



FIGURE 16-4 Algorithms for the treatment of bronchospasm in patients in the emergency department (A) and in outpatients with stable disease (B). IV, Intravenous; PRN, as needed. *Leukotriene antagonists could be considered.

shown to be harmful in the setting of prehospital emergency treatment for COPD (level 1 evidence). Therefore, oxygen should be closely titrated to maintain normoxia and to avoid either hypoxemia or excessively elevated PaO_2 . An oxygen saturation of 90% to 92% is a reasonable target in the absence of further data (level 3). During exacerbations of COPD leading to hypercarbic respiratory failure, noninvasive positive airway pressure ventilation has proved useful in reducing the work of breathing, alleviating diaphragm fatigue, and reducing the need for endotracheal intubation and mechanical ventilation (level 1).

Antibiotics

Exacerbations of airway obstruction may result from viral or bacterial infection. The most common bacterial pathogens in COPD are *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*. Management of acute exacerbations should include empiric administration of antibiotics, which have been shown to improve the success rate in exacerbation treatment (level 2 evidence). The role of chronic prophylactic antibiotic use in COPD is uncertain, and a trial of oral azithromycin resulted in a reduction in exacerbations but an increased risk of hearing loss (level 2). Immunization with influenza vaccines directed at specific epidemic strains reduces exacerbations of COPD (level 1). Pneumococcal vaccination is also recommended in patients with COPD.

Nonpharmacologic Therapies

Multiple airway clearance techniques aid in clearing of airway secretions, but their effectiveness in the management of emphysema and other obstructive lung diseases in adults is questionable. If needed, chest physiotherapy and postural drainage might be useful in patients with chronic bronchitis and increased sputum production. Few data support the use of specific mucolytics or expectorant agents for patients with COPD.

Patients with pulmonary disease of sufficient severity to compromise normal activities of daily living commonly demonstrate improved quality of life and less subjective dyspnea when enrolled in a comprehensive, high-quality pulmonary rehabilitation program (level 1 evidence). Pulmonary rehabilitation has not been shown to improve objective measures of pulmonary function, to affect the rate of decline in lung function, or to improve survival. However, it has been shown to improve the quality of life in motivated patients. An important part of pulmonary rehabilitation is nutritional assessment and careful attention to maintaining adequate nutrition. Malnutrition and cachexia are common in later stages of obstructive lung disease, and they result in decreased respiratory muscle strength and compromised immune function.

The role of surgery in COPD is generally limited. Bullectomy, lung volume reduction surgery (LVRS), and lung transplantation are all potentially effective surgical options for selected patients. Resection of nonfunctional areas of lung (e.g., bullectomy) may allow for compressed functional areas to expand and may improve symptoms, airflow, and oxygenation by improving ventilation-perfusion matching in a subgroup of patients. In addition, resection of bullae can decrease lung volumes, resulting in enhanced diaphragmatic function and decreased work of breathing. The best candidates for LVRS are those with predominantly upper