05 Asthma

1. DEFINITION

- Asthma is a chronic and recurrent inflammatory disease of the lungs resulting in airway obstruction, bronchial hyperresponsiveness, and inflammation.
- Rapid reversal of airflow obstruction is the principle management goal.

2. ED CLASSIFICATION

Pediatric respiratory assessment measure (PRAM) score:

- Total score of 1–3: low risk with a chance of <10% for hospital admission.
- Total score of 4–7: moderate risk with a chance of 10%–50% for hospital admission.
- Total score of 8–12: high risk with a chance of >50% for hospital admission.

3. DIFFERENTIAL DIAGNOSIS

Life-threatening causes of wheezing:

1. Asthma
2. Anaphylaxis
3. Bronchiolitis
4. Foreign-body aspiration
5. Pulmonary Hemorrhage
6. Mediastinal Tumor
7. Congestive Heart Failure
8. Chemical Pneumonitis

4. DIAGNOSTICS

- Most patients are managed without any lab tests.
- Chest radiographs not be performed routinely; May be indicated for those with high fever, a focal pulmonary exam, or severe disease to assess for pneumothorax.

5. INITIAL STABILAIZATION

- Rapid assessment and support of ABCs
- On arrival, perform rapid assessment of patient including:

1. *Vital signs:* HR, RR , O_2 saturation.
2. General appearance, mental status, ability to speak, and color.
3. *Cardiac:* Murmur, rub, or gallop; pulses and perfusion
4. *Respiratory:*
   - Accessory muscle use.
   - Auscultation for aeration, symmetry, degree of wheezing anteriorly and posteriorly and in inspiratory and expiratory phases.
   - Lack of wheeze may be due to poor aeration in a severely ill child (silent chest).

- This initial rapid assessment allows for an estimation of exacerbation severity.
- Initial therapy focuses on supporting the patient's respiratory efforts, including providing O_2 (keep saturation ≥92%) & nebulized or aerosolized albuterol treatments if indicated.
- **Frequent reassessments** of pulmonary exam and close clinical monitoring is needed to judge response to therapy.
- If concomitant dehydration is present, oral or IV hydration should be provided.

6. FIRST LINE

Albuterol (specifically, racemic albuterol):

- < 20 kg: 5 puffs by MDI/spacer or 2.5 mg by nebulizer q20min for 3 doses.
- ≥ 20 kg: 10 puffs by MDI/spacer or 5 mg by nebulizer q20min for 3 doses.

- Delivery by small-volume nebulizer or MDI is equally effective.
- Not infrequently, O_2 saturation will *decline* after bronchodilator therapy. This often reflects *V/Q mismatch* rather than worsening clinical condition.
- Levalbuterol is a pure R-albuterol (an active bronchodilator) which in theory would be more effective than racemic albuterol. Studies had conflicting results, but overall, levalbuterol appears to have no clinically significant advantage over racemic albuterol.

Ipratropium bromide:

- < 5 yrs: 4 puffs by MDI/spacer or 250 mcg by nebulizer q20min for 3 doses.
- ≥ 5 yrs: 8 puffs by MDI/spacer or 500 mcg by nebulizer q20min for 3 doses.

- In randomized trials, systematic reviews, and meta analyses, treatment with 2-3 doses of inhaled ipratropium combined with an inhaled beta-agonist was shown to reduce hospital admissions and improve lung function in children, most with moderate-to-severe asthma exacerbations, compared with an inhaled beta-agonist alone.

Steroids:

- Prednisolone: Prednisolone dose is 1–2 mg/kg. The maximum dose is 20 mg for children <2 yrs, 30 mg for children 2–5 yrs, and 60 mg for children 5–12 yrs.
- Dexamethasone: dose of 0.6 mg/kg up to maximum dose of 16 mg.
- Methylprednisolone: 2mg/kg as loading then 0.5 mg/kg Q 6 hrs

- Use of corticosteroids within *1 hour of presentation* to an ED significantly reduces the need for hospital admission.
- Dexamethasone or prednisone therapy are associated with similar outcomes.

7. SEVERE ASTHMA

- MgSo4: IV dose of 25–50 mg/kg to a maximum of 2 g by slow IV infusion over 15–30 min.
- Consider fluid bolus prior to or during administration of magnesium due to potential side effect of hypotension.
- In a systematic review, magnesium sulfate was shown to reduce hospitalizations in patients with severe or life-threatening asthma attacks that failed to respond to initial treatment.

- Epinephrine: IM: 0.01 mg/kg (Children max 0.3 mg/dose; Adolescent max 0.5 mg/dose) of 1:1,000 solution.
- Indicated for those with very tight wheezing with impaired delivery of inhaled beta2-agonists.

- Continuous salbutamol nebulization
- Terbutaline

8. UPON DISCHARGE

- The child may be discharged on salbutamol inhaler and ICS inhaler with a spacer.
- If oral steroids course is given initially, dexamethasone is recommended for extra 1 day and prednisolone for a total of 3–5 days
- It is recommended to offer the child an action plan, education on inhalers technique, and a follow-up visit within 1 week.

9. SUGGESTED READING

- SINA Guidelines 2021.
- PRAM score.
- The crashing asthmatic and ventilation strategies.

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Source: Fleisher & Ludwig's Textbook of Pediatric Emergency Medicine 8th Edition
SINA Guidelines 2021