FIGURE 21. MANAGEMENT OF ASTHMA EXACERBATIONS: EMERGENCY DEPARTMENT AND HOSPITAL-BASED CARE

**Initial Assessment**
Brief history, physical examination (auscultation, use of accessory muscles, heart rate, respiratory rate), PEF or FEV₁, oxygen saturation, and other tests as indicated

- **FEV₁ or PEF ≤40% (Mild-to-Moderate)**
  - Oxygen to achieve SaO₂ ≥90%
  - Inhaled SABA by nebulizer or MDI with valved holding chamber, up to 3 doses in first hour
  - Oral systemic corticosteroids if no immediate response or if patient recently took oral systemic corticosteroids

- **FEV₁ or PEF <40% (Severe)**
  - Oxygen to achieve SaO₂ ≥ 90%
  - High-dose inhaled SABA plus ipratropium by nebulizer or MDI plus valved holding chamber, every 20 minutes or continuously for 1 hour
  - Oral systemic corticosteroids

- **Impending or Actual Respiratory Arrest**
  - Intubation and mechanical ventilation with 100% oxygen
  - Nebulized SABA and ipratropium
  - Intravenous corticosteroids
  - Consider adjunct therapies

**Repeat Assessment**
Symptoms, physical examination, PEF, O₂ saturation, other tests as needed

- **Moderate Exacerbation**
  - FEV₁ or PEF 40–69% predicted/personal best
  - Physical exam: moderate symptoms
  - Inhaled SABA every 60 minutes
  - Oral systemic corticosteroid
  - Continue treatment 1–3 hours, provided there is improvement; make admit decision in <4 hours

- **Severe Exacerbation**
  - FEV₁ or PEF <40% predicted/personal best
  - Physical exam: severe symptoms at rest, accessory muscle use, chest retraction
  - History: high-risk patient
  - No improvement after initial treatment
  - Oxygen
  - Nebulized SABA plus ipratropium, hourly or continuous
  - Oral systemic corticosteroids
  - Consider adjunct therapies

**Admit to Hospital Intensive Care** (see box below)

**Good Response**
- FEV₁, or PEF ≥70%
- Response sustained 60 minutes after last treatment
- No distress
- Physical exam: normal

**Incomplete Response**
- FEV₁, or PEF 40–69%
- Mild-to-moderate symptoms

**Individualized decision re: hospitalization (see text)**

**Discharge Home**
- Continue treatment with inhaled SABA
- Continue course of oral systemic corticosteroid
- Consider initiation of an ICS
- Patient education
  - Review medications, including inhaler technique
  - Review/Initiate action plan
  - Recommend close medical followup

**Admit to Hospital Ward**
- Oxygen
- Inhaled SABA
- Systemic (oral or intravenous) corticosteroid
- Consider adjunct therapies
- Monitor vital signs, FEV₁, or PEF, SaO₂

**Admit to Hospital Intensive Care**
- Oxygen
- Inhaled SABA hourly or continuously
- Intravenous corticosteroid
- Consider adjunct therapies
- Possible intubation and mechanical ventilation

**Discharge Home**
- Continue treatment with inhaled SABAs
- Continue course of oral systemic corticosteroid
- Continue on ICS. For those not on long-term-control therapy, consider initiation of an ICS
- Patient education (e.g., review medications, including inhaler technique; review/Initiate action plan and, whenever possible, environmental control measures; and recommend close medical followup)
- Before discharge, schedule followup appointment with primary care provider and/or asthma specialist in 1–4 weeks

Key: FEV₁, forced expiratory volume in 1 second; ICS, inhaled corticosteroid; MDI, metered-dose inhaler; PCO₂, partial pressure carbon dioxide; PEF, peak expiratory flow; SABA, short-acting beta₂-agonist; SaO₂, oxygen saturation