Management of Acute Asthma

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Glenfield Hospital, Leicester

RCP BTS Acute Respiratory Medicine
on the Medical Take
29.1.20
Management of acute asthma:

- Assessment
- Management guidelines
- Drugs and evidence
- Quality standards
- Tips and pitfalls
- An important differential diagnosis
- Why patients still die from asthma
Management of acute severe asthma in adults in the emergency department

<table>
<thead>
<tr>
<th>Time</th>
<th>Measure peak expiratory flow and arterial saturations</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 mins</td>
<td>- Clinically stable AND PEF &gt;75%</td>
</tr>
<tr>
<td></td>
<td>- Clinically stable AND PEF &lt;75%</td>
</tr>
<tr>
<td></td>
<td>- No life threatening features AND PEF 50-75%</td>
</tr>
<tr>
<td></td>
<td>- Life threatening features OR PEF &lt;50%</td>
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</tbody>
</table>

PEF >50-75% best or predicted (Moderate asthma)

- SpO₂ ≥92%
- PEF >50-75% best or predicted
- No features of acute severe asthma

Give salbutamol (give 4 puffs initially and give a further 2 puffs, every 2 minutes according to response up to maximum of 10 puffs) preferably via spacer

PEF 33-50% best or predicted (Acute severe asthma)

- Features of severe asthma
  - PEF <50% best or predicted
  - Respiration ≥25/min
  - SpO₂ ≥92%
  - Pulse ≥110 beats/min
  - Cannot complete sentence in one breath

Give salbutamol 5 mg by oxygen driven nebuliser

PEF <33% best or predicted (Life-threatening asthma)

- SpO₂ <92%
- Silent chest, cyanosis, poor respiratory effort
- Arrhythmia, hypotension
- Exhaustion, altered consciousness

Obtain senior/ICU help now if any life-threatening features are present

IMMEDIATE MANAGEMENT
- Oxygen to maintain SpO₂ 94–98%
- Salbutamol 5 mg plus ipratropium 0.5 mg via oxygen-driven nebuliser
- Prednisolone 40–50 mg orally or IV hydrocortisone 100 mg

Measure arterial blood gases
Markers of severity:
- ‘Normal’ or raised PaCO₂ (PaCO₂ >4.6 kPa; 35 mmHg)
- Severe hypoxia (PaO₂ <8 kPa; 60 mmHg)
- Low pH (or high H⁺)
Remember: if you discharge the patient they may not see a health care professional again until the next crisis.

You have a responsibility to:
Educate
Prescribe inhaled corticosteroid

POTENTIAL DISCHARGE
- In all patients who received nebulised β₂ agonists prior to presentation, consider an extended observation period prior to discharge
- If PEF<50% on presentation, give prednisolone 40–50 mg/day for 5 days
- In all patients ensure treatment supply of inhaled steroid and β₂ agonist and check inhaler technique
- Arrange GP follow up within 2 working days post discharge
- Fax or email discharge letter to GP
- Refer to asthma liaison nurse/chest clinic

OBSERVE AND MONITOR
- SpO₂
- heart rate
- respiratory rate

Patient recovering AND PEF >75%  
No signs of severe asthma AND PEF 50-75%  
Signs of severe asthma OR PEF <50%

Patient stable AND PEF >50%  
Signs of severe asthma OR PEF <50%

ADMIT
Patient accompanied by a nurse or doctor at all times

- Give/repeat salbutamol 5 mg with ipratropium 0.5 mg by oxygen-driven nebuliser after 15 minutes
- Consider continuous salbutamol nebuliser 5–10 mg/hr
- Consider IV magnesium sulphate 1.2–2 g over 20 minutes
- Correct fluid/electrolytes, especially K⁺ disturbances
- Chest X-ray
- Repeat ABG
Patient NT 19 yr old female

- Unemployed, smokes 20 cpd and occasional Cannabis
- Lives intermittently with grandmother and friends
- Asthma diagnosed age 17, symptoms for “years”
- PMH: Eczema
- on prn salbutamol and “that brown one”
- 3 previous presentations to ED in 4 months via 999 – given nebulisers and discharged
Assessment on admission

• 1/52 history of increasing breathlessness and cough
• On arrival: distressed, unable to complete sentences
• RR 30, pulse 120
• PEF 100 (best 350)
• ABGs: pH 7.26, PCO₂ 6.04, PO₂ 13.21 (FiO₂ 0.4)
• Blood eosinophils 0.47 x 10⁹/L
## Severity assessment

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Moderate asthma</strong></td>
<td>Increasing symptoms</td>
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<tr>
<td></td>
<td>PEF &gt;50–75% best or predicted</td>
</tr>
<tr>
<td></td>
<td>No features of acute severe asthma</td>
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<tr>
<td><strong>Acute severe asthma</strong></td>
<td>Any one of:</td>
</tr>
<tr>
<td></td>
<td>- PEF 33–50% best or predicted</td>
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<tr>
<td></td>
<td>- respiratory rate ≥25/min</td>
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<tr>
<td></td>
<td>- heart rate ≥110/min</td>
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<tr>
<td></td>
<td>- inability to complete sentences in one breath</td>
</tr>
<tr>
<td><strong>Life-threatening asthma</strong></td>
<td>Any one of the following in a patient with severe asthma:</td>
</tr>
<tr>
<td></td>
<td><strong>Clinical signs</strong></td>
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<tr>
<td></td>
<td>Altered conscious level</td>
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<tr>
<td></td>
<td>Exhaustion</td>
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<tr>
<td></td>
<td>Arrhythmia</td>
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<td></td>
<td>Hypotension</td>
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<tr>
<td></td>
<td>Cyanosis</td>
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<tr>
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<td>Poor respiratory effort</td>
</tr>
<tr>
<td><strong>Near-fatal asthma</strong></td>
<td>Raised PaCO₂ and/or requiring mechanical ventilation with raised inflation pressures</td>
</tr>
</tbody>
</table>

Note: PaCO₂ is the partial pressure of carbon dioxide, and PaO₂ is the partial pressure of oxygen.
Immediate Treatment

- Oxygen to maintain SpO2 94-98%
- Salbutamol 5mg via O2 driven nebuliser
- Ipratropium bromide 0.5mg via O2 driven nebuliser
- Prednisolone 40-50mg or iv hydrocortisone 100mg
- No sedatives of any kind
- CXR if ?pneumothorax ?consolidation or needs ventilation

If life-threatening features:

- Discuss with ICU
- Consider iv Magnesium 1.2-2.0g infusion over 20 mins
- Nebulised salbutamol 5mg every 15-30mins or 10mg/hour continuously
## Severity assessment

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<th>Criteria</th>
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<tr>
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</tr>
<tr>
<td><strong>Acute severe asthma</strong></td>
<td>Any one of:&lt;br&gt;- PEF 33–50% best or predicted&lt;br&gt;- Respiratory rate ≥25/min&lt;br&gt;- Heart rate ≥110/min&lt;br&gt;- Inability to complete sentences in one breath</td>
</tr>
<tr>
<td><strong>Life-threatening asthma</strong></td>
<td>Any one of the following in a patient with severe asthma:&lt;br&gt;Clinical signs</td>
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</tr>
</tbody>
</table>
NT: management

- Documented life threatening asthma
- Oxygen 40% initially, O2 sat>94%
- Hydrocortisone 100mg iv
- Nebulised salbutamol 5mg and ipratropium 0.5mg
- Iv magnesium 1.2g
- Call ICU
Monitoring

• Repeat PEF 15-30 mins after Rx started
• Oximetry target sats 94-98%
• Repeat ABG at one hour if paO2 <8 kPA (unless Spo2>92%); or paCO2 N or raised or patient deteriorates
• PEF chart qds pre and post β2 agonist

• Transfer to ICU with a doctor able to intubate if:
  – Deteriorating PEF, persistent hypoxia or hypercapnia
  – Exhaustion / reduced GCS
  – Poor respiratory effort or respiratory arrest
NT: Scenario

• ICU comment:

“ We currently do not have an ICU bed. Please give iv aminophylline and if no better start NIV on the respiratory ward......”

• What do you do?
Drugs and evidence

• **Iv magnesium**
  – Pooled cochrane review shows possible benefit from iv (not inhaled) Magnesium sulfate
  – Prevents 7 admissions per 100 patients with acute asthma not responding to nebs and steroids in ED
  – Probably safe

• **Iv aminophylline**
  – Still widely used but evidence base is limited
  – Risk of side-effects 20 vomiting, 15 arrhythmias or palpitations per 100 patients
  – some patients report benefit
  – Use in guidelines appears historic

• **Iv salbutamol**
  – No convincing evidence of benefit, less commonly used (adults)
NIV and asthma

• Controversial
• Potential uses:
  – Pre-oxygenation and whilst preparing to intubate
  – To avoid intubation
• Rationale/advantages:
  – Mechanical intubation in asthma is difficult and risks dynamic hyperinflation, barotrauma and may need use of neuromuscular blockers which increase risk of steroid myopathy
• Risks:
  – May delay intubation
  – Usual risks of NIV eg local pressure sores, aspiration etc
NIV and asthma

• Evidence
  – Lack of high level evidence, no large RCTs
  – 2013 Cochrane review 5 trials, 206 patients, inconclusive
  – Some support in observational studies and case series

• Which patients, where and how?
  – Only on ICU and if intubation not imminently needed but where there are life threatening features
  – Contraindicated if reduced consciousness, vomiting, agitation, profuse secretions, significant haemodynamic instability
  – Suggested PEEP 3-5cmH20 (low); iPAP 7-15 cm H20, adjust to target RR<25. High inspiratory flow rate, low I:E ratio (ie 1:5) and prolonged expiratory time
  – Monitor very carefully, treat aggressively and intubate if they deteriorate
NT: Scenario

• ICU comment:

“ We currently do not have an ICU bed. Please give iv aminophylline and if no better start NIV on the respiratory ward…….”

• What do you do?

Trial of iv aminophylline appropriate but not for NIV on the ward – insist on ICU review
Patient NT: further Rx

- Continued wheeze and tiring despite treatment, becoming exhausted
- Transferred to ICU with anaesthetic StR
- Intubated: high airway pressures
- Iv hydrocortisone and aminophylline continued
- Improves within 48 hours and is extubated
- Transfer back to respiratory ward
You are called by ward nurse

• Patient wishes to go home.

• What assessments do you make?
Discharge criteria

• Been on discharge Rx for 12-24 hours and had inhaler technique checked and recorded: cross off regular nebs as soon as you can

• PEF >75% of best/predicted and PEF diurnal variability <25% unless agreed by respiratory specialist

• Treatment with oral and inhaled corticosteroids

• Own PEF and asthma action plan

• GP follow up within 2 working days (send info including potential best PEF)

• Respiratory follow up within 4 weeks

• Admission plus psychosocial factor = risk of fatal attack
Asthma care bundles

BTS Asthma Discharge Care Bundle: 2016

This care bundle describes 5 high impact actions to ensure the best clinical outcome for patients attending hospital with an acute asthma attack. The aim is to reduce the number of patients who are readmitted following discharge and to ensure that all aspects of the patient’s asthma care are considered. This bundle applies to patients from age 2 onwards (but may not always be suitable for patients under 5).

- In patients under 5 and older patients (particularly those with a smoking history) ensure that a correct diagnosis of asthma is established (see the BTS Asthma Guideline for diagnosis information).
- Optimal preventer therapy for children aged 2 to 5 with recurrent episodes of acute ‘viral wheeze’ and minimal interval symptoms is unknown. As a group, children with viral wheeze do not respond to inhaled corticosteroid preventer treatment.
- Children under 5 with frequent and/or severe wheeze attacks requiring hospital attendance should have a specialist review.

1. **ALL PATIENTS (OR FAMILY MEMBERS/CARERS ADMINISTERING MEDICINES) SHOULD HAVE THEIR INHALER TECHNIQUE ASSESSED PRIOR TO DISCHARGE**
   - Correct use of inhalers is associated with improved outcomes for patients including a reduction in risk of exacerbations and hospital admission. Repeated instruction is required to ensure that inhaler technique is optimised. Every opportunity must be taken to promote good inhaler technique in order to ensure adequate delivery of therapy.

   - **Inhaler technique checked?** YES NO
   - **Inhaler use instruction provided?** YES NO

2. **ALL PATIENTS SHOULD HAVE THEIR MEDICATIONS ASSESSED. THE IMPORTANCE OF MEDICATION ADHERENCE TO GOOD ASThma CONTROL SHOULD BE REINFORCED TO PATIENTS (AND / OR ANY FAMILY MEMBERS OR CARERS ADMINISTERING MEDICINES) PRIOR TO DISCHARGE**
   - Review of medication is vital following a hospital attendance or admission as intentional and unintentional non-adherence to preventer therapies (principally inhaled corticosteroids) frequently causes deterioration in asthma control.

   - **Medication classes reviewed?** YES NO
   - **Doses reviewed (increasing/decreasing as necessary)?** YES NO
   - **Was the importance of adherence to preventer medication discussed with the patient/family?** YES NO

3. **A WRITTEN ASTHMA ACTION PLAN FOR HOW TO MANAGE CARE SHOULD BE PROVIDED TO PATIENTS AND FAMILIES/CARERS**
   - Self-management/action plans for asthma provide information for patients and their families on how to carry out disease specific elements of self-care. There is strong evidence that providing written action plans, in addition to verbal information, is associated with improved patient/carer understanding of asthma and thereby reduces risk of further attack and hospitalisation. Examples of asthma action plans and further information on self-management can be found at www.asthma.org.uk.

   - **A written action plan has been provided?** YES NO
   - **Already has a plan?**

4. **TRIGGERING AND EXACERBATING FACTORS IN THE PATIENT’S OVERALL ENVIRONMENT SHOULD BE CONSIDERED**
   - Attacks may have an identifiable trigger which should be recognised in order to minimise exposure and reduce risk of further asthma attacks. Trigger factors include NSAIDs, smoking/smoke exposure in the home, psychosocial instability and other issues such as pets. Explicit attention should be paid to potential occupational factors. Recognition of these and other potential causes was identified as an important factor in the NRAD report.

   - **Have trigger factors* with the patient’s environment been considered?**
     - **NSAIDs?** YES NO Uncertain NA
     - **Smoking/smoke exposure in the home?** YES NO Uncertain NA
     - **Occupational?** YES NO NA
     - **Other?** YES NO

   - * ‘proving’ triggers e.g. occupational exposure, pets, NSAIDs may require further investigation at follow-up.

5. **SUBSEQUENT CARE: FOLLOW-UP IN THE COMMUNITY TO BE ARRANGED WITHIN 2 WORKING DAYS PLUS SPECIALIST CARE ACCORDING TO CRITERIA WITHIN 2 WEEKS**
   - National guidance clearly recommends early primary care follow up to improve outcomes. Local discussions may need to be held in order to fit this into local systems and care pathways.

   - **Community follow up arranged within 2 working days?** YES NO
   - **Specialist follow up arranged within 2 weeks?** YES NO
Nice Quality Statements

• People with asthma who present with an exacerbation of their symptoms should receive an objective measurement of severity at the time of presentation (2013, 2018 local target not national priority)

• People aged 5 or older presenting to a healthcare professional with a severe or life threatening acute exacerbation of asthma should receive oral or iv steroids within one hour (2013, 2018 local target not national priority)

• People who receive hospital or OOH Rx for acute asthma exacerbation should be followed up by their own GP practice within 2 working days (2018 national priority)
Tips and pitfalls

• Always look at the FBC eosinophil count
• Patients with high eosinophils may need prolonged course of oral prednisolone especially if recurrent attacks
• Always suspect non-adherence to ICS
• Always suspect poor inhaler technique
• If you are not sure whether this is genuine acute severe asthma always treat it as such – but document your thoughts
• If you are not sure of the severity of the attack, always assume it is life threatening until proved otherwise
Any asthma admission is a “red flag”: most patients are never admitted

• Most admissions are due to one of the following:
  – New or unsuspected diagnosis
  – Suboptimal Rx of known asthma usually due to poor adherence with ICS but sometimes due to poor primary care prescribing
  – Incorrect diagnosis (more to follow)
  – Psychosocial issues
  – Co-morbidity
  – Abnormal illness behaviour eg secondary gain, opiate dependance
Differential diagnosis of acute severe asthma

- Inducible laryngeal obstruction (Vocal cord dysfunction)
- Dysfunctional breathlessness
- COPD
- Lower respiratory tract infection
- Bronchiectasis
- Inhaled foreign body (or drugs)
- Heart failure
- Lung cancer
KD: History

- 45 year old male, previously fit and well
- Lichen Sclerosis
- No previous respiratory illness
- January 2014: sudden onset SOB, neck constriction, wheeze. Diagnosis: asthma – treated as acute severe episode
- Multiple admissions: Not responding to treatment with inhaled or oral corticosteroids
- Apparent salbutamol induced bronchospasm
Spirometry

<table>
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<tr>
<th></th>
<th>Pred</th>
<th>Pre</th>
<th>%Pred</th>
<th>S R</th>
<th>Post</th>
<th>%Pred</th>
<th>S R</th>
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<td>FVC</td>
<td>4.83</td>
<td>4.63</td>
<td>95.8</td>
<td>-0.33</td>
<td>3.77</td>
<td>78.1</td>
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<td>FEV 1</td>
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<tr>
<td>FEV 1 % FVC</td>
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<td>80.74</td>
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<td>1.8</td>
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<td>PEF</td>
<td>554</td>
<td>577</td>
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<td>77.8</td>
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<td>5.70</td>
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<td>4.64</td>
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<td>-25.7</td>
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**Physiologist Comment**

Spirometry was normal.

The patient was nebulised with Salbutamol 2.5mg/2.5ml and the spirometry was repeated after 20 minutes.

A significant deterioration after Salbutamol was observed. Mr had a significant adverse reaction to Salbutamol and must not be administered.
### Induced sputum results:
- Neutrophils: 91%
- Eosinophils: 0%

### Physiologist Comments

<table>
<thead>
<tr>
<th>Dose (mcg)</th>
<th>0.00</th>
<th>1.00</th>
<th>4.00</th>
<th>500.00</th>
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<tbody>
<tr>
<td>FEV1(L)</td>
<td>3.32</td>
<td>3.39</td>
<td>2.77</td>
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</table>

### Borg and symptoms

- Baseline = 0
- Saline = 2
- 1.0 = ?
- 4.0 = 3+ Tight chest and severe change in voice
- 8.0 = ?
- 16.0 = ?

- Pc20 = 3.96 mg/ml
- Patient given 400 mcg Salbutamol MDI
- Sputum obtained

Induced sputum results:
- Neutrophils 91%
- Eosinophils 0%
Inducible Laryngeal Obstruction (ILO):

• “an inappropriate, transient, reversible narrowing of the larynx in response to external triggers”

• Normal: vocal cords move away from the midline during inspiration and slightly back towards the midline during expiration. In ILO, the vocal cords move paradoxically toward the midline during inspiration or excessively so during expiration, resulting in airflow obstruction

• Variable symptoms include: laryngeal tickle, pain, a choking/strangled sensation, cough and dysphonia, episodic (often sudden) episodes of inspiratory (sometimes expiratory) dyspnoea, wheeze and stridor
ILO: pathophysiology

- Pathophysiology poorly understood and no consensus agreed.
- Early literature focuses on psychogenic / emotional reasons for ILO/ VCD
- More recently co-existing organic presentations have been highlighted including: upper airway sensitivity, laryngeal irritants, laryngo-pharyngeal reflux, asthma, post nasal drip.
- Variable triggers: emotional stress, exposure to cold air, exercise, smoke, coughing, laughing, talking, viruses, reflux, allergens, food and drink, forced respiratory manoeuvres
ILO: making the diagnosis

• Gold standard: paradoxical movement of the vocal cords at nasendoscopy (classically anterior 2/3 adduction, posterior diamond shaped chink on inspiration). Cords need to be visualised when symptomatic – challenges (breathing, phonation, topical trigger, exercise)

Listen over the trachea: wheeze here with clear lungs very suggestive: if in doubt treat as acute severe asthma but document your doubt – helps later
ILO: making the diagnosis

- Gold standard: paradoxical movement of the vocal cords at nasendoscopy (classically anterior 2/3 adduction, posterior diamond shaped chink on inspiration). Cords need to be visualised when symptomatic – challenges (breathing, phonation, topical trigger, exercise)

- Flow-volume loops: often poorly tolerated/non-reproducible - may show inspiratory loop truncation (extra-thoracic obstruction); ↑MEF 50%/MIF 50% ratio ↓MVV; ↑ Raw

- Emerging alternative tests: Questionnaires (eg VCDQ) impulse oscillometry, airway fluoroscopy, plethysmography, CT with 3D reconstruction of larynx and colour doppler ultrasound imaging of vocal cord movement (not fully evaluated)

- Exclude alternative/additional pathologies especially asthma
ILO: Treatment:

- No Randomised controlled trials
- MDT: SLT, physician, physiotherapist, clinical psychologist, ENT surgeon.
- Patient education critical
- Identification and avoidance of triggers (eg treat GOR)
- Psychological therapy
- Physiotherapy if dysfunctional breathing
- Other Rx anecdotal benefit but trials needed (Botox, surgery, inspiratory muscle training)

2017 ILO: official joint ERS/ELS statement Task Force Report
Back to asthma: Patient KS

• 17 year old female under severe asthma clinic
• Severe eosinophilic asthma with poor symptom control and recurrent severe exacerbations
• Known poor adherence to treatment
• Previous near-fatal attack (respiratory arrest on holiday age 12)
• Advised to take regular oral steroids but adverse effect on mood
Final admission

- Attended GP urgent care centre: Worsening SOB and wheeze despite 4 days of Prednisolone 40mg. Given 2.5mg neb salbutamol, EWS 5 - refer ED resus.

- ED 19:18 Used whole salbutamol inhaler at home. RR24 PEF330 HR 125 (Best PEF 370-390) sats 100% on neb, generalised wheeze

- Plan: nebulisers iv access, 200mg iv hydrocortisone (given 19:00), bloods, CXR (no penumothorax), review. Also given 1g iv meropenem and 1g iv paracetamol

- ED review 20:05 - walked to toilet, no wheezing

- ED review 20:55 Improved: RR 18, sats 97% on air PF 380 (normal for her) Imp: good response Plan: advised send to EDU and aim home later but patient unhappy as in the past she has deteriorated after discharge, would like overnight admission therefore plan to admit
**ED asthma pathway**

**5 Will discharge be safe?**

☐ No, as at least one of the below

- Observations still abnormal
- Significant remaining symptoms
- Concerns about compliance
- Living alone / socially isolated
- Psychological problems
- Physical disability
- Learning difficulties
- Previous near-fatal or brittle asthma
- Exacerbation despite adequate PO steroids
- 2nd ED visit for asthma attack within 24h
- Discharge after 22:00
- Pregnancy

☐ Yes, as none of the above
• ED review 22:50 (SpR) “Patient remained stable, last neb 19:30. I spoke to her again and she is happy to go home and will stay with her friend. I advised staying in EDU for observation but she wanted to go home. Patient has full capacity.”

• Patient self discharged and went to friend's house. Parents not aware of admission or discharge
15 hours later: 999 EMAS to ED

- 999 call 13:01 Cardiac arrest at friend’s house - witnessed collapse, vomiting, friend started CPR

- Arrival at ED: asystolic arrest:
  - A: bag and valve ventilation
  - B: reduced AE very difficult to bag
  - C: cardiac arrest

- Intubated, 4Hs and 4Ts addressed, bilateral needle thoracotomies performed - right sided pneumothorax 20F drain inserted then changed to 28F. Given salbutamol, hydrocortisone, aminophylline

- ROSC 14:21 (down time 52 minutes)

- Bronchoscopy and manual chest compression performed by ITU cons

- Imp: Cardiac arrest secondary to tension pneumothorax and bronchospasm

- Tragically died 18 hours later: cause of death 1(a) tension pneumothorax (b) acute severe asthma
Asthma still kills

National Review of Asthma Deaths published May 2014

- 2/3 of deaths could be prevented with better routine care
- Room for improvement in care of 83% of those who died
- Particular issues in children

2017: young patients still dying due to inadequate asthma care

Lessons are not being learnt

7 KEY PREVENTABLE FACTORS LINKED TO ASTHMA DEATHS
<table>
<thead>
<tr>
<th></th>
<th>WHY DOES ASTHMA STILL KILL?</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Over use of rescue $\beta_2$-agonist</td>
</tr>
<tr>
<td>2</td>
<td>Under use of inhaled corticosteroid</td>
</tr>
<tr>
<td>3</td>
<td>No objective assessment of control</td>
</tr>
<tr>
<td>4</td>
<td>No Personalised Asthma Action Plan (PAAP)</td>
</tr>
<tr>
<td>5</td>
<td>Missed opportunity for review after acute attack</td>
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<tr>
<td>6</td>
<td>Psychosocial factors</td>
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<td>7</td>
<td>Triggers not avoided</td>
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1. Over use of rescue $\beta_2$-agonist
   - Good control is salbutamol < twice per WEEK
   - Review if > 12 salbutamol inhalers/12 months

2. Under use of inhaled corticosteroid
   - Review prescribing, inhaler technique, adherence

3. No objective assessment of control
   - Assess control each visit (RCP 3Qs, Peak flow): ACT if not controlled

4. No Personalised Asthma Action Plan (PAAP)
   - PAAP saves lives: give to all patients and review every visit

5. Missed opportunity for review after acute attack
   - Refer to specialist if > 2 courses prednisolone/year
   - Follow up within 48 hours after admission/ED/OOH

6. Psychosocial factors
   - Address smoking / adherence / psychological factors / obesity / comorbidity / safeguarding

7. Triggers not avoided
   - Address smoking, allergen exposure
   - Avoid NSAIDs and Beta-blockers
National quality improvement priorities for 2019/20

- Ensure 90% of patients are assessed for asthma severity including measurement of PEF within one hour
- Ensure 90% of patients receive a respiratory specialist review before discharge
- Ensure 90% of patients receive systemic steroids within one hour of arrival (unless given at home)