Asthma and Exercise

Indexing Metadata/Description

- **Title/condition:** Asthma and Exercise
- **Synonyms:** Exercise-related asthma; exercise-induced bronchospasm; exercise-induced airway obstruction; asthma, exercise therapy; asthma, exercise training; asthma attack, exercise; and asthma attack
- **Anatomical location/body part affected:** Lungs/lower airways (bronchi, bronchioles) and, in severe cases, alveoli
- **Area(s) of specialty:** Pulmonary Rehabilitation, Home Health, Sports Rehabilitation

**Description**

- Asthma severity and control vary widely between patients. Many who are asymptomatic at rest experience restricted airflow (e.g., shortness of breath, chest tightness, cough, and wheezing) during physical activity. Such exercise-related exacerbations may be a sign of poorly controlled persistent asthma.
- Although exercise and sports may aggravate asthma symptoms, aerobic exercise training as tolerated usually improves functional capacity and asthma-related quality of life (ARQoL) in both children and adults with asthma.
- This clinical review highlights the prominent role of supervised exercise therapy for increasing physical capacity in patients with stable exercise-related asthma.
- For further information, see Clinical Review…Asthma in Adults; Topic ID Number: T708450 and Clinical Review…Asthma in Children; Topic ID Number: T708451

**ICD-10 codes**

- **J45 asthma**
  - J45.0 predominantly allergic asthma
  - J45.1 nonallergic asthma
  - J45.8 mixed asthma
  - J45.9 asthma, unspecified
- **ICD-10-CA modifications in Canada:** J45.0, J45.1, J45.8, and J45.9 subdivided and additional digit used to indicate:
  - 0 without stated status asthmaticus
  - 1 with stated status asthmaticus

- **J46 status asthmaticus**
- **J38.5 laryngeal spasm**
- **Z82.5 family history of asthma and other chronic lower respiratory diseases**

(ICH codes are provided for the reader’s reference, not for billing purposes)

**G-Codes**

- **Mobility G-code set**
  - G8978, Mobility: walking & moving around functional limitation, current status, at therapy episode outset and at reporting intervals
  - G8979, Mobility: walking & moving around functional limitation; projected goal status, at therapy episode outset, at reporting intervals, and at discharge or to end reporting
  - G8980, Mobility: walking & moving around functional limitation, discharge status, at discharge from therapy or to end reporting
• Changing & Maintaining Body Position G-code set
  – G8981, Changing & maintaining body position functional limitation, current status, at therapy episode outset and at reporting intervals
  – G8982, Changing & maintaining body position functional limitation, projected goal status, at therapy episode outset, at reporting intervals, and at discharge or to end reporting
  – G8983, Changing & maintaining body position functional limitation, discharge status, at discharge from therapy or to end reporting

• Carrying, Moving, & Handling Objects G-code set
  – G8984, Carrying, moving, & handling objects functional limitation, current status, at therapy episode outset and at reporting intervals
  – G8985, Carrying, moving, & handling objects functional limitation, projected goal status, at therapy episode outset, at reporting intervals, and at discharge or to end reporting
  – G8986, Carrying, moving, & handling objects functional limitation, discharge status, at discharge from therapy or to end reporting

• Self-care G-code set
  – G8987, Self-care functional limitation, current status, at therapy episode outset and at reporting intervals
  – G8988, Self-care functional limitation, projected goal status, at therapy episode outset, at reporting intervals, and at discharge or to end reporting
  – G8989, Self-care functional limitation, discharge status, at discharge from therapy or to end reporting

• Other PT/OT Primary G-code set
  – G8990, Other physical or occupational therapy primary functional limitation, current status, at therapy episode outset and at reporting intervals
  – G8991, Other physical or occupational therapy primary functional limitation, projected goal status, at therapy episode outset, at reporting intervals, and at discharge or to end reporting
  – G8992, Other physical or occupational therapy primary functional limitation, discharge status, at discharge from therapy or to end reporting

• Other PT/OT Subsequent G-code set
  – G8993, Other physical or occupational therapy subsequent functional limitation, current status, at therapy episode outset and at reporting intervals
  – G8994, Other physical or occupational therapy subsequent functional limitation, projected goal status, at therapy episode outset, at reporting intervals, and at discharge or to end reporting
  – G8995, Other physical or occupational therapy subsequent functional limitation, discharge status, at discharge from therapy or to end reporting

<table>
<thead>
<tr>
<th>G-code Modifier</th>
<th>Impairment Limitation Restriction</th>
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<tr>
<td>CI</td>
<td>At least 1 percent, but less than 20 percent impaired, limited, or restricted</td>
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<tr>
<td>CJ</td>
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<tr>
<td>CK</td>
<td>At least 40 percent, but less than 60 percent impaired, limited, or restricted</td>
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<td>CL</td>
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<td>CM</td>
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</tr>
<tr>
<td>CN</td>
<td>100 percent impaired, limited, or restricted</td>
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Source: https://www.cms.gov/
Reimbursement: Reimbursement for therapy will depend on insurance contract coverage. No specific issues or information regarding reimbursement has been identified.

Presentation/signs and symptoms
- Limitations in ADLs or vigorous physical activity due to persistent exercise-related asthma
- Complaints of increased asthma symptoms during or after physical exertion, including the following:
  - Shortness of breath/dyspnea
  - Cough
  - Wheezing
  - Chest tightness
- Reduction in forced expiratory volume in 1.0 second (FEV$_1$) on pulmonary function testing after exercise challenge
- Reduced cardiopulmonary (aerobic) fitness

Causes, Pathogenesis, & Risk Factors

Causes
- Asthma symptoms are attributed to chronic lower airway inflammation and reactivity with episodic breathing obstruction
- Exercise-related asthma is associated with bronchial hyper-responsiveness to increased airflow during exercise (e.g., chest tightness, wheezing, exercise-induced bronchoconstriction [EIB])
- EIB is more likely to occur when persons with persistent asthma breathe cold, dry air

Pathogenesis
- In addition to chronic airway inflammation and bronchial hyper-responsiveness, the pathophysiologic features of asthma involve smooth muscle contraction, epithelial sloughing, mucous hypersecretion, and mucosal edema$^{(1)}$
- Airway hyper-responsiveness has been linked to the actions of T-helper (Th) cells in the adaptive immune system. Uncontrolled Th2-driven adaptive immune responses may mediate airway tissue remodeling$^{(20)}$
- Avoidance of exercise due to anxiety about activity-related worsening of asthma symptoms (e.g., EIB) likely contributes to the reduced functional capacity observed in persons with asthma$^{(1,2)}$
- EIB is characterized by increased symptomatic dyspnea during or soon after exercise, and may be an indicator of uncontrolled asthma
- EIB is usually diagnosed by reduced pulmonary function with exercise (e.g., by a drop of 10% or more in FEV$_1$)
- Respiratory water loss promotes mucosal cooling and dehydration, each of which contributes to bronchoconstriction$^{(10)}$
- Water loss from airways also creates a hyperosmolar state, resulting in
  - degranulation of airway mast cells with release of chemical mediators, including prostaglandins, leukotrienes, and histamine
  - inflammation of airway with involvement of lymphocytes, eosinophils, epithelial cells, and perhaps neutrophils
  - bronchoconstriction via stimulation of cholinergic receptors (increased airway tone and secretions)
  - pulmonary vasoconstriction in response to colder air, followed by reactive hyperemia with vascular bronchial congestion
  - submucosal edema and airway narrowing
- Airway cooling during exercise and rapid rewarming after exercise may trigger
  - thermally sensitive neuroreceptors in bronchial epithelium that might be triggered by vasoconstriction
  - vascular response with reactive hyperemia and edema after rapid postexercise rewarming
  - increased responses to very cool or very warm dry air
- Inhalation of allergens or pollutants. This creates oxidative stress in the airways, with
  - enhanced EIB-related mediator production
  - increased reactive oxygen/nitrogen compounds and depletion of antioxidants in airway
- Additional factors associated with EIB include
  - increased bronchomotor tone due to
    - autonomic dysregulation associated with regular high-intensity and prolonged physical training
    - predominant parasympathetic drive (e.g., low resting heart rate)
- Aerobic exercise training may reverse airway remodeling in asthma, possibly by deactivating peribronchial leukocytes$^{(21,22)}$

Risk factors
- Breathing pollen, airborne pollutants, mold, animal dander, and cold-dry air and smoking increase asthma symptoms
- Obesity is a risk factor for asthma in children$^{(4)}$
Overall Contraindications/Precautions
› Obtain written referral from physician for exercise training to improve physical functioning
› Confirm that the patient is taking asthma medications as prescribed. In addition, the patient should have a fast-acting bronchodilator (“relief inhaler”) on hand to relieve acute attacks
› Postpone testing or training and consult with physician if a patient presents with
   • poorly controlled or increasing asthma symptoms at rest (i.e., unstable asthma)
   • an asthma exacerbation; i.e., a period of worsened symptoms that usually requires use of systemic steroid medication (vs inhaled corticosteroid [ICS]) to prevent a serious outcome
› See specific Contraindications/precautions to examination and Contraindications/precautions under Assessment/Plan of Care

Examination
› Contraindications/precautions to examination
   • Stop the examination and consult physician if asthma symptoms worsen despite the use of medications (e.g., bronchodilator) as prescribed
   • Obtain statement from physician regarding instructions for use of bronchodilator before exercise (i.e., in the absence of symptoms) to forestall EIB

History
› History of present illness/injury
   – Mechanism of injury or etiology of illness
     - When do asthma attacks usually occur? Does a certain type or intensity of physical activity trigger attacks? What are the symptoms and how long do they last? Is there any chest pain/tightness during exercise (suggestive of angina) without increased asthma symptoms? Is wheezing or cough present? Does coughing produce mucus? How debilitating are symptoms? What is the current reason for referral?
   – Course of treatment
     - Medical management
       - Impairment measures, such as short-acting beta agonist use, nighttime awakenings, interference of disease with normal ADLs, and pulmonary function testing, are essential for assessing patient risk and control of acute exacerbations
       - Acute asthma attacks generally are managed with a short-acting β2 agonist and, if necessary, supplemental oxygen
       - In severe attacks, patient may have to be sedated and intubated for mechanical ventilation
       - ICS is generally used to prevent acute attacks in chronic intermittent and persistent asthma
       - Recommendations for environmental modifications to minimize triggers; allergen immunotherapy
     - Medications for current illness/injury: Determine what medications clinician has prescribed; are they being taken? Are they effectively controlling patient’s symptoms? Most asthma medications are administered by inhalation
       - Short-acting β2 agonists (e.g., albuterol/salbutamol, terbutaline, metaproterenol) administered by inhaler
         - Authors of a small placebo-controlled trial (N = 16 healthy male athletes) found that using a salbutamol inhaler (1600 µg) daily for 6 weeks did not improve training effects on measures of strength or endurance
       - Long-acting β2 agonists (e.g., salmeterol xinafoate [Serevent], formoterol fumarate [Foradil])
       - ICS (e.g., beclomethasone [Qvar], fluticasone and salmeterol [Advair])
       - Mast cell stabilizers (e.g., cromolyn, nedocromil)
       - Antileukotrienes (e.g., montelukast [Singulair]) – by mouth
     - Diagnostic tests completed: May include:
       - Pulse oximetry
       - Pulmonary function tests
       - Exercise/pulmonary stress test
       - Chest X-ray
       - Atopic allergy testing
       - Arterial blood gas (ABG)
       - Complete blood count (CBC)
     - Home remedies/alternative therapies: Document any use of home remedies or complementary/alternative treatments such as mind-body techniques, dietary and herbal supplements, manual therapies, and acupuncture
- **Previous therapy**: Document whether patient has had occupational or physical therapy for this or other conditions and what specific treatments were helpful or not helpful

- **Aggravating/easing factors** (and length of time each item is performed before the symptoms come on or are eased): Generally includes upper respiratory infections, noncompliance with treatment regimen, and exposure to allergens

- **Body chart**: Use body chart to document location and nature of symptoms

- **Nature of symptoms**: Document nature of symptoms. See *Presentation/signs and symptoms*, above

- **Rating of symptoms**: Use a visual analog scale (VAS) or 0–10 scale to assess symptoms at their best, at their worst, and at the moment (specifically address if pain is present now and how much), as indicated

- **Pattern of symptoms**: Document changes in symptoms throughout the day and night, if any (a.m., mid-day, p.m.); also document changes in symptoms due to weather or other external variables

- **Sleep disturbance**: Document number of wakings/night

- **Other symptoms**: Document other symptoms patient may be experiencing that could exacerbate the condition and/or symptoms that could be indicative of a need to refer to physician (e.g., dizziness, bowel/bladder dysfunction)

- **Respiratory status**: Inquire about ICS use and previous need, if any, for therapeutic oxygen or intubation

- **Barriers to learning**
  - Are there any barriers to learning? Yes ___ No ___
  - If Yes, describe _________________________

- **Medical history**
  - Past medical history: Is there a family history of asthma? Are recurrent respiratory infections a problem? Is there any history of musculoskeletal dysfunction or injury that could affect the patient’s ability to exercise?

- **Comorbid diagnoses**: Comorbidities that may aggravate asthma symptoms include obesity, anxiety/depression, and cardiovascular diseases

- **Medications previously prescribed**: Obtain a comprehensive list of medications prescribed and/or being taken (including OTC drugs)

- **Other symptoms**: Ask patient about other symptoms he or she may be experiencing

- **Social/occupational history**
  - **Patient’s goals**: Document what the patient hopes to accomplish with therapy and in general

  - **Vocation/avocation and associated repetitive behaviors, if any**: (e.g., does the patient participate in recreational or competitive sports?) Can the patient fully participate in occupational tasks? Is he or she able to participate in other desired activities?

  - **Functional limitations/assistance with ADLs/adaptive equipment**: What is the patient’s level of function? Does the patient use assistive or adaptive devices?

  - **Living environment**
    - Is the patient exposed to secondhand tobacco smoke?
    - Are there pets or other environmental triggers in the home?
    - Inquire about barriers to accessibility in the home, including stairs

- **Relevant tests and measures** (While tests and measures are listed in alphabetical order, sequencing should be appropriate to patient medical condition, functional status, and setting):

  - **Anthropometric characteristics**: Document height, weight, and BMI. Document if the patient is obese

  - **Balance**: Screen as indicated and appropriate

  - **Cardiorespiratory function and endurance**
    - Assess resting heart rate (HR), blood pressure (BP), and respiratory rate (RR). Document if tachypneic
    - Assess breath sounds by auscultation
    - Assess aerobic endurance with 6-minute walk for distance test (6MWT). Monitor perceived exertion using the Borg Rating of Perceived Exertion (RPE) Scale during the test. Note that endurance testing with 6MWT is sensitive to long-term use of ICS. A change in walking distance of more than 50 meters on reevaluation is clinically significant

  - **Circulation**: Assess peripheral pulses

  - **Gait/locomotion**: Assess for grossly abnormal patterns in gait that may reduce walking efficiency

  - **Muscle strength**: Manually scan strength in functional tasks (e.g., pushing, pulling, sit-up, squatting). Assess strength in any extremity in which weakness is found

  - **Observation/inspection/palpation** (including skin assessment): Determine that no physical deformities are present that might restrict participation in the prescribed exercises. Document visible signs of accessory muscle involvement, inability to talk, cyanosis, or diaphoresis during asthma attacks or EIB
Posture: Assess posture in standing and during gait. Alterations in static posture due to breathing with accessory muscles in severe persistent asthma beginning in childhood may include protraction of head and shoulders, reduced normal spinal curves, and changes in chest wall anatomy.

Range of motion: Screen for flexibility/functional ROM of the trunk and extremities.

Reflex testing: Assess deep tendon reflexes, as indicated.

Sensory testing: General scan of dermatomes.

Special tests specific to diagnosis:
- Incremental exercise test for assessment of functional aerobic capacity or VO$_2$peak may be conducted on a cycle ergometer or treadmill, with or without pulse oximetry.$^5$
- Bronchoprovocation test is used to diagnose asthma. A 10–15% decline in FEV$_1$ after an exercise challenge can give a definitive diagnosis of EIB.$^{13}$
- Document any of the following symptoms or exercise symptom limitations observed or reported during the examination:
  - Wheezing
  - Atypical breathing patterns (e.g., labored, prolonged expiration)
  - Shortness of breath
  - Cough (if productive, document sputum color, consistency, and amount)
  - Chest tightness
- Six-minute step test (6MST) was found useful for evaluating exercise capacity in Brazilian adolescents with asthma because it produced the level of discomfort typically experienced in their ADLs.$^{11}$
- Asthma Control Questionnaire (ACQ)$^{1,3}$

Assessment/Plan of Care

Contraindications/precautions:
- Obtain treatment guidelines/parameters from referring physician.
- Tailor the exercise prescription for the patient’s functional ability, goals, and interests, and modify the program to minimize symptoms. Coexisting conditions may require modifying the exercise prescription to accommodate patient tolerance and safety.$^5$
  - Ensure close supervision with instruction throughout exercise therapy and functional training sessions.
  - Provide a thorough orientation to using therapeutic exercise equipment and adequate warm-up time to help ease any apprehension about exercise-related asthma.
  - Modification of exercise conditions for prevention of EIB includes a light warm-up, frequent rest breaks, enjoyable activities, and avoidance of breathing cold air.$^5$
  - Physical and electrotherapeutic modalities are not indicated for treating asthma and should be used only for coexisting musculoskeletal conditions.
  - Rehabilitation professionals should always use their professional judgment in decision making and follow the exercise guidelines of their clinic/hospital.

Diagnosis/need for treatment:
Persistent asthma with exercise-related symptom limitations leading to sedentary lifestyle/reduced ARQoL associated with impaired physical functioning for ADLs.

Rule out:
- Allergic rhinitis
- Sinusitis
- Aspiration
- Vocal cord dysfunction
- Vascular rings or laryngeal webs
- Laryngotracheomalacia
- Exercise-induced laryngeal dysfunction (EILD)
- Tracheal stenosis
- Bronchostenosis
- Enlarged lymph nodes or tumor
- Cystic fibrosis
- Bronchopulmonary dysplasia
• Heart disease
• Pneumonia
• Bronchitis
• Bronchiolitis
• GERD
• Recurrent cough unrelated to asthma

Prognosis
- Physical exercise training has been found to reduce symptom frequency and to improve asthma control and ARQoL in adults with asthma\(^{(2,6)}\)

Referral to other disciplines:
- Physician/allergy specialist for medical management of increased asthma symptoms
- Respiratory therapist for breathing exercises
- Nutritionist for dietary counseling
- Acupuncturist for complementary/alternative care

Other considerations
- Authors of a 2012 systematic review found that weight loss can improve asthma control and symptoms in overweight and obese adults with asthma. Weight loss is also associated with improvements in level of lung function and airway responsiveness\(^{(2)}\)
- Authors of a 10-week randomized trial (N = 46 overweight or obese persons with asthma [mean BMI, 33.7 kg/m\(^2\)]) in Australia found that a 5% to 10% weight loss resulted in clinically important improvements in asthma control in 58% of participants and in ARQoL in 83%\(^{(12)}\)
- Inspiratory muscle training may improve exercise tolerance in persons with asthma by decreasing respiratory muscle fatigue and the severity of dyspnea\(^{(8)}\)

Treatment summary
- Guidelines for the management of EIB are available from the American Academy of Allergy, Asthma, and Immunology,\(^{(13)}\) the American Thoracic Society,\(^{(14)}\) and the British Thoracic Society\(^{(15)}\)
- Physical training for at least 20 minutes, 2 times per week, over a minimum period of 4 weeks can improve cardiopulmonary fitness in persons with asthma without serious adverse effects
  - Based on a 2013 Cochrane review of 21 exercise trials with 772 participants\(^{(2)}\)
    - Median VO\(_2\)max increased significantly by 4.92 mL/kg/min in eight studies (N = 267)
    - No statistically significant changes were observed post exercise training for forced vital capacity (FVC), FEV\(_1\), minute ventilation at maximal exercise (VEmax), or peak expiratory flow rate (PEFR)
    - A clinically significant improvement in quality of life was found in four of five studies
    - It was concluded that individuals with stable asthma generally tolerate physical training well and thus should be encouraged to exercise regularly to develop and maintain their functional capacity
- Exercise training may improve aerobic endurance, symptoms, and ARQoL in middle-aged and older adults with moderate or severe persistent asthma\(^{(3)}\)
  - Based on a small RCT with 34 participants in Australia
    - The exercise group (n = 19; mean age, 65.3 years) trained for 80–90 minutes, 3 times per week for 6 weeks, in a multicomponent supervised program that consisted mainly of walking and circuit training (cycle ergometry, step-ups, wall squats, and upper limb exercises) at “somewhat hard” exertion (12 to 14 on Borg’s 6–20 RPE scale)
    - The control group (n = 15, mean age 71.0 years) maintained their usual activities and asthma management
    - 6MWT increased 36 meters in the exercisers with no change in end-test percutaneous O\(_2\) saturation or dyspnea score
    - HRQoL and asthma symptoms improved significantly in the exercisers
    - No significant changes were found in controls
- Authors of a 2013 systematic review of 29 studies with a total of 1,045 participants found that exercise is safe for the pediatric population aged 6–18 years with asthma and that the training program should be a minimum of 3 months, with at least two 60-minutetraining sessions per week. Training intensity should be set at the patient’s ventilatory threshold, if measured\(^{(16)}\)
- Aerobic exercise training may reduce markers of airway inflammation in patients with moderate or severe asthma
  - Based on an RCT in Brazil with 68 participants\(^{(9)}\)
The exercise group (n = 34; mean age, 37.9 years) trained for 30 minutes, 2 times per week for 3 months, at 70% of VO$_2$\textsubscript{max} on an indoor treadmill. In addition, they participated in yoga breathing exercises for 30 minutes, 2 times per week for 3 months.

The control group (n = 34; mean age, 36.0 years) maintained their usual activities and asthma management, and also participated in the same yoga breathing program.

On follow-up, VO$_2$\textsubscript{max} increased significantly (13.5%) in the exercise group, with no change in controls.

Sputum eosinophil and total cell counts and the fraction of exhaled nitric oxide (markers of airway inflammation), as well as asthma symptoms (i.e., number of asthma-free days), were significantly reduced after training; no changes were found in the controls.

- Aerobic exercise training of at least 35 minutes can reduce bronchial hyper-responsiveness in adult patients with asthma\textsuperscript{(25)}

  - Based on an RCT in Italy with 58 participants
  - The training group (n = 29) performed aerobic exercise training on a treadmill for 35 minutes, followed by yoga activities that focused on breathing exercises, and participated in an educational program on asthma.
  - The control group (n = 29) only performed yoga activities focusing on breathing and participated in an educational program on asthma.
  - Primary outcome measures were bronchial hyper-responsiveness (BHR), markers that measure inflammation, the Asthma Quality of Life Questionnaire (AQLQ), induced sputum, and a cardiopulmonary exercise test.
  - After a 12-week follow-up, there were statistical differences in reduction of serum levels of cytokines and monocyte chemo-attractant protein (MCP-1), fewer asthma exacerbations, and improved score on the AQLQ (p < 0.05) in the treatment group compared to the control group.

- Authors of a 2014 systematic review with meta-analysis of 14 RCTs (N = 824 patients with asthma) found no evidence for greater beneficial effects of yoga on asthma control or pulmonary function compared to sham yoga or breathing exercises\textsuperscript{(24)}

- Authors of an RCT study conducted in Nigeria concluded that both incentive spirometry (IS) and diaphragmatic resistance training (DRT) have beneficial effects in improving FEV$_1$, FVC, and PEFR. DRT is more beneficial than IS and is highly recommended for patients with asthma\textsuperscript{(26)}

<table>
<thead>
<tr>
<th>Problem</th>
<th>Goal</th>
<th>Intervention</th>
<th>Expected Progression</th>
<th>Home Program</th>
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</thead>
<tbody>
<tr>
<td>Asthma symptoms that interfere with ADLs</td>
<td>Reduced asthma symptom-induced limitations</td>
<td><strong>Patient education</strong></td>
<td>Reduced frequency and severity of asthma symptoms</td>
<td>Provide patient with literature on asthma triggers and exercise. Advise to follow prescribed exercise program.</td>
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<tr>
<td></td>
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<td>Minimize exposure to environmental triggers during ADLs. Comply with prescribed use of asthma medications</td>
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<tr>
<td></td>
<td></td>
<td>Explanation of guidelines to follow with exercise prescription</td>
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<tr>
<td>Decreased activity tolerance/endurance</td>
<td>Improve physical functioning in ADLs and recreational activities</td>
<td><strong>Therapeutic exercise</strong></td>
<td>Improved aerobic functional capacity</td>
<td>Participation in enjoyable recreational activities</td>
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<tr>
<td></td>
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<td>Exercise prescription for regular physical activity, aerobic exercise, and/or resistance exercise, according to established guidelines\textsuperscript{(5)}</td>
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</tbody>
</table>
Postural changes related to excessive use of accessory respiratory muscles | Improved postural control | Functional training | Exercises to address postural deviations | Progress exercises as indicated | Daily repetition of exercises at home

**Desired Outcomes/Outcome Measures**

› Reduced frequency and severity of asthma symptoms and exacerbations during ADLs
  - ACQ
› Increased daily physical activity
  - Exercise diary or pedometry
› Weight loss, as indicated
  - Reduced BMI
› Increased muscle strength, as indicated
  - Manual muscle testing (MMT)
› Increased flexibility and ROM, as indicated
  - Goniometry
› Improved activity tolerance and aerobic endurance
  - 6MWT, graded exercise test
› Improved posture, as indicated
  - Reassessment of posture
› Improved ARQoL
  - Medical Outcomes Study Short-Form Health Survey (SF-36), ACQ

**Maintenance or Prevention**

› Avoid asthma triggers
› Continue therapeutic exercise at home
› Use pharmacological agents, as directed/prescribed
› Continue airway clearance techniques, as needed
› Nonpharmacologic therapy, such as reduction of sodium intake and supplementation with fish oil and ascorbic acid (vitamin C), as well as a pre-exercise warm-up, may help to prevent asthmatic episodes

**Patient Education**

› American Lung Association website, “Managing Asthma,”

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**Coding Matrix**

References are rated using the following codes, listed in order of strength:

- **M** Published meta-analysis
- **SR** Published systematic or integrative literature review
- **RCT** Published research (randomized controlled trial)
- **R** Published research (not randomized controlled trial)
- **C** Case histories, case studies
- **G** Published guidelines
- **RV** Published review of the literature
- **RU** Published research utilization report
- **QI** Published quality improvement report
- **L** Legislation
- **PGR** Published government report
- **PFR** Published funded report
- **PP** Policies, procedures, protocols
- **X** Practice exemplars, stories, opinions
- **GI** General or background information/texts/reports
- **U** Unpublished research, reviews, poster presentations or other such materials
- **CP** Conference proceedings, abstracts, presentation

**References**


