therapies are met.

* Other long-acting beta agonists (LABA) may be used other than formoterol if indicated.

3. Assessment of symptom control and future risk
   - To assess symptom control, practitioners can utilize Asthma Control Test (https://www.qualitymetric.com/health-surveys/asthma-control-test-act/). Poor symptom control is a risk factor for flare-ups.
   - Recommend ongoing monitoring of lung function with use of spirometry per clinician discretion.

D. Nonpharmacological Approach To Asthma Management

1. Immunizations
   a. Encourage age-appropriate vaccinations against influenza, pneumococcus, pertussis, SARS-CoV-2, and respiratory syncytial virus for all patients with asthma or as clinically indicated.
      i. Pneumococcal vaccinations:
         1. Adults aged 19–64 years with asthma should receive an additional pneumococcal vaccination.
         2. Children aged 6–18 years with moderate to severe asthma may require an additional pneumococcal dose, depending on their prior vaccination status.
2. Physical Activity/Exercise
   a. Regular physical training improves asthma control and lung function in stable asthma.
   b. Physical activity interventions are linked to improved symptoms and quality of life in adults with moderate/severe asthma, with no reported adverse effects.
   c. As such, referral to a physical therapist may be beneficial for nonpharmacological treatment of asthma in addition to pharmacological therapy as outlined above in Section IV C. Specific techniques include aerobic and strength training, breathing techniques, lifestyle modifications, and management of exercise induced asthma. Frequency of these services may be guided per clinician discretion.
3. Physical medicine (chiropractic, physical therapy, occupational therapy)
   Patients with asthma often present with hypertonicity and hypersensitivity of the muscles of the torso and abdomen, along with decreased joint range of motion and stiffness of the thoracic spine's intervertebral, the costovertebral and sternocostal articulations. These musculoskeletal findings are usually accompanied by tenderness or hypersensitivity to palpation. Palpation and observation are usually all that is needed to determine these findings.
   The treatment regimen would typically consist of therapeutic exercises and ergonomic instructions regarding ADL and manual therapies to increase the costal and inter-vertebral ranges of motion along with reducing muscular hypersensitivity and lengthening/stretching muscles of the torso. These therapies have a dual effect by improving a patient's comfort level and decreasing any secondary/musculoskeletal restrictions regarding inspiration and expiration that may have developed.

E. Patient Education

The following shall be discussed with the patient at the initial physician visit and repeated thereafter as necessary:

1. Key points about signs and symptoms of asthma and characteristic airway changes in asthma.
2. Asthma triggers and how to avoid them. For a more comprehensive database, healthcare providers can refer to the following database:
   https://aoec.org/programs-services/exposure-and-asthmagen-codes/

3. How medications work and their potential adverse effects; instruction and demonstration in the correct use of all medications (e.g. proper use of metered dose inhaler)
4. Techniques of monitoring status of asthma, such as peak expiratory flow (PEF) readings.
5. Indications for emergency care.

*Education of the employer is important to ensure that workers are protected from worksite conditions that cause or exacerbate asthma.

V. ONGOING MANAGEMENT

If causal or aggravating exposure is eliminated or reduced and asthma symptoms resolve without medication, no further medical management is needed. If symptoms have resolved with medication, a period of medical follow-up will be needed to determine the necessity for continued medication and to establish an effective maintenance regimen.

APPENDIX

Hierarchy of Controls

The hierarchy of controls is a framework used to identify the most effective methods for minimizing or eliminating exposure to hazards. It consists of five levels of strategies, ranked in order of their overall effectiveness in reducing risk:

1. Elimination
2. Substitution
3. Engineering controls
4. Administrative controls
5. Personal protective equipment

Summary of Common Irritants

- Massachusetts DPH Occupational Health Surveillance Program has a brief high-level list of work-related asthma causing agents, which can also be found here: https://www.mass.gov/info-details/is-my-asthma-work-related. This list includes:
    - Isocyanates
    - Certain cleaners & disinfectants
    - Latex rubber
    - Grain & flour dust
    - Wood dusts
    - Animal dander
    - Cockroaches
    - Some molds
    - Some metals such as nickel & chromium
    - Cigarette smoke
    - Cement
    - Grout
    - Lime
    - Dust
    - Diesel emissions
    - Solvents
    - Paint
    - Epoxy resins
    - Surface coatings
    - Adhesives
    - Welding fumes
    - Shotcrete used in tunnel work

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