# *Therapeutic Class Overview*
# *Inhaled Corticosteroids*

**Therapeutic Class**

- **Overview/Summary:** The inhaled corticosteroids (ICSs) are Food and Drug Administration (FDA)-approved for the maintenance treatment of asthma as prophylactic therapy with beclomethasone (QVAR®), flunisolide (Aerospan®) and fluticasone propionate (Flovent Diskus®, Flovent HFA®) also being indicated for use in asthma patients who require systemic corticosteroid therapy.[1-11] These agents are effective in the treatment of asthma due to their wide range of inhibitory activities against multiple cell types (e.g., mast cells and eosinophils) and mediators (e.g., histamine and cytokines) involved in the asthmatic response. The ICSs exert their anti-inflammatory effects by binding to glucocorticoid receptors with a subsequent activation of genes involved in the anti-inflammatory processes as well as an inhibition of pro-inflammatory genes involved in the asthmatic response. Inflammation is also a component of chronic obstructive pulmonary disease (COPD) pathogenesis; however, no single-entity ICS has been FDA-approved for use in COPD.[1-10] Although ICSs exert their therapeutic effects through identical mechanisms of action, they differ in their potency, dosing schedules, and dosage form availability. Clinical trials comparing ICSs of varying potencies have shown that those of higher potencies do not demonstrate greater clinical efficacy than those of lower potencies when administered at equipotent doses and have not demonstrated any major differences in clinical efficacy between the available ICSs.[12-67] Currently, only budesonide nebulizer suspension is available generically.

**Table 1. Current Medications Available in Therapeutic Class**[1-10]

| Generic Name (Trade Name) | Food and Drug Administration Approved Indications | Dosage Form/Strength | Generic Availability |
|---|---|---|---|
| Beclomethasone (QVAR®) | Maintenance Treatment of Asthma as Prophylactic Therapy¶; Treatment of Asthma Patients Requiring Systemic Corticosteroid Therapy¶ | Inhalation aerosol (HFA inhaler, metered dose):<br>40 µg<br>80 µg | - |
| Budesonide (Pulmicort Flexhaler®, Pulmicort Respules®*) | Maintenance Treatment of Asthma as Prophylactic Therapy†,‡ | Dry powder for inhalation (inhaler, breath activated, metered dose):<br>90 µg<br>180 µg<br><br>Suspension for inhalation (nebulizer):<br>0.25 mg/2 mL<br>0.5 mg/2 mL<br>1 mg/2 mL | ✔ |
| Ciclesonide (Alvesco®) | Maintenance Treatment of Asthma as Prophylactic Therapy§ | Inhalation aerosol (HFA inhaler, metered dose):<br>80 µg<br>160 µg | - |
| Flunisolide (Aerospan®) | Maintenance Treatment of Asthma as Prophylactic Therapy#; Treatment of Asthma Patients Requiring Systemic Corticosteroid Therapy# | Inhalation aerosol (HFA inhaler, metered dose):<br>80 µg | - |
| Fluticasone furoate | Maintenance Treatment of | Aerosol powder (breath | - |

| Generic Name (Trade Name) | Food and Drug Administration Approved Indications | Dosage Form/Strength | Generic Availability |
|---|---|---|---|
| (Arnuity Ellipta®) | Asthma as Prophylactic Therapy§ | activated inhaler):<br>100 µg<br>200 µg | |
| Fluticasone propionate (Flovent Diskus®, Flovent HFA®) | Maintenance Treatment of Asthma as Prophylactic Therapy‖; Treatment of Asthma Patients Requiring Systemic Corticosteroid Therapy‖ | Dry powder for inhalation (inhaler with blister pack; Flovent Diskus®):<br>50 µg<br>100 µg<br>250 µg<br><br>Inhalation aerosol (HFA inhaler, metered dose; Flovent HFA®):<br>44 µg<br>110 µg<br>220 µg | - |
| Mometasone furoate (Asmanex HFA®, Asmanex Twisthaler®) | Maintenance Treatment of Asthma as Prophylactic Therapy#,** | Dry powder for inhalation (inhaler, metered dose; Asmanex Twisthaler®):<br>110 µg<br>220 µg<br><br>Inhalation powder (HFA inhaler, metered dose, breath activated; Asmanex HFA®):<br>100 µg<br>200 µg | - |

* Generic available in at least one dosage form or strength.
¶ In patients five years of age and older.
† Pulmicort Flexhaler®: In patients six years of age and older.
‡ Pulmicort Respules®: In patients 12 months to eight years of age.
§ In patients 12 years of age and older.
‖ In patients four years of age and older.
# In patients six years of age and older.
# Asmanex HFA®: In patients 12 years of age and older.
** Asmanex Twisthaler®: In patients four years of age and older.

## Evidence-based Medicine

- Numerous placebo controlled trials have demonstrated the efficacy of inhaled corticosteroid agents in the treatment of asthma, and these agents are considered the most effective agents in the long-term management of the disease. The results of head-to-head trials directly comparing the inhaled corticosteroids products have not demonstrated one agent to be significantly more effective than another, regardless of the potency or dosage form of the inhaled corticosteroid agent used.[12-67]
- FDA-approval for fluticasone furoate was based on the results of three dose-ranging trials and four confirmatory trials which included a total of 3,611 patients aged ≥12 years with various asthma severities, $FEV_1$ of 40 to 90% predicted and varied (or no) previous ICS use.[13-15,19-22] Pre-dose, pre-bronchodilator $FEV_1$ (primary endpoint) was significantly improved upon treatment with the FDA-approved doses of fluticasone furoate when compared to placebo in each of the seven clinical trials.
    - Fluticasone furoate also significantly improved percentage of rescue-free 24-hour periods and although statistical significance could not be determined in some cases, fluticasone furoate also improved symptom-free 24-hour periods over the course of the studies.[13-15,19-22]

## Key Points within the Medication Class

- According to Current Clinical Guidelines:
  - ICSs are the most potent and consistently effective long-term controller medications for asthma patients of all ages. These agents are recommended as first-line therapy for long-term control of persistent asthma symptoms in all age groups. Although ICSs reduce both impairment and risk of asthma exacerbations, they do not appear to alter the progression or underlying severity of the disease. No ICS is recommended over another.[68,71]
    - The adverse effect on growth rate associated with these agents does appear to be dose dependant; however, it is not considered predictable. The effect on growth velocity appears to occur mainly in the first several months of treatment and is generally small and not progressive.[68]
  - For COPD: In patients with an $FEV_1$ <60% of the predicted value, regular treatment with ICS improves symptoms, lung function and quality of life as well as reduces exacerbations. However, long term therapy ICS as monotherapy is not recommended.[72]
  - ICSs should be used as adjunctive agents to long-acting bronchodilators to decrease exacerbation frequency in patients with an $FEV_1$ ≤50% predicted and repeated exacerbations.[73]
- Other Key Facts:
  - None of the inhaled corticosteroid products are indicated for the relief of acute bronchospasm[1-10]
  - Currently, budesonide suspension for nebulization is the only generic product available within the therapeutic class.

## References


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