Cook Children's Medical Center

Evidence based pathway for treatment of asthma exacerbation in the Emergency Department

Goals: 1) Standardize treatment of asthma exacerbations in the ED
2) Improve time to steroids and albuterol upon presentation to the ED
3) Improve compliance to CHAT (Children's Hospital Association of Texas) recommendations
4) Use the most up to date research in the treatment of asthma exacerbations

Inclusion Criteria: 1) 2yo or greater with Hx of asthma or recurrent wheezing presenting with acute onset of wheezing, cough, dyspnea, respiratory distress, hypoxia, or tachypnea

Exclusion Criteria: 1) Patients < 2yo
2) Acute Illness (pneumonia, bronchiolitis, croup, aspiration)
3) Chronic Conditions (CLD, CF, BP, Restrictive lung disease, neuromuscular disorders)
4) Medically complex patients

Overview: Cook Children's Medical Center is part of the Children's Hospital Association of Texas or CHAT. CHAT has created an evidence base pathway for treatment of asthma exacerbations. The mainstays for treatment of asthma exacerbations are oxygen, albuterol, systemic steroids, ipratropium, magnesium sulfate, Terbutaline/aminophylline, and heliox.

Background:

1) Respiratory Scoring System: Multiple scoring systems exist for quantifying a patient's degree of respiratory distress. CHAT uses the clinical respiratory score, which is shown below. A patient will be scored every hour while in the Emergency Department. The higher score correlates to more respiratory distress.

Assess	Score 0	Score 1	Score 2
Respiratory Rate	<2 months <50 2-12 months <40 1-5 years <30 >5 years <20	<2 months 50-60 2-12 months 40-50 1-5 years 30-40 >5 years 20-30	<2 months >60 2-12 months >50 1-5 years >40 >5 years >30
Auscultation	Good air movement, expiratory scattered wheezing or loose rales/crackles	Depressed air movement, inspiratory and expiratory wheezes or rales/crackles	Diminished or absent breath sounds, severe wheezing, or rales/crackles or marked prolonged expiration
Use of Accessory Muscles	Mild to no use of accessory muscles, mild to no retractions **OR** nasal flaring on inspiration	Moderate intercostals retractions, mild to moderate use of accessory muscles, nasal flaring	Severe intercostals and substernal retractions, nasal flaring
Mental Status	Normal to mildly irritable	Irritable, agitated, restless	Lethargic
Room Air SpO2	> 95%	90-95%	<90%
Color	Normal	Pale to normal	Cyanotic, dusky

2) Oxygen Therapy

- Patients with acute asthma exacerbations should receive supplemental oxygen to maintain saturations >90%. (1,2,3)
- Oxygen saturation is correlated with the severity of illness in asthma. (8,9)
- An oxygen saturation of <92% after 1 hour of treatment is a better predictor of need of hospitalization than initial oxygen saturation (7,14)

3) Albuterol Treatment

- An inhaled short-acting beta 2-agonist is the drug of choice in the US for rapid reversal of airflow obstruction
  - Onset of action for albuterol is less than 5 minutes
  - Repetitive administration produces incremental bronchodilation
- Methods of delivery
  - Continuous delivery is the preferred method for severe acute asthma (24,25,34,35,36,38)
  - Intermittent delivery is appropriate for relief of mild and moderate exacerbations (24,25,34,35,36,38)
  - MDI use
    - MDI use associated with shorter length of stay in the ED and lower pulse rates (1,4,5,23,27,39,43)
    - MDI should always be used with valved-holding chamber or spacer (1,4,5,42,43,44)
- Levalbuterol
  - An alternative to albuterol formulated to theoretically have fewer side effects.
  - Levalbuterol provides no additional benefit in efficacy or side effects over albuterol (1,4,28,29,31,32,33,37

4) Ipratropium bromide (atrovent)

- An acetyl receptor antagonist that is used as an adjunctive therapy for asthma exacerbations by administering in combination with albuterol (1,4,5,49)
- When given in the ED, Ipratropium has been shown to improve lung function and reduce admission rate (49) (NNT in systemic review was 12)
- No evidence that treatment with ipratropium provides additional benefit beyond treatment in the ED (52,53)

5) Magnesium Sulfate

- This drug produces bronchodilation via smooth muscle relaxation and may have an anti-inflammatory effect.
- IV dose of 50mg/kg max 2,000mg over 30 mins.
- Can cause hypotension so recommend giving with 20ml/kg (max 1L) NS bolus

6) Corticosteroids

- All patient should receive systemic corticosteroids unless given prior to arrival in the emergency department
- Use of corticosteroids within 1 hour of presentation to the ED significantly

reduces the need for hospital admission in patients with acute asthma (1,4,5,58)
-Initial effects of steroids are noted at 2 hours with maximal effects seen at 6 hours (58)
-IV steroids are only indicated when oral steroids are not tolerated or GI absorption is questionable (1,4,5,70)
- Recommend using Dexamethasone PO at (0.6mg/kg max of 16mg) as initial steroid in the emergency department due to equal efficacy as prednisolone and prednisone (84-94)
  - If discharging patient home recommend second dose of dexamethasone to be given 24-26 hours later for a total of two doses due to higher compliance rates than prednisolone (84-94)

7) Terbutaline

-IV Terbutaline is a nonselective beta-agonist that produces bronchodilation with risk for additional side effects associated with beta-1 stimulation
-Side effects can be diastolic hypotension and elevated cardiac enzymes and its use should be considered carefully

8) Aminophylline

-Older medication and is converted to theophylline in the body. It relaxes smooth muscles and reduces airway responsiveness to histamine, metacholine, adenosine, and allergens.
-Aminophylline has similar efficacy to terbutaline in trials but with a higher side effect profile

9) Discharge Planning

-Every Patient discharged from the emergency department should have checklist completed as recommended by CHAT

Medications - Order 2nd dose of dexamethasone
- Refill/order albuterol
- Re-label MDI and spacer used in ED for home
- Consider refill of controller

Follow Up
- With PCP or specialist

Education
-Review control of environmental factors
-MDI

10) ICU Admission

-Patient should be considered for ICU admission if:

1) Need for PPV
2) Need for continuous albuterol (>2 hours after steroids)
3) Need for terbutaline or theophylline drip
4) Worsening respiratory status or score despite aggressive treatment

Sources

Pathways Used

1) CHAT Asthma Management Pathway (https://chatexas.com/asthma-pathway/)
2) Seattle Children's Hospital Asthma Pathway (https://www.seattlechildrens.org/pdf/asthma-pathway.pdf)
3) Children's Hospital of Colorado Asthma Pathway (https://www.childrenscolorado.org/49e72a/globalassets/healthcare-professionals/clinical-pathways/asthma-exacerbation-management.pdf)
4) Cincinnati Children's Hospital Asthma Pathway

Other Sources

Guidelines and Reviews

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Albuterol / Beta-agonists

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