Management of Acute Asthma

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Recognition

The severity of an asthma attack is often underestimated by patients and relatives, largely because of a failure to make objective measurements. Patients who remain severely obstructed after the proper administration of a β_2 agonist and anyone who has remained in respiratory distress for more than 6 hours should be admitted to hospital.

Features of severe asthma

- Too wheezy or breathless to complete sentences in one breath
- Respiratory rate ≥ 25 breaths/min
- Heart rate ≥ 110 beats/min
- PEF 33-50% predicted normal or best

Features of life-threatening asthma

- PEF < 33% predicted normal or best
- SpO2 < 92%
- PaO2 <8 kPa and/or 'normal' $PaCO_2$ (4.6-6.0 kPa)
- A silent chest, cyanosis or feeble respiratory effort
- Bradycardia, dysrhythmia or hypotension
- Exhaustion, confusion or coma

Features of near-fatal asthma

- Raised $PaCO_2$ and/or requiring mechanical ventilation with raised inflation pressures

Assessment

Respiratory rate, pulse and blood pressure, oxygen saturation and peak expiratory flow rate (if patient is able) should be measured and recorded clearly in hospital notes.

Peak expiratory flow

Measurements of PEF are best interpreted when expressed as a percentage of the recent best PEF (within two years) or the percentage of predicted normal. Predicted PEF values should be used only if the recent best PEF (within 2 years) is unknown. If neither of these is known the doctor must base his/her decision on the absolute value, remembering values vary with age sex and height. Values expressed as a percentage predicted normal are of no value in patients with chronically impaired lung function. In patients admitted to hospital PEFs should initially be recorded 1-2 hourly.

Arterial blood gases

Measurements of ABGs should be made on all patients with acute severe asthma who are admitted to hospital. The following are markers of a severe or life-threatening attack:

- A normal (5-6 kPa) or high pCO_2 in a breathless asthmatic patient
- Severe hypoxia (pO_2 < 8 kPa) irrespective of treatment with oxygen
- A low pH (or high H^+) value

Further investigations

- A CXR, U+E, FBC and in older patients, an ECG.

Criteria for admission

- Admit patients with any feature of a life-threatening or near-fatal asthma attack.
- Admit patients with any feature of a severe asthma attack persisting after initial treatment.
- Patients whose peak flow is greater than 75% best or predicted one hour after initial treatment may be discharged from ED unless they meet any of the following criteria, when admission may be appropriate:
    - still have significant symptoms
    - concerns about adherence
    - living alone/socially isolated
    - psychological problems
    - physical disability or learning difficulties
    - previous near-fatal asthma attack
    - asthma attack despite adequate dose steroid tablets prior to presentation
    - presentation at night
    - pregnancy.

Immediate Treatment

The following therapy should begin AT ONCE:

Oxygen

Give controlled supplementary oxygen to all hypoxaemic patients with acute severe asthma titrated to maintain an SpO_2 level of 94-98%. Do not delay oxygen administration in the absence of pulse oximetry but commence monitoring of SaO_2 as soon as it becomes available, Hypercapnia indicates the development of near-fatal asthma and the need for emergency anaesthetic intervention. In this situation care should be taken to avoid hypoxia as well as overoxygenation.

Inhaled β_2 agonists/ ipratropium

Give nebulised salbutamol 2.5-5mg or terbutaline 10mg nebulised with oxygen. If the patient's condition is improving this should be repeated every 4 hours. If the patient has not improved after 15-30 minutes give nebulised β2 agonists more frequently (up to every 15 minutes) and add ipratropium 0.5mg to the nebuliser solution.

NOTE
Nebulised ipratropium bromide and aminophylline or sulbutamol infusions are not needed in every patient. They are indicated in patients with very severe attacks and in those whose initial response to other treatment is unsatisfactory.

Corticosteroids

Steroid tablets are as effective as injected steroids, provided they can be swallowed and retained. Start prednisolone 40–60mg orally. In acute severe asthma, hydrocortisone 200mg IV stat can be given at the same time.

Subsequent management

1. Ensure that a nurse or doctor stays with the patient for at least 15 minutes and certainly until clear improvement is seen.

2. Continue oxygen therapy to maintain an SpO_2 level above 93%.

3. Continue high dose steroids - prednisolone tablets 40-60mg daily. In patients who are severely ill or vomiting, continue with hydrocortisone 100mg every six hours.

4. If the patient's condition is improving continue with nebulised β2 agonists every four hours.

5. If the patient's condition has not improved after 15-30 minutes give nebulised β_2 agonist more frequently (up to every 15 minutes or 10mg continuously hourly) and add ipratropium bromide 0.5mg to the nebuliser solution. Repeat the ipratropium every 6 hours until the patient is improving.

6. If progress is still unsatisfactory consider giving IV magnesium sulphate, parenteral β2 agonists or aminophylline, after discussion with senior clinician and ICU team

Intravenous Magnesium Sulphate (1.2-2.0gm infusion in 100ml of 0.9% saline over 20 minutes)

IV magnesium sulphate should be considered for patients with acute severe asthma who have not had a good initial response to bronchodilator therapy.

Aminophylline infusion (0.5-0.9mg/kg/hour or 0.3mg/kg/hour in elderly patients)

Use IV aminophylline only after consultation with senior medical staff. If life-threatening features are present give a loading dose of aminophylline 5mg/kg (usual range 250mg–500mg) in 100ml saline over 30 minutes. Do not give a loading dose to patients already taking oral theophylline. In practice, three concentrations of aminophylline are used based on the patient's weight and co-morbidities:

- 750mg in 1L of saline 0.9%
- 1000mg in 1L of saline 0.9%
- 1500mg in 1L of saline 0.9%

Lower doses may be required in smaller patients, frail/elderly patients, patients with renal, liver or cardiovascular disease and patients receiving enzyme inhibitors (e.g. clarithromycin). Larger, younger patients and smokers may require larger doses.

Measure aminophylline level 6 hours after starting IV aminophylline (target level 10-20mg/l). If IV aminophylline is given to patients already taking oral theophylline, levels should be checked on admission. Levels should be checked daily for all patients on aminophylline infusions.

ECG monitoring is recommended during administration.

For further information please see the trust protocol for aminophylline (see link)

Salbutamol Infusion

Salbutamol infusions should be reserved for patients who are unable to reliably receive nebulised therapy. The rate of infusion should be adjusted according to the response of the peak flow and heart rate. The initial starting dose is 5mcg/min and adjusted according to response. The usual dose range is 3-20mcg/min (consider monitoring lactate to monitor for toxicity). Parenteral β2 agonists, in addition to inhaled β2 agonists, may have a role in ventilated patients or those in extremis, however there is limited evidence to support this.

Monitoring treatment

1. Measure and record peak expiratory flow 15-30 minutes after starting treatment, and thereafter according to the response. Measure and record PEF before and after β2 agonists (at least four times daily) throughout the hospital stay. Patients can usually be taught to do this themselves.

2. Record oxygen saturation by oximetry. Maintain arterial oxygen saturation above 93%.

3. Repeat measurement of blood gas tensions within 2 hours of starting treatment if:

4. The initial PaO_2 is below 8kPa unless the oxygen saturations is above 92%

5. The initial $PaCO_2$ is normal or raised: or

6. The patient's condition deteriorates. Measure again if the patient has not improved within 4-6 hours.

7. Measure and record the heart rate.

8. Measure the serum aminophylline after 6 hours.

9. Measure serum potassium (especially if on aminophylline) and blood glucose concentrations.

Unhelpful Treatment

1. Any sedation is contraindicated (unless this is to allow anaesthetic or intensive care procedures).
2. Give antibiotics only if bacterial infection is present.
3. Percussive physiotherapy is unnecessary.

Indications for ITU

Patients with features of life-threatening asthma require intensive monitoring by experienced staff. If no beds are available on a properly staffed medical ward this may be available only in the intensive care unit. Patients with the following features require intensive care:

- Deteriorating peak flow, worsening persisting hypoxia ($Pa0_2$ < 8kPa) despite 60% inspired oxygen, or worsening hypercapnoea ($PaCO_2$ > 6kPa)
- Onset of exhaustion, feeble respiration, confusion or drowsiness
- Coma or respiratory arrest
- Non-invasive ventilation (NIV) is not usually appropriate in acute severe asthma and it is unlikely to replace intubation in these very unstable patients. NIV should only ever be considered in an ITU setting with recourse to early intubation if required.

Planning Discharge

1. Patients should have been on discharge medication for 24 hours prior to discharge
2. PEF >75% of best or predicted
3. A review of all medication. Check whether patients prescribed nebulised therapy have a nebuliser at home.
4. A review of inhaler technique.
5. Ensure that the patient has a self-management plan. see here
6. Ensure all patients are advised when to step down their medication.
7. Ensure all patients have a follow-up appointment 4-6 weeks after discharge.
8. Ensure the patient's primary care practice is informed within 24 hours of discharge from the emergency department or hospital following an asthma attack.
9. If the patient is a smoker strongly advise them to quit and refer the patient to the hospital based stop smoking service.

Confirmed Asthma → Contact Asthma CNS Cisco [redacted] / Office [redacted] → Record Peak Flow → Stat dose oral Prednisolone 40mgs

Patient Addressograph

ASSESS FOR MARKERS OF LIFE-THREATENING EXACERBATION

Fatigue or exhaustion, bradycardia <60bpm, poor respiratory effort,

No

Yes

PEFR	Pulse	SpO2	BP	RR	Temp	*Measure initial PEFR (Peak Expiratory Flow Rate) and Observations*

PEFR > 75% MILD

Salbutamol 100mcg Inhaler 4 puffs then 2 puffs every 2 minutes up to 10 puffs

PEFR	Pulse	SpO2	BP	RR	Temp	*Collect asthma history and measure observations at 20 minutes*

PEFR > 75% And patient is stable

Discharge Anticipated

PEFR	Pulse	SpO2	BP	RR	Temp	*Continue to collect asthma history and measure observations at 60 minutes*

PEFR > 75%

Discharge Anticipated

PEFR	Pulse	SpO2	BP	RR	Temp	*Measure PEFR at 120 minutes*

POTENTIAL DISCHARGE

See advice sheet overleaf regarding Discharge Bundle

PEFR 50% - 75% MODERATE

Salbutamol 100mcg Inhaler 4 puffs then 2 puffs every 2 minutes up to 10 puffs / Salbutamol 5mg nebulised

Prednisolone 40mg PO

PEFR 50% - 75% and no life-threatening features

Salbutamol 5mg by oxygen driven nebuliser target SpO_2>94%

Prednisolone 40mg PO if steroids not previously given

PEFR 50% - 75% and no life-threatening features

PEFR 50% and patient is stable

PEFR 33% - 50% or severe features
(RR>24, HR>110bpm unable to complete sentences in 1 breath)
ACUTE SEVERE

Salbutamol 5mg by oxygen driven nebuliser target SpO2>94%

Prednisolone 40mg PO

PEFR < 50% or life-threatening features

Further salbutamol 5mg via oxygen driven nebuliser target SpO_2>94% may be given as required

PEFR < 50% or life-threatening features

PEFR < 50% Or patient is unstable

PEFR < 33% LIFE THREATENING

OBTAIN SENIOR HELP

Apply high-flow oxygen to target SpO_2 > 94%

Salbutamol 5mg and Ipratropium 0.5mg by oxygen driven nebuliser

Prednisolone 40mg PO or IV hydrocortisone 100mg if no steroid previously given

FBC, U&E, ABG, CXR

Salbutamol 5mg and Ipratropium bromide 0.5mg by oxygen driven nebuliser

Consider IV magnesium sulphate 1.2-2g over 20 minutes (2.4-4mls MgSO4 50% in 100mls 0.9% saline)

Correct fluid/electrolytes especially K^+ disturbances

Consider continuous salbutamol nebuliser 5-10mg/hour

Inform ITU if patient fails to respond quickly or worsening PEFR or pO_2, high/normal pCO_2

ADMIT

Contact the Asthma Specialist Nurse on Ext [redacted] if not already done

DECISION TO DISCHARGE

Discuss with senior if any high risk features

- Previous ITU Admissions or near fatal asthma attack despite adequate dose oral steroids prior to attendance
- Concerns about adherence or support network (e.g. socially isolated, psychological concerns
- Pregnancy

ASTHMA DISCHARGE BUNDLE

- Patient reviewed by Asthma Nurse Specialist? **YES / NO**

INHALER REVIEW

- Inhaler technique assessed. Patient/carer able to use inhalers correctly (+/- spacer) – understands both preventer and reliever

Sign: Date:

MEDICATION REVIEW

- Reinforce good adherence to medication
- Any changes made by medical team explained to patient/carer
- Does the patient have inhaled steroids? **Yes** **No**

Sign: Date:

TEMPORARY ASTHMA ACTION PLAN (needs to be provided prior to discharge)
Patient has a peak flow meter and record peak flow and is aware how to use it.

Sign: Date:
If not able to provide a Temporary action plan please document reason why in the medical notes.
Remind medical team to prescribe rescue pack for use during next exacerbation

TRIGGERS (please circle)

- Triggers discussed e.g. Occupational/pets/NSAIDs? **YES / NO**
- Is the patient a smoker? **YES/E .cigarette/ Ex (≥4 weeks) / Never**
- Is patient exposed to second hand smoke **YES / NO**
- Has referral to Smoking Cessation been made? **Hospital / help me Quit Number provided /patient declined**

Sign: Date:

FOLLOW UP

- Advised to see GP within 2 working days **YES / NO**
- Follow up requested CNS Asthma within 2 weeks of attendance
  Contact Numbers: **Cisco** [redacted] **or Ext** [redacted]
- Refer Out of Hours to [redacted] for follow up

Sign: Date:

Prescription
Prednisolone 40mg OD 5 days
(If moderate-severe exacerbation on arrival)
Peak Flow Meter
(If patient does not have own. For use with Action Plan)

Is patient taking inhaled steroid therapy?

Yes → Consider step up in therapy. Document changes in notes

No → Start preventer therapy
Beclomethasone / Formoterol e.g. Fostair or Iuforbec 100/6 2 puffs bd via spacer + MART Regime or Symbicort 200/6 Turbohaler 2 puffs bd + MART regime

Ensure sufficient supply of inhaled steroid and bronchodilator +/- spacer

PEFR at discharge:

DISCHARGE with USE OF DISCHARGE BUNDLE

The asthma discharge 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 readmissions following discharge

Patients discharged should be given:

- Temporary Asthma Action Plan ☐
- Peak Flow Meter & Diary ☐
- OPD Appointment ☐

Appendix II

Peak Flow Meter Readings

Name _____

Date																												
Time	08.00	12.00	18.00	22.00	08.00	12.00	18.00	22.00	08.00	12.00	18.00	22.00	08.00	12.00	18.00	22.00	08.00	12.00	18.00	22.00	08.00	12.00	18.00	22.00	08.00	12.00	18.00	22.00
700																												
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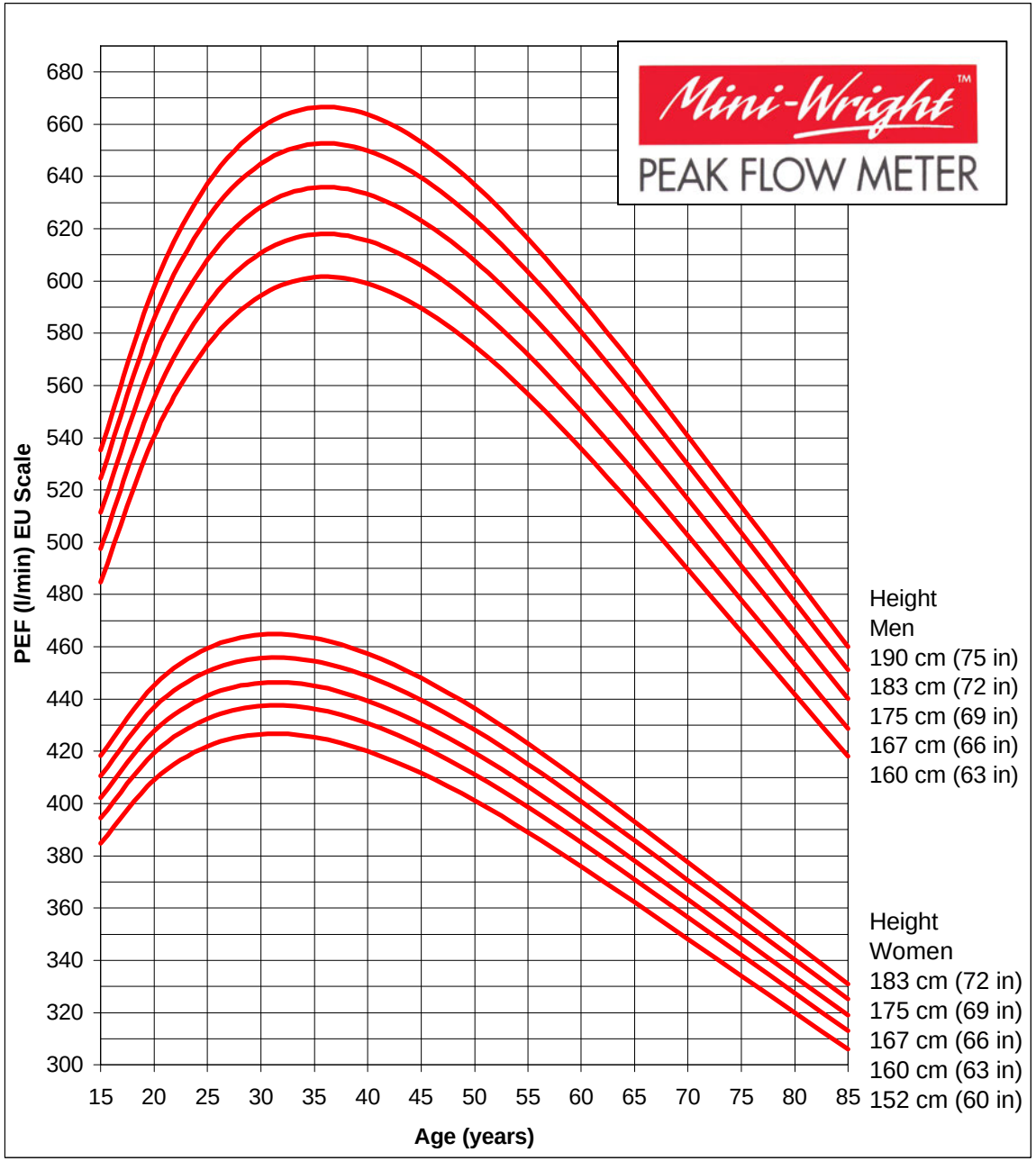
400																												
350																												
300																												
250																												
200																												
150																												
100																												
50																												

Please record - PRE BRONCHODILATOR PEFR IN **BLACK** & POST BRONCHODILATOR PEFR IN **RED**

IP3670

PEAK EXPIRATORY FLOW RATE - NORMAL VALUES

For use with EU/EN13826 scale PEF meters only



Adapted by Clement Clarke for use with EN13826 / EU scale peak flow meters from Nunn AJ Gregg I, Br Med J 1989:298;1068-70

In men, readings up to 100 L/min lower than predicted are within normal limits. For women, the equivalent figure is 85 L/min. Values are derived from Caucasian populations.

Mini-Wright
(Standard Range)
EU scale
(EN 13826)

Blue text
on a yellow
background

Single Patient Use
Part Ref: 3103388

Multiple Patient Use
Part Ref: 3103387

NHS Logistics
Code : FDD 609

Mini-Wright
(Low Range)
EU scale

Blue text
on a yellow
background

Single Patient Use
Part Ref: 3104708

Multiple Patient Use
Part Ref: 3104710

Clement Clarke has developed mathematical equations that will allow conversion of P.E.F. readings from Wright-McKerrow scale to EN 13826 scale, and vice-versa. Contact us directly, or visit the website

www.peakflow.com

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