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Management of Acute Severe Asthma

Status Asthmaticus

Asthma attack
unresponsive to β -2
adrenergic agents

Golden Rule

ALL THAT WHEEZES IS NOT ASTHMA

Pulmonary edema

Allergic reactions

Pneumonia , bronchiolitis

Foreign body aspiration

Organophosphorus poison

Objectives

Discuss how to recognise acute severe and life-threatening Asthma

Discuss the management of Acute severe asthma based on the current practice and guidelines.

Discuss the evidence on different treatment modalities.

Normal Respiratory Rates

0-2month

40-60

2m-1yr

30-50

Preschool child

20-40

Teenager/adult

14-20

Signs of Respiratory Distress

- **Effort**
 - child's position
 - accessory muscle use
 - recession
 - nasal flaring / grunting
 - respiratory rate
- **Efficacy**
 - chest expansion
 - air entry
 - saturations
- **Effects**
 - heart rate
 - skin colour
 - mental status

Respiratory Distress

Figure 6: Respiratory Distress
Signs of respiratory distress include tripod position, nasal flaring, retractions

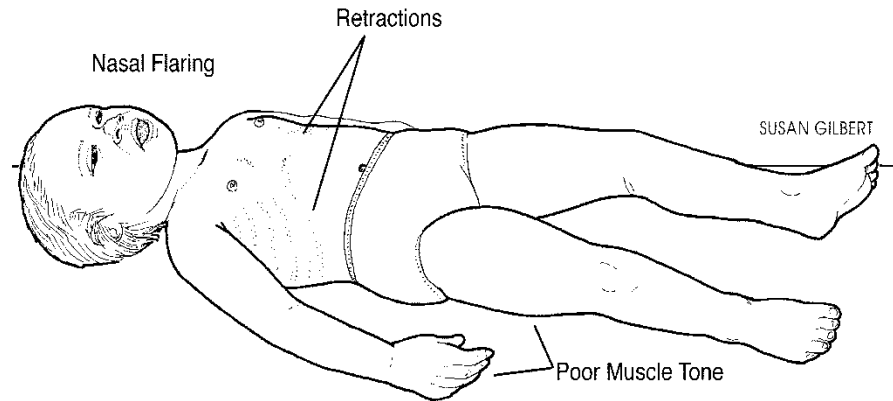
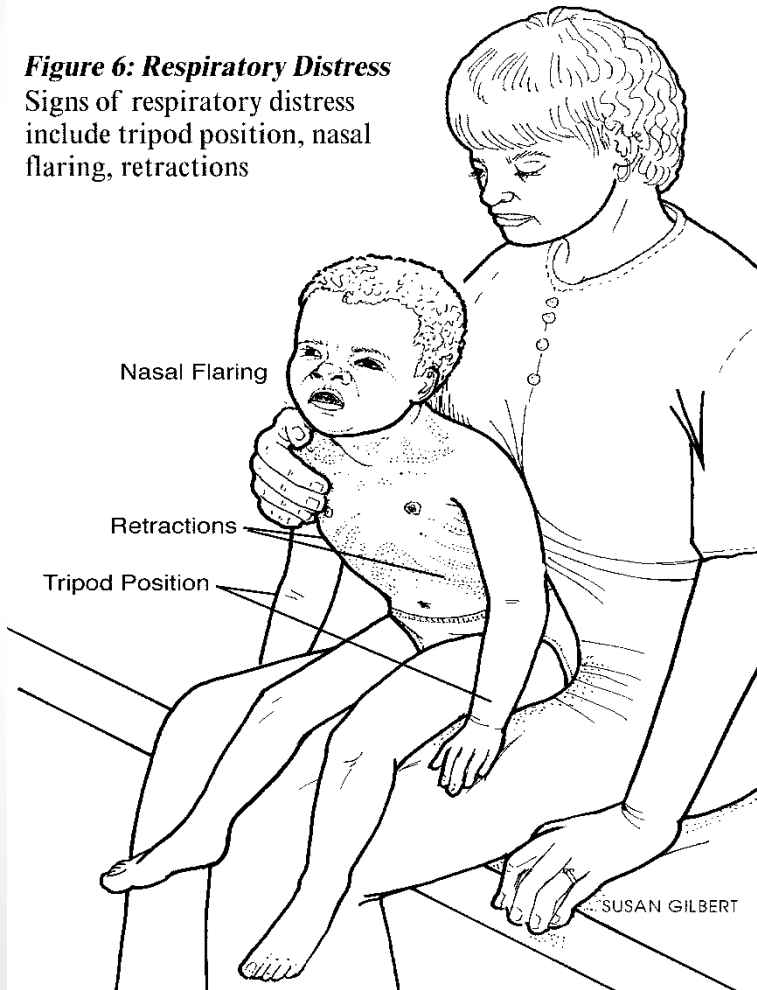


Figure 4: Child, Poor First Impression
Sick child with poor muscle tone, nasal flaring, retractions

The following clinical signs should be recorded:

- **Pulse rate** - increasing tachycardia generally denotes worsening asthma; a fall in heart rate in life threatening asthma is a pre-terminal event
- **Respiratory rate and degree of breathlessness** – i.e too breathless to complete sentences in one breath or to feed
- **Use of accessory muscles of respiration** - best noted by palpation of neck muscles

The following clinical signs should be recorded:

- **Amount of wheezing** - which might become biphasic or less apparent with increasing airways obstruction
- **Degree of agitation and conscious level** - always give calm reassurance
- **NB Clinical signs correlate poorly with the severity of airways obstruction. Some children with acute asthma do not appear distressed.**

Severe exacerbation

- SpO₂ <92%
- PEF 33-50%
- Can't complete sentences in one breath or
- too breathless to talk or feed
- Pulse >125 (>5 years)
- or >140 (2 to 5 years)
- Respiration >30 breaths/min (>5 years) or >40 (2 to 5 years)

Life threatening asthma

- SpO₂ <92%
- PEF<33 best or predicted
- Hypotension
- Silent chest
- Exhaustion
- Cyanosis
- Confusion
- Poor respiratory effort
- Coma

Who is at risk for fatal asthma?

Previous PICU admission for asthma, especially if mechanical ventilation required

Current or very recent treatment with **prednisone**

Hospitalization or emergency department visit for asthma in the **past year**

Not currently using or have recently stopped **inhaled corticosteroids**

Who is at risk for fatal asthma?

Excessive use of short-acting **inhaled β_2 agonist** (> 1 canister Salbutamol per month)=200puffs

History of **psychisric** disease or psychosocial problems.

Chronic severity with impaired lung functions

Poor adherence with asthma medications or written asthma action plan.

Investigation

Chest x-ray- Not usually indicated but consider in

- a severe attack
- signs suggesting pneumothorax
- lobar collapse or consolidation

Investigation

- If cardiomegaly or pulmonary oedema present then think of left ventricular failure

Blood gases

- in severe cases (especially if decreased respiratory effort, cyanosis, restlessness, confusion, drowsiness)
- Normal or increased $p\text{CO}_2$ indicates impending respiratory failure

Blood gasses

PaO₂ (on air)

Severe asthma < 8 kPa (60 mm Hg)

PaCO₂

Usually **Hypocarbica** = < 6 kPa (45 mm Hg)

Normal PaCO₂ at presentation = ? trouble

Increasing levels of CO₂ is an **OMINOUS SIGN**

Treatment

- Oxygen
- Inhaled bronchodilators
 - β 2 agonists
 - Anticholinergics
- Additional treatment
 - IV β 2 agonists
 - IV theophylline
 - IV magnesium sulphate
 - Adrenaline (inhaled, SC and IM)
 - *IV montelukast*
 - *Heliox*

Nebulised vs. MDI β 2 agonist

- Patients who received β 2 agonists by MDI and valved holding chamber showed a **SIGNIFICANT DECREASE IN THE ADMISSION RATE** compared with those receiving nebulizer treatments

Nebulised vs. MDI β 2 agonist

- Nebulised β 2 agonist is driven by oxygen!
- Patients may be unfamiliar with spacers or too agitated to use them.
- The potential for suboptimal MDI technique may increase with increasing severity of exacerbations.
- The nebulised route allows continuous bronchodilator administration.

Continuous Vs. intermittent Nebulised β 2 agonists

- There is evidence suggesting that continuous administration of nebulised β 2-agonists may have a better and prolonged bronchodilatory effect compared to intermittent therapy
- A sustained stimulation of β 2-receptors is accomplished, and a possible rebound bronchoconstriction reported during intermittent therapy is prevented

Ipratropium Bromide

- The **combination** of nebulized IB with a nebulized β_2 agonist has been shown to result in **greater bronchodilatation with improved spirometric parameters and reduced hospital admissions** than a β_2 agonist alone.

Steroid therapy

- **Oral Steroid are as effective as injected steroids.**
 - Effect after 3-4 hours
- **ORAL**
 - Usual dose of oral prednisone or prednisolone is **1mg/kg/day**
- **IV**
 - Hydrocortisone of 4 mg/kg\dose.6hrly.
 - Methylprednisolone 0.5 - 1.0 mg/kg every 4-6 hour.

IV Salbutamol

- The use of IV salbutamol in the early management of acute severe asthma in children has been shown to ***reduce the duration of the exacerbation*** and ***hasten the discharge from hospital*** of the children.
- In the intensive care unit IV salbutamol by continuous infusion is ***effective*** and probably ***safer than aminophylline***.
- Side effect
 - Cardiovascular in nature
 - Hypokalemia, hypomagnesaemia, hypocalcaemia.

IV salbutamol

- IV Salbutamol: 15 micrograms per kg given by slow bolus injection over 10 minutes (max 250 micrograms total dose). *NB check K+ levels when putting an IV cannula*
- Followed by a continuous infusion (1–5 micrograms/kg/min)

IV aminophylline

Theophylline safely hastened the recovery of children in severe status asthmaticus who were also receiving albuterol, ipratropium, and methylprednisolone

IV aminophylline Asthma BTS /SIGN guidelines 2011

- Aminophylline is not recommended in children with mild to moderate acute asthma
- Consider aminophylline in an HDU or PICU setting for children with severe or life threatening bronchospasm unresponsive to maximal doses of bronchodilators plus steroids.

IV aminophylline

- May be used in cases of **near fatal or life threatening** asthma in the intensive care unit.
- IV Aminophylline: slow bolus 5 mg/kg (over 20-30mins)
- then infusion 1 mg/kg/hr
- NB: Any of this medication **MUST** be given via an infusion pump.
- ECG monitor essential
- **Never** give bolus of Aminophylline if taking oral xanthenes and check level.

Adrenaline (Epinephrine) SC or IM

- Not routinely indicated
- Useful in severe wheeze associated with anaphylaxis

Magnesium sulphate

- Magnesium causes smooth muscle relaxation secondary to inhibition of calcium uptake
- Safe and established treatment for asthma in adult
- A **single dose** of IV magnesium sulphate has been shown to be **safe** and **effective** in those patients with acute severe asthma who have had a poor response to initial therapy

OTHER Rx

- **Heliox**

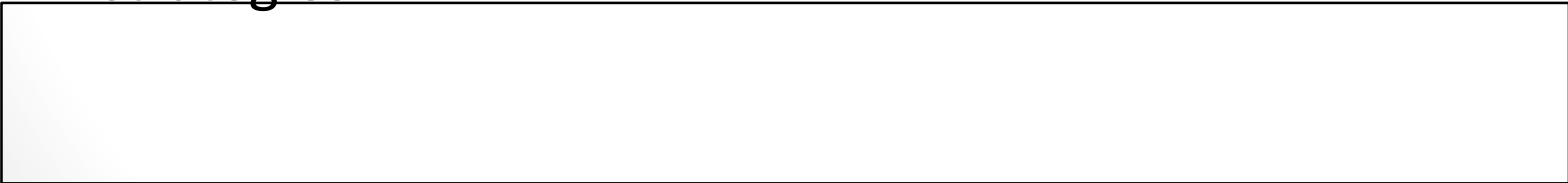
- Might be superior to oxygen as a driving gas for aerosol delivery of β -agonists in patients with acute asthma because its lower gas density results in decreased flow resistance and increased lung penetration
- 80:20 mixture of helium-oxygen is most effective

Antibiotics

- Do not give antibiotics routinely in the management of acute childhood asthma.
- If chest infection is suspected on clinical grounds or Chest X-ray findings, consider antibiotics.

Ventilation: TRY TO AVOID IF POSSIBLE

- ketamine (1–2 mg/kg) may be useful in this setting as it is a bronchodilator.
- Secondly, ventilation is likely to be difficult and the largest possible endotracheal tube should be inserted.
- Following intubation, **slow rates** and **long inspiratory times** are usually the most successful ventilator strategies



Monitor for of Asthma complications

- **Pneumothorax**
- Pneumomediastinum
- Pneumopericardium
- Pulmonary interstitial emphysema
- Pneumoretroperitoneum
- Myocardial ischaemia or infarction
- **Mucus plugging**
- **Atelectasis**
- Pneumonia
- **Respiratory failure**
- Electrolyte disturbances
 - **Hypokalaemia**
 - Hypomagnesaemia
 - Hypophosphataemia
 - Cardiac arrhythmias
- Lactic acidosis
- Theophylline toxicity

Summary of treatment (Guidelines)

- **Oxygen** as required to keep saturations above 95%
- Continuous nebulisation of **Short acting β 2 agonist** in the first 1hour
- Nebulised **Ipratropium bromide** can be added to (combined with) nebulised salbutamol (3 doses in the first hour)
- Oral or IV **steroids** should be given early in the course of the illness.
- If no or incomplete improvement after 1-2 hours consider **IV magnesium sulphate**
- The next step is **IV salbutamol** infusion (monitor side effects)
- **IV aminophylline** may be used in cases of near fatal or life threatening asthma in the intensive care unit (monitor side effects)

Best luck

Questions