Treatment of Acute Asthma Exacerbations in the Emergency Department

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Assessment of Asthma severity

- 20 million asthmatics-3000 deaths annually
- Disproportionately high in big cities
- Periods following Hospitalization- especially dangerous
EPR-3 Guidelines for Asthma Management, 2007

- National Heart, Lung, and Blood Institute (NHLBI) Guidelines for the Diagnosis and Management of Asthma
- National Asthma Education and Prevention Program’s Expert Panel Report 3 (EPR-3)
EPR-3 Overview for ED Setting

- Initial Assessment
- Repeat Assessment
- Discharge Home
  - Continue treatment
  - Provide patient education
  - Review or Initiate an Asthma Action Plan
  - Promote environmental control measures
  - Schedule follow up appointment with primary care
Assessment of symptoms of asthma

- Coughing, wheezing, shortness of breath or chest tightness during the day
- Awakening at night because of asthma symptoms
- Awakening in morning with asthma symptoms
- Improvement within 15 minutes of beta agonist use
- Missed days from school or work
- Had symptoms while exercising or playing
Assessment of Pulmonary functioning

- Highest and lowest peak flows
- Knowledge of personal best peak flow measurements
Assessment of Asthma severity
Risk Factors / Pitfalls

- Wide Rapid swings in pulmonary function
- Severe Nocturnal Symptoms
- Chronic use of oral steroids
- Use of three or more categories of medicines
- Frequent Hospital Admissions or Emergency Department Visits
- Atopy
Assessment of Asthma severity
Risk Factors/ Pitfalls

- Delay in care because of lack of recognition of severity, disregard for, or other psychological factors
Assessment of Asthma severity
Patients at risk

- Elderly Patients after discharge from the hospital or Emergency Department
- Psychiatric Disease/ Use of psychotropic medicines
- Coronary artery disease
- Patients with limited access to medical care
Assessment of Asthma severity
Patients at risk

- Poor compliance
- Over use of beta\textsubscript{2} agonists
- Beta Receptor polymorphisms
- Under use of corticosteroids
- African Ethnic origin
- Poverty
Assessment of Asthma Severity
Urgent and Emergent Settings

- **Mild**
  - Dyspnea only with activity
  - PEF ≥ 70 percent predicted/personal best

- **Moderate**
  - Dyspnea interferes or inhibits usual activity
  - PEF 40-69 percent predicted
Assessment of Asthma severity

- **Severe**
  - Dyspnea at rest – interferes with conversation
  - PEF < 40% predicted / personal best
- **Life Threatening**
  - Too dyspneic – diaphoresis
Assessment of Asthma Severity

- Inflammation can and does occur in mild asthma.
- Duration and early onset of asthma results in worsening lung functioning.
- Children with mild cases of asthma are at risk of dying from asthma.
- Use of short-acting beta agonists alone results in increased hospitalizations.
- Decrease FEV1 is highly correlated with increased risk for asthma attacks.
Pediatric Asthma Deaths

Adapted from Robertson et al. Pediatric Pulmonol. 1992:13 95-100
Therapeutic Targets

Smooth muscle dysfunction

Airway inflammation

- Bronchoconstriction
- Bronchial hyperreactivity
- Hyperplasia/hypertrophy
- Inflammatory mediator release

- Inflammatory cell infiltration/activation
- Mucosal edema
- Cellular proliferation
- Epithelial damage
- Basement membrane thickening

Symptoms/Exacerbations

Treatment of Acute Exacerbations

- Short acting Bronchodilators are still the main form of treatment in the ED
- Addition of anticholinergic agents have been found to be helpful in the acute exacerbation
- Anticholinergics seem more efficacious in patients with low FEV1 <35%predicted

Treatment of Acute Exacerbations

- **FEV₁ /PEF ≥40% (Mild to moderate Asthma)**
  - Oxygen – SA02 ≥ 90%
  - Inhaled short acting B agonist X 3 doses.
  - Oral corticosteroids if no immediate response

- **FEV₁ /PEF < 40% (Severe)**
  - Oxygen – SA02 ≥ 90%
  - High dose inhaled short acting B agonist
  - Add anticholinergic - ipratropium bromide
  - Oral systemic corticosteroids
Treatment of Acute Exacerbations
Reassessment

- \( \text{FEV}_1 / \text{PEF} \ 40-69\% \) (Moderate exacerbation)
  - Physical exam – moderate symptoms
  - SABA every 60 minutes
  - Oral systemic corticosteroids
  - Continue treatment for 1-3 hours prior to re-evaluation
Treatment of Acute Exacerbations
Reassessment

- FEV₁ /PEF < 40% (Severe Exacerbation)
  - Physical exam; Severe symptoms at rest, accessory muscle use
  - History: High risk
  - No improvement after initial treatment
    - Oxygen
    - Nebulized SABA + anticholinergic
    - Oral systemic corticosteroids
    - Other Adjunctive therapies
Treatment of Acute Exacerbations
Response to Treatment

- **Good Response** – Discharge
  - FEV₁ /PEF ≥ 70%
  - Response sustained 60 minutes after last treatment
  - No distress
  - Normal Physical Exam

- **Partial Response**. – Consider hospitalization
  - FEV₁ or PEF 40-60%
  - Mild to moderate symptoms
Poor response—Hospitalization
- FEV₁/PEF <40%
- PC0₂ ≥ 42mm Hg
- Physical Exam: Symptoms Severe
- Presence of drowsiness/confusion
Mechanical Ventilation of Asthmatics

- Indications for Intubation
  - Coma/Mental status changes
  - Respiratory arrest

- Mechanical ventilation should
  - Involve permissive hypercapnia
  - Decreased tidal volumes
  - Rapid flow rates
  - Prolonged expiratory flow rates
Mechanical Ventilation of Asthmatics

- Complications of mechanical ventilation
  - Elevated airway pressures
  - Air trapping
  - Auto PEEP
  - Increased residual volume
- Increased intra-thoracic pressures can lead to significant decrease in venous return, hypotension and cardiac arrest
Treatment of Acute Exacerbations

Albuterol Inhalers with spacers
Resulted in a shorter duration of Stay, elevated PEF and O₂ saturation
Improvements compared to Albuterol Nebulization (standard treatment)
Treatment of Acute Exacerbations

- Discharge with corticosteroids
  - Must address long term maintenance therapy
  - Intramuscular /oral dexamethasone as an alternative for children
Treatment of Acute Exacerbations
Inhaled Corticosteroids (ICS) in Acute Therapy

- Rapid onset of action (eg: CROUP)
- Early vasoconstriction may occur with use of ICS
- Emerging (limited) evidence supporting its use in the Emergency Department setting.

Treatment of Acute Exacerbations

- Methylxanthines
  - No role in the treatment of acute asthma
  - May have benefits as a controller when administered with corticosteroids in order to reduce long term Beta_2 agonist activity
Treatment of Acute Exacerbations

- **Magnesium**
  - Exact mechanism unknown
    - Decreases uptake of calcium by smooth muscle cells
    - Bronchodilation
    - Inhibits the release of histamine from smooth muscle cells.
  
  - Effects of Magnesium seems to be transient and more efficacious in patients with severe acute exacerbations
  
  - No well documented Randomized double blinded clinical trials show any significant sustained benefit of Magnesium

  - Meta Analysis showing reduction of hospitalization rates in patients with severe acute asthma exacerbations
Long term Management
Emergency Departments play a role

- 12-17% relapse rate within 2 weeks of Emergency Department Discharge
- Strong evidence suggesting that the addition of long acting beta agonists to inhaled corticosteroids improves outcomes
- Patients discharged on oral corticosteroids need less beta-agonists during the first three weeks after discharge
Updates on treatment

- Stepwise Approach to the care and Management of Asthma
  - Maintain control with the least amount of medication
  - Maintain normal and healthy lifestyles
  - Prevention of Exacerbations
  - Stepping up or down depending upon asthma severity
Long term Management
Emergency Departments play a role

- Oral + Inhaled Corticosteroids
  - Wide variation in practice (25% of patients discharged in the US are prescribed ICS if they were not already taking one) (http://healthcare.partners.org/MARC)
  - Evidence supports the use of both oral and ICS on discharge from the Emergency Department.

  Rowe BH et al., Inhaled budesonide in addition to oral corticosteroids to prevent relapse following discharge from the Emergency Department. A randomized controlled trial. JAMA 1999;281:2119

Long term Management
Emergency Departments play a role

- It is preferable to add long acting Beta$_2$ agonists to low to medium dose corticosteroids

NAEPP guidelines
Other controversies
Use of Antibiotics in the treatment of Asthma Exacerbations

- No routine indication for the use of antibiotics.
- Asthma exacerbation is sometimes associated with the clinical signs of infection such as
  - Purulent sputum production
  - Nasal discharge
- Often associated with Respiratory Syncytial Virus or Rhino virus infections
- May be associated with Chlamydia or Mycoplasma infections
- Mucus plugging may predispose patients to bacterial infections
What we don’t do in Asthma

- We don’t
  - follow asthma patients closely enough
  - take asthma seriously
  - treat asthma aggressively enough
  - educate our patients well enough