Acute severe asthma

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Acute asthma is important

- **Patient perspective**
  - Exacerbations of asthma can have a huge impact on patients
    - Exacerbations can be life threatening
    - Up to 90% of the deaths from asthma are preventable

- **Health costs considerable**
  - Direct costs for asthma (UK): £900 million per yr
  - There are over 69,000 hospital admissions each yr
    - Estimated 75% of admissions avoidable
UK hospital admissions for acute asthma

Rate per 10,000 population

- Males 0-14 yrs
- Females 0-14 yrs
- Females 15+ yrs
- Males 15+ yrs
National & international guidelines

British Guidelines
www.sign.ac.uk

GINA
www.ginasthma.com
Definition of asthma exacerbations

- No generally accepted definition

‘A sustained worsening of a patient’s condition from the stable state and beyond normal day-to-day variations, that is acute in onset and necessitates a change in medication’

- Criteria:
  - Lung function e.g. fall in peak expiratory flow (PEF) in 2 consecutive days of 25% of baseline
  - Medication e.g. use of systemic steroids
Risk factors for near fatal/fatal asthma

- Severe asthma, recognised by 1 or more of:
  - Previous near fatal asthma
  - Previous admission (last year)
  - Repeat emergency department attendance
  - Heavy use of beta$_2$ agonist
  - Brittle asthma

- And adverse psychological features, recognised by 1 or more of:
  - Non-compliance with treatment
  - Self discharge
  - Alcohol or drug abuse
  - Social isolation
  - Psychosis, depression

*British Guidelines on Management of asthma, 2008*
Causes of exacerbations

- **Viruses**
  - Children: 80% of episodes (mainly rhinoviruses)  
    *Johnston et al, BMJ 1995*
  - Adults: 26-50% of episodes  
    *Green et al, BMJ 2002; Atmar et al, Arch Int Med 1998*

- **Atypical bacterial infections**
  - Mycoplasma & *chlamydia pneumoniae*  
    *Johnston & Martin, AJRCM 2005*

- **Air pollution**  
  *Sunyer et al, Thorax 1997*

- **Allergens**  
  *Green et al, BMJ 2002; Bacharier et al, Pediatrics 2003*

- **Cigarette smoke**  
  *Eisner, Thorax 2005*
Air pollution & risk of hospital admission

Children with asthma admitted to hospital in 4 European cities

Sunyer et al, Thorax 1997
Pathology of fatal asthma

- Mucus
- Epithelial cells and goblet-cell hyperlasia
- Thickening of sub-basement membrane
- Cellular infiltrate
- Hypertrophy of smooth muscle
- Vascular congestion
Airway inflammation in acute asthma

- Induced sputum cell counts:

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Fahy et al, JACI 1995
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Initial assessment

- Clinical features
  - Non specific for a severe attack
- Peak expiratory flow (PEF) or FEV$_1$
  - Improves recognition of degree of severity
- Pulse oximetry
  - Measurement of oxygen saturation (SpO$_2$)
- Blood gases
  - If SpO$_2$ <92% or features of life threatening asthma
- Chest x-ray: Not routine
  - Suspected pneumothorax, pneumonia, life threatening attack

*Management of acute asthma. British Asthma Guidelines 2008*
Levels of severity of acute asthma exacerbations

- **Acute severe**
  - PEF > 33-50% best or predicted

- **Life threatening**
  - PEF < 33% best or predicted
  - SpO₂ < 92%

- **Near fatal**
  - Raised PaCO₂ / mechanical ventilation

_Management of acute asthma. Thorax 2008; 58 (Suppl I): i1-i92_
Criteria for admission

- Life threatening or near fatal attack [Grade B]
- Severe attack after initial treatment [Grade B]
- Consider discharge if PEF is > 75% best or predicted 1 hour after initial treatment unless other factors [Grade C]
  - Concern about compliance, living alone, pregnancy, etc

Management of acute asthma. Thorax 2008
Establish plan for treating exacerbation

- Primary therapies for exacerbations:
  - Repetitive administration of rapid-acting inhaled β2-agonist
  - Early introduction of systemic corticosteroids
  - Oxygen supplementation

- Closely monitor response to treatment with serial measures of lung function
Treatment of acute asthma in adults

- **Oxygen**
  - Give high flow oxygen to all patients with acute asthma [Grade C]
  - Aim to keep $SpO_2$ at least 92%

- **Beta$_2$ agonist bronchodilators**
  - High dose inhaled beta$_2$ agonist [Grade A]
  - Rarely require IV beta$_2$ agonists
  - In severe asthma (PEF <50%) consider continuous nebulisation [Grade A]

*Management of acute asthma. Thorax 2008*
Steroid therapy

- Give systemic steroids in adequate doses to all cases of acute asthma [Grade A]
  - Tablets as effective as injections
  - Moderate doses as effective as very high doses

- Continue prednisolone 40-50 mg daily for at least 5 days or until recovery
  - e.g. prednisolone 2 x 25 mg

Management of acute asthma. Thorax 2008
Other therapies for acute asthma in adults

- Ipratropium bromide
  - Nebulised ipratropium should be added to inhaled beta₂ agonist for acute severe or life threatening or poor initial response
    
    [Grade A]; Rodrigo et al Thorax 2005

- Intravenous aminophylline
  - Not likely to result in any additional bronchodilation

- Antibiotics
  - Routine prescription not indicated [Grade B]
Other therapies for acute asthma

- **Intravenous magnesium sulphate**
  
  Consider giving a single dose of IV magnesium sulphate for patients with:
  
  - Acute severe asthma who have not had a good initial response to inhaled bronchodilator therapy
  - Life threatening or near fatal asthma

[Grade A]

*Management of acute asthma. Thorax 2008*
Monitoring of adults with acute asthma

- Measure and record PEF 15-30 minutes after starting treatment, and before/after $\beta_2$ agonist bronchodilator (at least four times daily) until controlled.

- Record oxygen saturation by oximetry and maintain arterial SaO$_2$ > 92%.

- Repeat measurements of blood gas tensions within 2 hours of starting treatment if:
  - Initial PaO$_2$ < 8 kPa unless SaO$_2$ > 92%; or
  - Initial PaCO$_2$ is normal or raised; or
  - Patient’s condition deteriorates or not improved by 4-6 hours.

- Record heart rate.

- Measure serum potassium and blood glucose concentrations.
Criteria for referral to intensive care

- **Clinical**
  - Exhaustion
  - Drowsiness
  - Respiratory arrest

- **Lung function**
  - Deteriorating PEF

- **Gas exchange**
  - Persisting or worsening hypoxia
  - Hypercapnia
  - Fall in ph or rising $H^+$ concentration

*Management of acute asthma. Thorax 2008*
Hospital discharge & follow-up

- Timing of discharge
  - No single physiological parameter
    - PEF > 75% best or predicted
- Patient education
  - Inhaler technique, PEF record keeping, action plan
  - Role for asthma liaison nurse service

Management of acute asthma. Thorax 2008
Self management or action plan

**SIGNS OF WORSENING ASTHMA**

It is very important for you to be able to recognise early when your asthma symptoms are deteriorating. By doing so you will know when to increase your treatment or contact your GP or practice nurse.

Signs of worsening asthma are:

- An increase in symptoms i.e. cough, chest tightness, wheeze and breathlessness
- Overnight wakening with the above symptoms
- Increased use of reliever inhaler with reduced benefit
- Restriction on daily activities
- Reduced peak flow and a greater variation between the morning and evening reading

**YOUR ASTHMA MANAGEMENT PLAN**

This plan helps you to adjust your treatment according to your symptoms and peak flow reading. If you take quick action, you can usually prevent severe attacks.

If you are experiencing the **signs of worsening asthma** and your peak flow reading falls below ................., you should double the dose of your preventer inhaler and continue this higher dose for one week.

Take your reliever inhaler as required every four to six hours.

Inform your GP or practice nurse that you have adjusted your treatment.

If there is still no improvement in your symptoms contact your GP immediately.

_Date discussed:_

_Date discussed:_
Evidence for self management or action plans

- Cochrane review Powell H, Gibson PG, 2003: 15 RCTs in adults over 16 years of age with asthma

- Can be conducted by either self-adjustment with the aid of a written action plan or by regular medical review

- Action plans based on peak flow are equivalent to action plans based on symptoms

- Reducing the intensity of self-management education or level of clinical review may reduce its effectiveness
Hospital discharge & follow-up

- **Timing of discharge**
  - No single physiological parameter
    - PEF > 75% best or predicted
- **Patient education**
  - Inhaler technique, PEF record keeping, action plan
  - Role for asthma liaison nurse service
- **Follow-up**
  - Reasons for exacerbation
  - Review medication
  - Arrange follow-up with GP within 2 weeks &/or with respiratory service within 4 weeks

*Management of acute asthma. Thorax 2003*
Stepwise management of chronic asthma in adults

Check list:
- Asthma control
- Adherence
- Inhaler technique
- Self-management

Step 1: Mild intermittent asthma: Short acting β-agonist

Step 2: Regular preventer therapy: Inhaled steroid (ICS)

Step 3: Add-on therapy: Long acting β-agonist (LABA)

Step 4: Persistent poor control: High dose ICS + other add-ons

Step 5: Continuous or frequent use of oral steroids

Step-down

Asthma control
Adherence
Inhaler technique
Self-management

British Guidelines on Asthma 2008
Summary: assess & treat

Assess severity

- Acute severe asthma
- Life-threatening asthma
- Near fatal asthma

Immediate treatment:
- Oxygen: maintain $\text{SaO}_2 > 92$
- Nebulised bronchodilators
- Corticosteroids

Notify anaesthetist / ITU early
Summary: next steps

- If patient not improving within 15-30 min or life threatening or near fatal attack
  - Discuss with middle grade/senior clinician
  - Nebulised salbutamol + iprotropium bromide every 15 min
  - Add IV magnesium: 1.2-2g infusion over 20 min
  - Other treatments: consider IV salbutamol or aminophylline
  - Alerting on-call anaesthetist/referral to ITU
Summary: monitoring/investigations

Oximetry
- Maintain O₂ >92%

Repeat blood gases if:
- Initial paO₂ <8 KPa unless SpO₂ >92%
- PCO₂ normal or raised

PEF

Chest-ray

Electrolytes
Summary: discharge planning

- Check inhaler technique & assess adherence with therapy
- Stop nebulised therapy 24 hrs before discharge
- Review maintenance treatment
- Written asthma action plan
- Smoking cessation advice, if appropriate
Questions?