medication must be loaded into the inhaler before use. Children who have difficulty using MDIs or other inhalers can receive their asthma medications via a nebulizer, which administers the medication via compressed air or oxygen. Children are instructed to breathe normally with the mouth open to provide a direct route to the trachea.

Corticosteroids are antiinflammatory drugs used to treat reversible airflow obstruction, control symptoms, and reduce bronchial hyperresponsiveness in chronic asthma. Inhaled corticosteroids are used as first-line therapy in children older than 5 years of age. Clinical studies of corticosteroids have indicated significant improvement of all asthma parameters, including decreases in symptoms, emergency visits, and medication requirements (Bekmezian, Fee, and Weber, 2015).

Corticosteroids may be administered parenterally, orally, or by inhalation. Oral medications are metabolized slowly, with an onset of action up to 3 hours after administration and peak effectiveness occurring within 6 to 12 hours. Oral systemic steroids may be given for short periods of time (e.g., 3- or 10-day "bursts") to gain prompt control of inadequately controlled persistent asthma or to manage severe persistent asthma. These drugs should be given in the lowest effective dose. These medications have few side effects (cough, dysphonia, and oral thrush), and strong evidence indicates that they improve the long-term outcomes for children of all ages with mild or moderate persistent asthma. Some studies have monitored children for 6 years after starting inhaled corticosteroids, and they indicate that when used at recommended doses, they do not have long-term significant effects on growth, bone mineral density, or suppression of the adrenal–pituitary axis (Liu, Covar, Spahn, et al, 2016). However, primary care providers should frequently monitor (at least every 3 to 6 months) the growth of children and adolescents taking corticosteroids to assess the systemic effects of these drugs and make appropriate reductions in dosages or changes to other types of asthma therapy when necessary. Inhaled corticosteroids include budesonide and fluticasone.

β-Adrenergic agonists (short acting) (primarily albuterol, levalbuterol [Xopenex], and terbutaline) are used for treatment of acute exacerbations and for the prevention of EIB. These drugs bind with the β-receptors on the smooth muscle of airways, where they