Objectives	Knowledge	Skills / Attitudes
Asthma	Pathophysiology of asthma. BTS Guidelines (http://www.brit_thoracic.org.uk/) Including who may be discharged. Detailed knowledge of drug therapy including magnesium. To recognise the difficulties of rapid sequence induction and ventilation in asthmatics	To be able to recognise acute severe asthma and institute emergency treatment. To be able to recognise early those patients with life threatening asthma who may require ventilation. To be able to organise safe discharge of patients suffering from an acute asthma exacerbation.

HR >110
RR> 25
PEFR 33-50%
inability complete sentances

Brittle Asthma

Type 1 wide PEFR variability
Type 2 sudden severe attack on background well controlled asthma

asthma_fullguideline2007.pdf

FURTHER INVESTIGATION AND MONITORING

Children can be discharged when stable on 3-4 hourly inhaled bronchodilators that can be continued at home.[307] PEF and/or FEV_1 should be > 75% of best or predicted and SpO_2 > 94%.

Adult studies show that "optimal care" comprising self-monitoring, regular review and a written asthma action plan can improve outcomes.[237] Acute asthma attacks should be considered a failure of preventive therapy and thought should be given about how to help families avoid further severe episodes. Discharge plans should address the following:

- check inhaler technique
- consider the need for regular inhaled steroids
- provide a written asthma action plan for subsequent asthma with clear instructions about the use of bronchodilators, seeking urgent medical attention in the event of worsening symptoms and, if appropriate, starting a course of oral steroids
- arrange follow up by a GP within one week
- arrange follow up in a paediatric asthma clinic within one to two months.

PEFR < 33%
SaO_2 < 92%
PaO_2 <8
PCO_2 normal range
bradycardia
silent chest
cyanosis
hypotension
coma
confusion
feeble resp effort

pCO2 high or requiring IPPV & High IP

Lives alone/poor access to help
Continuing symptoms
Exacerbation despite steroid pre hospital
Psychological problems/difficulty in learning
Concerns regarding compliance
Pregnant
Previous near fatal/brittle asthma
Presentation at night

Table 6: Clinical features for assessment of severity

Acute severe		*Life threatening*
Can't complete sentences in one breath or too breathless to talk or feed		▪ Silent chest ▪ Cyanosis ▪ Poor respiratory effort
Pulse	> 120 in children aged > 5 years > 130 in children aged 2-5 years	▪ Hypotension ▪ Exhaustion
Respiration	> 30 breaths/min aged > 5 years > 50 breaths/min aged 2-5 years	▪ Confusion ▪ Coma

APLS also uses sats moderate > 92% severe <92%

Before children can receive appropriate treatment for acute asthma in any setting, it is essential to assess accurately the severity of their symptoms. 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).
- Amount of wheezing
  (which might become biphasic or less apparent with increasing airways obstruction).
- Degree of agitation and conscious level
  (always give calm reassurance).

Clinical signs correlate poorly with the severity of airways obstruction.[281-284] Some children with acute severe asthma do not appear distressed. | 2++

Objective measurements of PEF and SpO_2 are essential. Suitable equipment should be available for use by all health professionals assessing acute asthma in both primary and secondary care settings.

Low oxygen saturations after initial bronchodilator treatment selects a more severe group of patients.[281 284] | 2++

B **Consider intensive inpatient treatment for children with SpO_2 < 92% on air after initial bronchodilator treatment.**

✓ Decisions about admission should be made by trained physicians after repeated assessment of the response to further bronchodilator treatment.

A measurement of < 50% predicted PEF or FEV_1 with poor improvement after initial bronchodilator treatment is predictive of a more prolonged asthma attack.

✓ Attempt to measure PEF or FEV_1 in all children aged > 5 years, taking the best of three measurements, ideally expressed as percentage of personal best for PEF (as detailed in a written action plan) or alternatively as percentage of predicted for PEF or FEV_1.

Chest x-rays and ABG measurements rarely provide additional useful information and are not routinely indicated.[285 286]

BTS state mild moderate inhalers via spacer +/- mask
upto 10 puffs
add ipratopium if not responding too B agonists alone (250ug neb) give early in severe repeat every 20-30 minutes. Benefit shown first 2 hours
Iv agents

IV SALBUTAMOL

The role of intravenous β_2 agonists in addition to nebulised treatment remains unclear.[254] One study has shown that an IV bolus of salbutamol given in addition to near maximal doses of nebulised salbutamol results in clinically significant benefits.[254] 1+

B **The early addition of a bolus dose of intravenous salbutamol (15 mcg/kg) can be an effective adjunct to treatment in severe cases.**

Continuous intravenous infusion should be considered when there is uncertainty about reliable inhalation or for severe refractory asthma. Doses above 1-2 mcg/kg/min (200 mcg/ml solution) should be given in a Paediatric Intensive Care Unit (PICU) setting (up to 5 mcg/kg/min) with regular monitoring of electrolytes.

IV AMINOPHYLLINE

There is no evidence that aminophylline is of benefit for mild to moderate asthma and side-effects are common and troublesome.[268 303] However, one well conducted study has shown evidence for benefit in severe acute asthma unresponsive to multiple doses of β_2 agonists and steroids.[304] 1+ 2+

A **Aminophylline is not recommended in children with mild to moderate acute asthma.**

C **Consider aminophylline in a High Dependency Unit or PICU setting for children with severe or life threatening bronchospasm unresponsive to maximal doses of bronchodilators and steroid tablets.**

A 5 mg/kg loading dose should be given over 20 minutes with ECG monitoring (omit in those receiving maintenance oral theophyllines) followed by a continuous infusion at 1 mg/kg/hour. Estimate serum theophylline levels in patients already receiving oral treatment and in those receiving prolonged treatment.

Consider magnesium sulphate 25-40 mg/kg

Management of acute asthma in children in A&E

Age 2-5 years

ASSESS ASTHMA SEVERITY

Moderate exacerbation
- SpO_2 ≥92%
- No clinical features of severe asthma

NB: If a patient has signs and symptoms across categories, always treat according to their most severe features

- β_2 agonist 2-10 puffs via spacer ± facemask
- Reassess after 15 minutes

RESPONDING
- Continue inhaled β_2 agonist 1-4 hourly
- Give soluble oral prednisolone 20 mg

DISCHARGE PLAN
- Continue β_2 agonist 4 hourly prn
- Consider prednisolone 20 mg daily for up to 3 days
- Advise to contact GP if not controlled on above treatment
- Provide a written asthma action plan
- Review regular treatment
- Check inhaler technique
- Arrange GP follow up

Severe exacerbation
- SpO_2 <92%
- Too breathless to talk or eat
- Heart rate >130/min
- Respiratory rate >50/min
- Use of accessory neck muscles

NOT RESPONDING
- Repeat inhaled β_2 agonist
- Give soluble oral prednisolone 20 mg

ARRANGE ADMISSION

(lower threshold if concern over social circumstances)

Life threatening asthma
- SpO_2 <92%
- Silent chest
- Poor respiratory effort
- Agitation
- Altered consciousness
- Cyanosis

- Give nebulised β_2 agonist: salbutamol 2.5 mg *or* terbutaline 5 mg with oxygen as driving gas
- Continue O_2 via face mask/nasal prongs
- Give soluble prednisolone 20 mg *or* IV hydrocortisone 50 mg

IF LIFE THREATENING FEATURES PRESENT

Discuss with senior clinician, PICU team or paediatrician

Consider:
- Chest x-ray and blood gases
- Repeat nebulised β_2 agonist
  Plus:
- ipratropium bromide 0.25 mg
- Bolus IV salbutamol 15 mcg/kg of 200 mcg/ml solution over 10 minutes

Arrange immediate transfer to PICU/HDU if poor response to treatment

Admit all cases if features of severe exacerbation persist after initial treatment

Age >5 years

ASSESS ASTHMA SEVERITY

Moderate exacerbation
- SpO_2 ≥92%
- PEF ≥50% best or predicted
- No clinical features of severe asthma

NB: If a patient has signs and symptoms across categories, always treat according to their most severe features

- β_2 agonist 2-10 puffs via spacer
- Reassess after 15 minutes

RESPONDING
- Continue inhaled β_2 agonist 1-4 hourly
- Add 30-40 mg soluble oral prednisolone

DISCHARGE PLAN
- Continue β_2 agonist 4 hourly prn
- Consider prednisolone 30-40 mg daily for up to 3 days
- Advise to contact GP if not controlled on above treatment
- Provide a written asthma action plan
- Review regular treatment
- Check inhaler technique
- Arrange GP follow up

Severe exacerbation
- SpO_2 <92%
- PEF <50% best or predicted
- Heart rate >120/min
- Respiratory rate >30/min
- Use of accessory neck muscles

NOT RESPONDING
- Repeat inhaled β_2 agonist
- Add 30-40 mg soluble oral prednisolone

ARRANGE ADMISSION

(lower threshold if concern over social circumstances)

Life threatening asthma
- SpO_2 <92%
- PEF <33% best or predicted
- Silent chest
- Poor respiratory effort
- Altered consciousness
- Cyanosis

- Give nebulised β_2 agonist: salbutamol 2.5 mg *or* terbutaline 5 mg with oxygen as driving gas
- Continue O_2 via face mask/nasal prongs
- Give soluble prednisolone 30-40 mg or IV hydrocortisone 100 mg

IF LIFE THREATENING FEATURES PRESENT

Discuss with senior clinician, PICU team or paediatrician

Consider:
- Chest x-ray and blood gases
- Bolus IV salbutamol 15 mcg/kg of 200 mcg/ml solution over 10 minutes
- Repeat nebulised β_2 agonist
  Plus:
- ipratropium bromide 0.25 mg nebulised

Arrange immediate transfer to PICU/HDU if poor response to treatment

Admit all cases if features of severe exacerbation persist after initial treatment

Management of acute asthma in children in hospital

Age 2-5 years

ASSESS ASTHMA SEVERITY

Moderate exacerbation
- SpO_2 ≥92%
- No clinical features of severe asthma

NB: If a patient has signs and symptoms across categories, always treat according to their most severe features

- β_2 agonist 2-4 puffs via spacer ± facemask
- Increase β_2 agonist dose by 2 puffs every 2 minutes up to 10 puffs according to response
- Consider soluble oral prednisolone 20 mg

Reassess within 1 hour

Severe exacerbation
- SpO_2 <92%
- Too breathless to talk or eat
- Heart rate >130/min
- Respiratory rate >50/min
- Use of accessory neck muscles

Oxygen via face mask/nasal prongs to achieve normal saturations

- β_2 agonist 10 puffs via spacer ± facemask *or* nebulised salbutamol 2.5 mg *or* terbutaline 5 mg
- Soluble prednisolone 20 mg or IV hydrocortisone 4 mg/kg
- Repeat β_2 agonist up to every 20-30 minutes according to response
- If poor response add 0.25 mg nebulised ipratropium bromide

Life threatening asthma
- SpO_2 <92%
- Silent chest
- Poor respiratory effort
- Agitation
- Altered consciousness
- Cyanosis

Oxygen via face mask/nasal prongs to achieve normal saturations

- Nebulised β_2 agonist: salbutamol 2.5 mg *or* terbutaline 5 mg plus ipratropium bromide 0.25 mg nebulised
- IV hydrocortisone 4 mg/kg

Discuss with senior clinician, PICU team or paediatrician

- Repeat bronchodilators every 20-30 minutes

ASSESS RESPONSE TO TREATMENT

Record respiratory rate, heart rate and oxygen saturation every 1-4 hours

RESPONDING
- Continue bronchodilators 1-4 hours prn
- Discharge when stable on 4 hourly treatment
- Continue oral prednisolone for up to 3 days

At discharge
- Ensure stable on 4 hourly inhaled treatment
- Review the need for regular treatment and the use of inhaled steroids
- Review inhaler technique
- Provide a written asthma action plan for treating future attacks
- Arrange follow up according to local policy

NOT RESPONDING
- Arrange HDU/PICU transfer

Consider:
- Chest x-ray and blood gases
- IV salbutamol 15 mcg/kg bolus over 10 minutes followed by continuous infusion 1-5 mcg/kg/min (dilute to 200 mcg/ml)
- IV aminophylline 5 mg/kg loading dose over 20 minutes (omit in those receiving oral theophyllines) followed by continuous infusion 1 mg/kg/hour

Age >5 years

ASSESS ASTHMA SEVERITY

Moderate exacerbation
- SpO_2 ≥92%
- PEF ≥50% best or predicted
- No clinical features of severe asthma

NB: If a patient has signs and symptoms across categories, always treat according to their most severe features

- β_2 agonist 2-4 puffs via spacer
- Increase β_2 agonist dose by 2 puffs every 2 minutes up to 10 puffs according to response
- Oral prednisolone 30-40 mg

Reassess within 1 hour

Severe exacerbation
- SpO_2 <92%
- PEF <50% best or predicted
- Heart rate >120/min
- Respiratory rate >30/min
- Use of accessory neck muscles

Oxygen via face mask/nasal prongs to achieve normal saturations

- β_2 agonist 10 puffs via spacer *or* nebulised salbutamol 2.5-5 mg *or* terbutaline 5-10 mg
- Oral prednisolone 30-40 mg or IV hydrocortisone 4 mg/kg if vomiting
- If poor response nebulised ipratropium bromide 0.25 mg
- Repeat β_2 agonist and ipratropium up to every 20-30 minutes according to response

Life threatening asthma
- SpO_2 <92%
- PEF <33% best or predicted
- Silent chest
- Poor respiratory effort
- Altered consciousness
- Cyanosis

Oxygen via face mask/nasal prongs to achieve normal saturations

- Nebulised β_2 agonist: salbutamol 5 mg *or* terbutaline 10 mg plus ipratropium bromide 0.25 mg nebulised
- IV hydrocortisone 4 mg/kg

Discuss with senior clinician, PICU team or paediatrician

- Repeat bronchodilators every 20-30 minutes

ASSESS RESPONSE TO TREATMENT

Record respiratory rate, heart rate, oxygen saturation and PEF/FEV every 1-4 hours

RESPONDING
- Continue bronchodilators 1-4 hours prn
- Discharge when stable on 4 hourly treatment
- Continue oral prednisolone 30-40 mg for up to 3 days

At discharge
- Ensure stable on 4 hourly inhaled treatment
- Review the need for regular treatment and the use of inhaled steroids
- Review inhaler technique
- Provide a written asthma action plan for treating future attacks
- Arrange follow up according to local policy

NOT RESPONDING
- Continue 20-30 minute nebulisers and arrange HDU/PICU transfer

Consider:
- Chest x-ray and blood gases
- Bolus IV salbutamol 15 mcg/kg if not already given
- Continuous IV salbutamol infusion 1-5 mcg/kg/min (200 mcg/ml solution)
- IV aminophylline 5 mg/kg loading dose over 20 minutes followed by continuous infusion 1mg/kg/hour (omit in those receiving oral theophyllines)
- Bolus IV infusion of magnesium sulphate 40 mg/kg (max 2 g) over 20 minutes

Combination severe asthma and

- previous near fatal asthma
- previous admission for asthma esp if in last year
- >= 3 classes medication
- heavy B2 use
- repeated ED attendance esp last year
- brittle asthma

Behavioral

- non-compliance
- DNA's
- Self discharge
- psychosis,depression,DSH
- alcohol abuse
- obesity
- learning difficulties
- employement problems

23 year old woman presents to A&E with SOB, difficulty in finishing sentences. She has a history of asthma and takes regular inhalers.

Describe your initial management of this patient 3 points

O2, nebulised salbutamol 5mg and ipratropium 0.5 mg, steroids- 40-50mg pred or 100-200mg Hydrocort
Check PEFR, O2 sats

List 6 signs of life threatening asthma 3 points

Silent chest, pO2<8kPa or sats < 92%, normal pCO2, bradycardia, cyanosis, hypotension, feeble resp effort, PEFR <33%,, confusion, coma

List 6 therapies except the initial management which can be used in severe or life threatening asthma 3 points
Mg 2+, BiPAP, continuous nebulised Beta agonist, IV aminophylline after senior consultation, salbutamol infusion, Heliox- although not currently recommended, anaesthetic gases, ketamine, adrenaline

What is the best predictor of outcome in acute asthma presentation in ED 1 point

Response to treatment

A 35 year old man comes in to you're A&E c/o SOB. He is a known asthmatic but does not feel too bad, he had ran out of inhalers while on holidays yesterday.
He receives all the appropriate treatment but does not seem to be getting any better. List 4 signs/symptoms of moderate/severe asthma.- 2 points

PEFR 33-50% best or predicted
RR > 25
Pulse > 110
Difficulty in finishing sentences.

What are the indications for chest X-ray in acute asthma? 3 points

? pneumothorax
?pneumomediastinum
?consolidation
no improvement on treatment
life threatening asthma
requirement for intubation
½ point for each of the above

After a further nebuliser he does seem to improve and is virtually symptom free, his PEFR is now 80% his best. Under what circumstances would you prefer to keep him in hospital? 3 point

Lives alone/poor access to help
Continuing symptoms
Exacerbation despite steroid pre hospital
Psychological problems/difficulty in learning
Concerns regarding compliance
Pregnant
Previous near fatal/brittle asthma
Presentation at night
½ point for each of the above

Just as you are about to discharge the pt your SHO comes in with a set of ABG he had done a few minutes ago before you came to review the pt.

pO_{2-} 12

pCO_{2-} 3.0

pH- 7.46

BE- 3

What would you say to the SHO? – 2 points

Why did he do the ABGs- they are not indicated in non life threatening asthma and it has been shown that patients present late because they fear that someone will do the ABGs on them.

23 year old woman presents to A&E with SOB, difficulty in finishing sentences. She has a history of asthma and takes regular inhalers.

Describe your initial management of this patient 3 points

List 6 signs of life threatening asthma 3 points

List 6 therapies except the initial management which can be used in severe or life threatening asthma 3 points

What is the best predictor of outcome in acute asthma presentation in ED 1 point

A 35 year old man comes in to you're A&E c/o SOB. He is a known asthmatic but does not feel too bad, he had ran out of inhalers while on holidays yesterday. He receives all the appropriate treatment but does not seem to be getting any better. List 4 signs/symptoms of moderate/severe asthma.- 2 points

What are the indications for chest X-ray in acute asthma? 3 points

After a further nebuliser he does seem to improve and is virtually symptom free, his PEFR is now 80% his best. Under what circumstances would you prefer to keep him in hospital? 3 point

Just as you are about to discharge the pt your SHO comes in with a set of ABG he had done a few minutes ago before you came to review the pt.

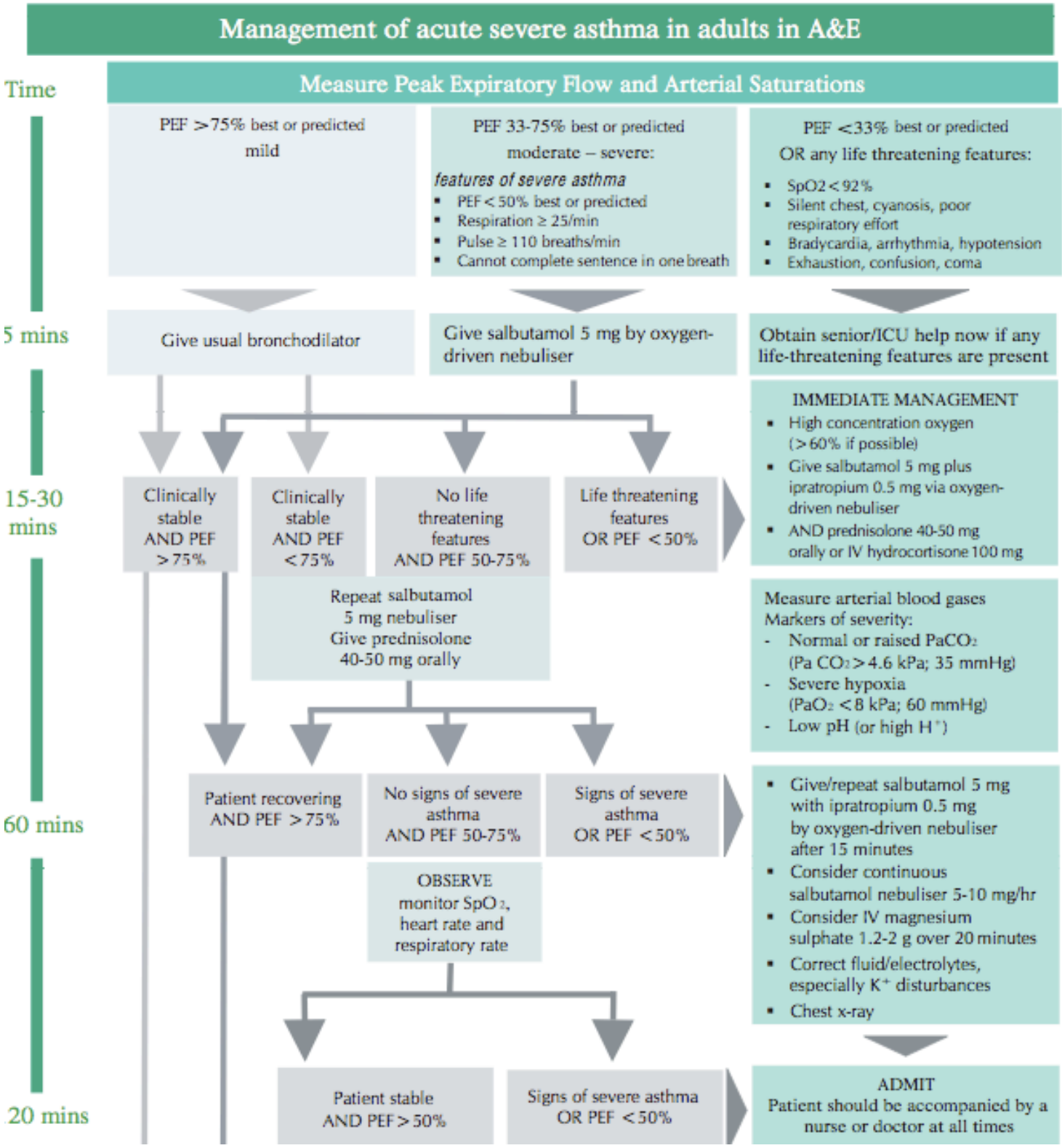
pO_{2}- 12

pCO_{2}- 3.0

pH- 7.46

BE- 3

What would you say to the SHO? – 2 points


Management of acute severe asthma in adults in A&E
Time
Measure Peak Expiratory Flow and Arterial Saturations
PEF >75% best or predicted
mild
PEF 33-75% best or predicted
moderate – severe:
features of severe asthma
PEF < 50% best or predicted
Respiration ≥ 25/min
Pulse ≥ 110 breaths/min
Cannot complete sentence in one breath
PEF <33% best or predicted
OR any life threatening features:
SpO2 < 92%
Silent chest, cyanosis, poor respiratory effort
Bradycardia, arrhythmia, hypotension
Exhaustion, confusion, coma
5 mins
Give usual bronchodilator
Give salbutamol 5 mg by oxygen-driven nebuliser
Obtain senior/ICU help now if any life-threatening features are present
IMMEDIATE MANAGEMENT
High concentration oxygen (>60% if possible)
Give salbutamol 5 mg plus ipratropium 0.5 mg via oxygen-driven nebuliser
AND prednisolone 40-50 mg orally or IV hydrocortisone 100 mg
15-30 mins
Clinically stable AND PEF >75%
Clinically stable AND PEF <75%
No life threatening features AND PEF 50-75%
Life threatening features OR PEF <50%
Repeat salbutamol 5 mg nebuliser
Give prednisolone 40-50 mg orally
Measure arterial blood gases
Markers of severity:
- Normal or raised PaCO2 (Pa CO2 >4.6 kPa; 35 mmHg)
- Severe hypoxia (PaO2 <8 kPa; 60 mmHg)
- Low pH (or high H+)
60 mins
Patient recovering AND PEF >75%
No signs of severe asthma AND PEF 50-75%
Signs of severe asthma OR PEF <50%
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
OBSERVE
monitor SpO2, heart rate and respiratory rate
20 mins
Patient stable AND PEF >50%
Signs of severe asthma OR PEF <50%
ADMIT
Patient should be accompanied by a nurse or doctor at all times

New guidelines
Stick with inhaled Rx Iv little extra to offer
aminophylline if failure respond d/w senior