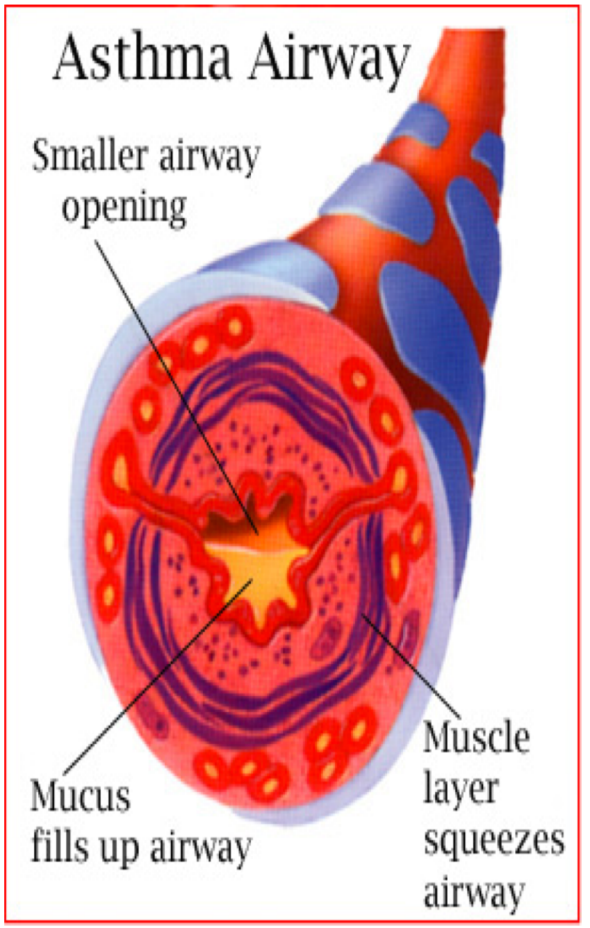
Severe Asthma

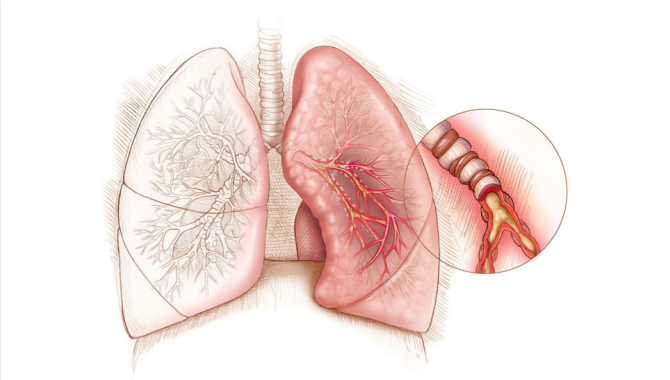
EMET FAME 2





Severe Asthma

- Over 2.2 million Australians have currently diagnosed asthma
- 406 deaths attributed to asthma in 2006 (rate has been going down)
- Highest risk of dying from asthma is in the elderly over 70
- Severe/Critical asthma is a life threatening condition
  - Essential to recognise it



Education Objectives

1. You will recognize the clinical features of near fatal asthma.
2. You will have an approach to managing severe asthma in the ED.
3. You will understand the risks involved in definitive airway management in near fatal asthma.
4. You will be able to describe an approach to intubation and mechanical ventilation in near fatal asthma.

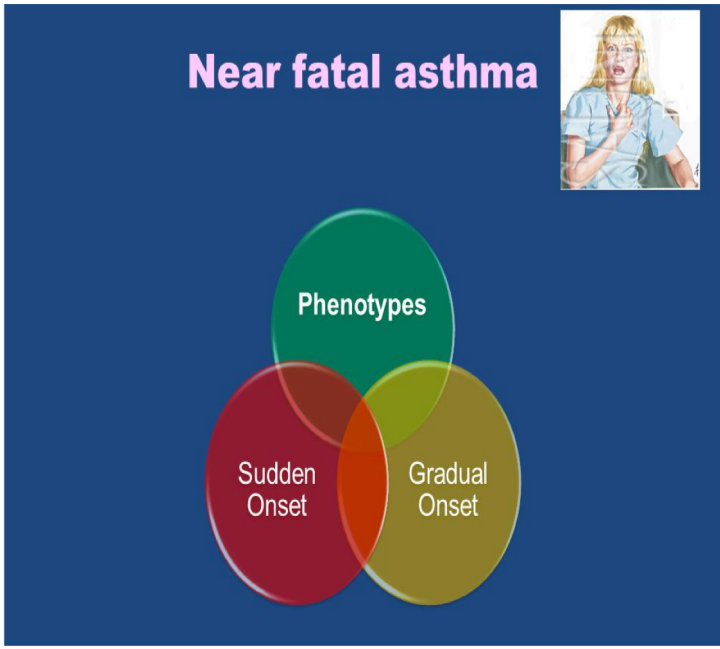
Near fatal asthma

- *Near-fatal asthma* (NFA)
  - acute asthma associated with a respiratory arrest *or* pCO_2 > 50 mmHg, *with or without altered consciousness*.
- Two-thirds of near fatal attacks or deaths occurred within 1 year of the previous life-threatening admission.



Phenotypes of Near Fatal Asthma

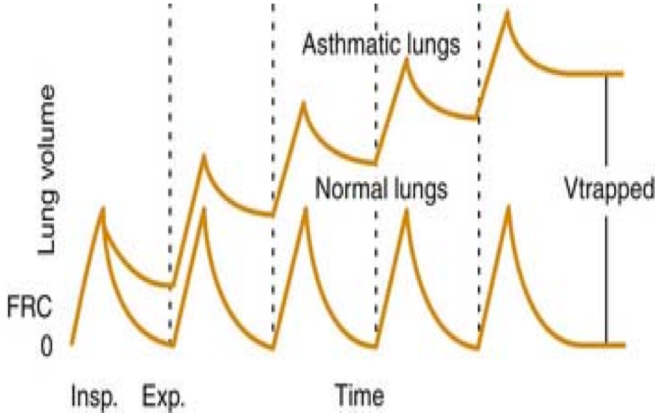
- Two distinctive phenotypes:
  - Type 1
    - Most common (80-85% NFA)
    - Eosinophilic inflammation
    - Gradually worse (days-weeks)
    - Severe or poorly controlled asthma
    - Slow to respond to therapy.
  - Type 2
    - Neutrophilic inflammation
    - Rapid onset
    - Rapid response to therapy.

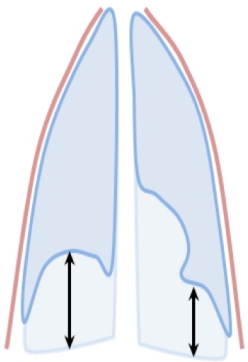


Severe asthma

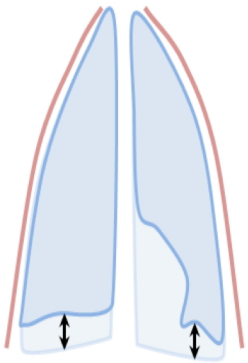
- Abnormal distribution of ventilation, perfusion with altered gas exchange.

- Expiratory flow limitation with incomplete expiration
  - Hyperinflation of the lungs
  - “Breath stacking” (dynamic hyperinflation)
  - Increased elastic burden of the thorax.
  - Expiratory muscles actively involved in expiration





Normal diaphragmatic excursion



Diaphragmatic excursion in a hypernflated asthamtic chest

As muscles fatigue, asthma becomes life threatening

Treatment Priorities for Severe/Life Threatening Asthma

1. Inhaled B-2 agonist bronchodilator (salbutamol) with O_2 (aim for SaO_2 92-95%)

2. Add ipratropium if poor response to salbutamol alone

3. If poor response to 1 & 2, add-on therapies

4. Steroids for ALL patients within 1 hour

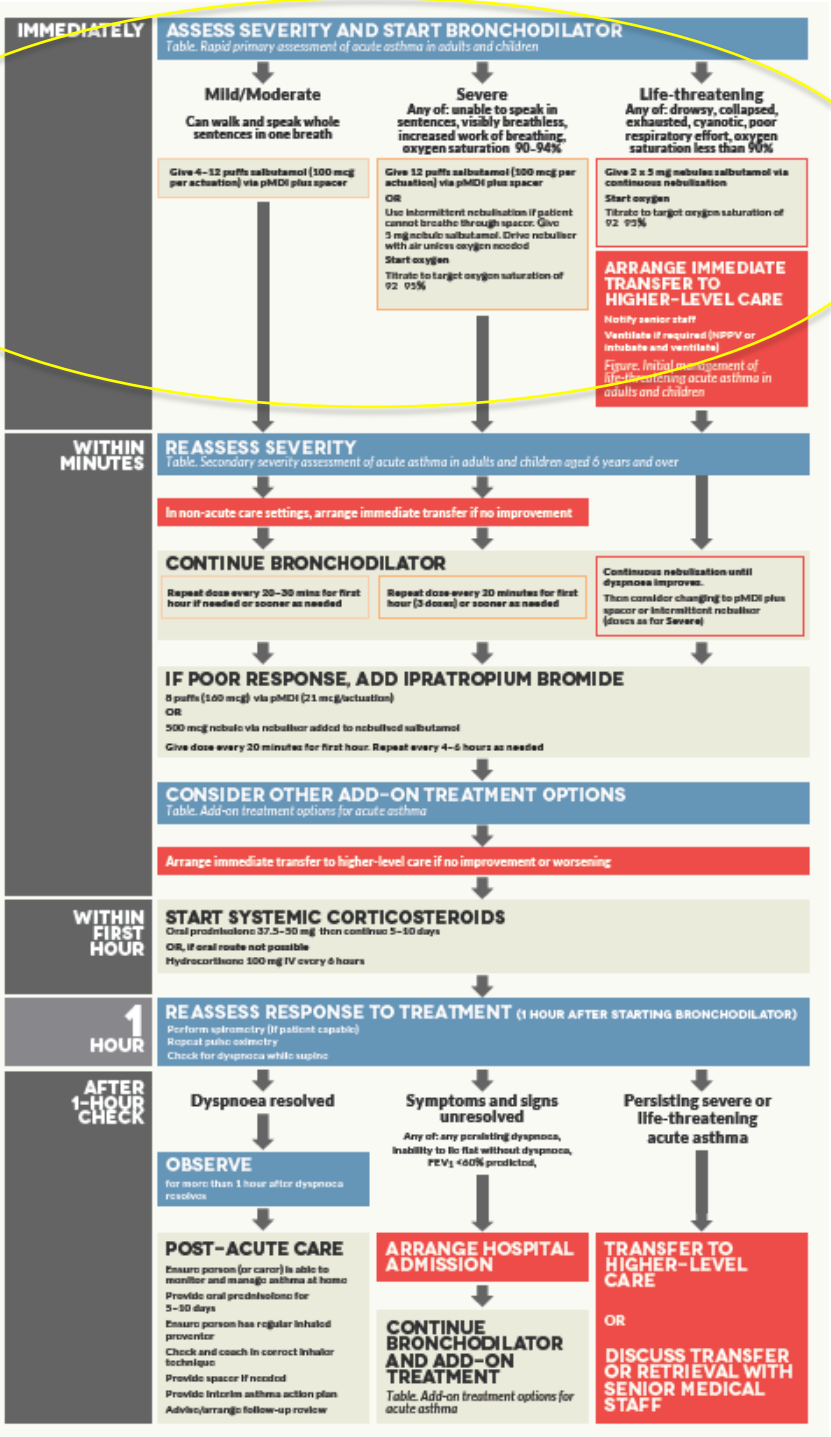
5. Trial of NIV is deteriorating

Assessment & Treatment

- Algorithms based around:
  - Immediate initial clinical severity assessment
    - *Mild/moderate or Severe or Life Threatening*
  - Immediate bronchodilator with O_2 if severe or LFA
  - Reassess severity during initial treatment
    - Consider ipratropium
    - Consider add-on treatments
    - Consider NIV

Primary assessment

Mild/Moderate	*Severe*	*Life-threatening*
Can walk, speak whole sentences in one breath (For young children: can move around, speak in phrases) Oxygen saturation > 94%	Any of these findings: • Use of accessory muscles of neck or intercostal muscles or 'tracheal tug' during inspiration or subcostal recession ('abdominal breathing') • Unable to complete sentences in one breath due to dyspnoea • Obvious respiratory distress • Oxygen saturation 90–94%	Any of these findings: • Reduced consciousness or collapse • Exhaustion • Cyanosis • Oxygen saturation <90% • Poor respiratory effort, soft/absent breath sounds


IMMEDIATELY
ASSESS SEVERITY AND START BRONCHODILATOR
Table. Rapid primary assessment of acute asthma in adults and children
Mild/Moderate
Can walk and speak whole sentences in one breath
Give 4–12 puffs salbutamol (100 mcg per actuation) via pMDI plus spacer
Severe
Any of: unable to speak in sentences, visibly breathless, increased work of breathing, oxygen saturation 90–94%
Give 12 puffs salbutamol (100 mcg per actuation) via pMDI plus spacer
OR
Use intermittent nebulisation if patient cannot breathe through spacer. Give 5 mg nebule salbutamol. Drive nebuliser with air unless oxygen needed
Start oxygen
Titrate to target oxygen saturation of 92–95%
Life-threatening
Any of: drowsy, collapsed, exhausted, cyanotic, poor respiratory effort, oxygen saturation less than 90%
Give 2 × 5 mg nebules salbutamol via continuous nebulisation
Start oxygen
Titrate to target oxygen saturation of 92–95%
ARRANGE IMMEDIATE TRANSFER TO HIGHER-LEVEL CARE
Notify senior staff
Ventilate if required (NIPPV or intubate and ventilate)
Figure. Initial management of life-threatening acute asthma in adults and children
WITHIN MINUTES
REASSESS SEVERITY
Table. Secondary severity assessment of acute asthma in adults and children aged 6 years and over
In non-acute care settings, arrange immediate transfer if no improvement
CONTINUE BRONCHODILATOR
Repeat dose every 20–30 mins for first hour if needed or sooner as needed
Repeat dose every 20 minutes for first hour (3 doses) or sooner as needed
Continuous nebulisation until dyspnoea improves.
Then consider changing to pMDI plus spacer or intermittent nebuliser (doses as for Severe)
IF POOR RESPONSE, ADD IPRATROPIUM BROMIDE
8 puffs (160 mcg) via pMDI (21 mcg/actuation)
OR
500 mcg nebule via nebuliser added to nebulised salbutamol
Give dose every 20 minutes for first hour. Repeat every 4–6 hours as needed
CONSIDER OTHER ADD-ON TREATMENT OPTIONS
Table. Add-on treatment options for acute asthma
Arrange immediate transfer to higher-level care if no improvement or worsening
WITHIN FIRST HOUR
START SYSTEMIC CORTICOSTEROIDS
Oral prednisolone 37.5–50 mg then continue 5–10 days
OR, if oral route not possible
Hydrocortisone 100 mg IV every 6 hours
1 HOUR
REASSESS RESPONSE TO TREATMENT (1 HOUR AFTER STARTING BRONCHODILATOR)
Perform spirometry (if patient capable)
Repeat pulse oximetry
Check for dyspnoea while supine
AFTER 1-HOUR CHECK
Dyspnoea resolved
OBSERVE
for more than 1 hour after dyspnoea resolves
POST-ACUTE CARE
Ensure person (or carer) is able to monitor and manage asthma at home
Provide oral prednisolone for 5–10 days
Ensure person has regular inhaled preventer
Check and coach in correct inhaler technique
Provide spacer if needed
Provide interim asthma action plan
Advise/arrange follow-up review
Symptoms and signs unresolved
Any of: any persisting dyspnoea, inability to lie flat without dyspnoea, FEV1 <60% predicted,
ARRANGE HOSPITAL ADMISSION
CONTINUE BRONCHODILATOR AND ADD-ON TREATMENT
Table. Add-on treatment options for acute asthma
Persisting severe or life-threatening acute asthma
TRANSFER TO HIGHER-LEVEL CARE
OR
DISCUSS TRANSFER OR RETRIEVAL WITH SENIOR MEDICAL STAFF

IMMEDIATELY

ASSESS SEVERITY AND START BRONCHODILATOR

Table. Rapid primary assessment of acute asthma in adults and children

Mild/Moderate

Can walk and speak whole sentences in one breath

Give 4–12 puffs salbutamol (100 mcg per actuation) via pMDI plus spacer

Severe

Any of: unable to speak in sentences, visibly breathless, increased work of breathing, oxygen saturation 90–94%

Give 12 puffs salbutamol (100 mcg per actuation) via pMDI plus spacer

OR

Use intermittent nebulisation if patient cannot breathe through spacer. Give 5 mg nebule salbutamol. Drive nebuliser with air unless oxygen needed

Start oxygen

Titrate to target oxygen saturation of 92–95%

Life-threatening

Any of: drowsy, collapsed, exhausted, cyanotic, poor respiratory effort, oxygen saturation less than 90%

Give 2 x 5 mg nebules salbutamol via continuous nebulisation

Start oxygen

Titrate to target oxygen saturation of 92–95%

ARRANGE IMMEDIATE TRANSFER TO HIGHER-LEVEL CARE

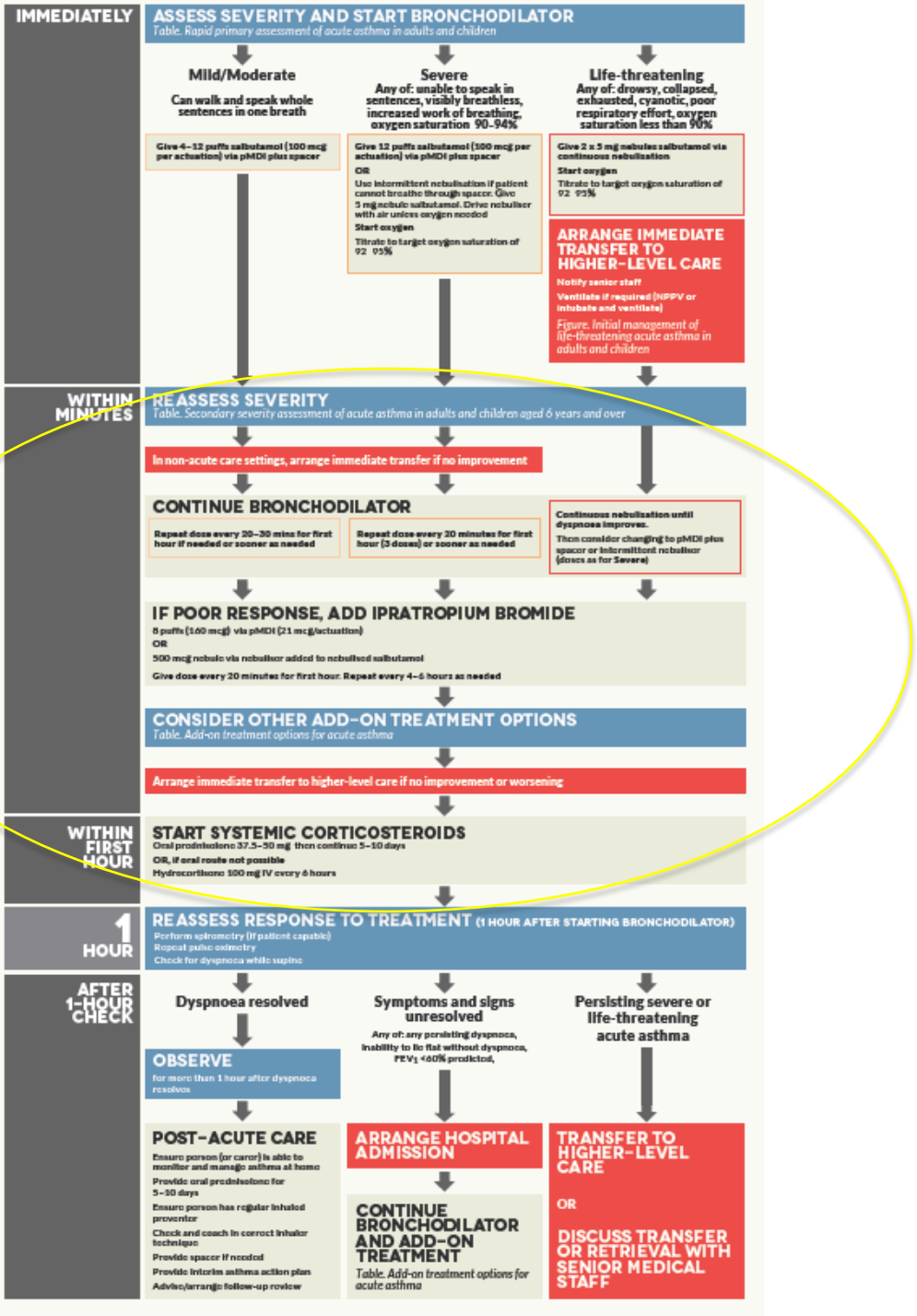
Notify senior staff

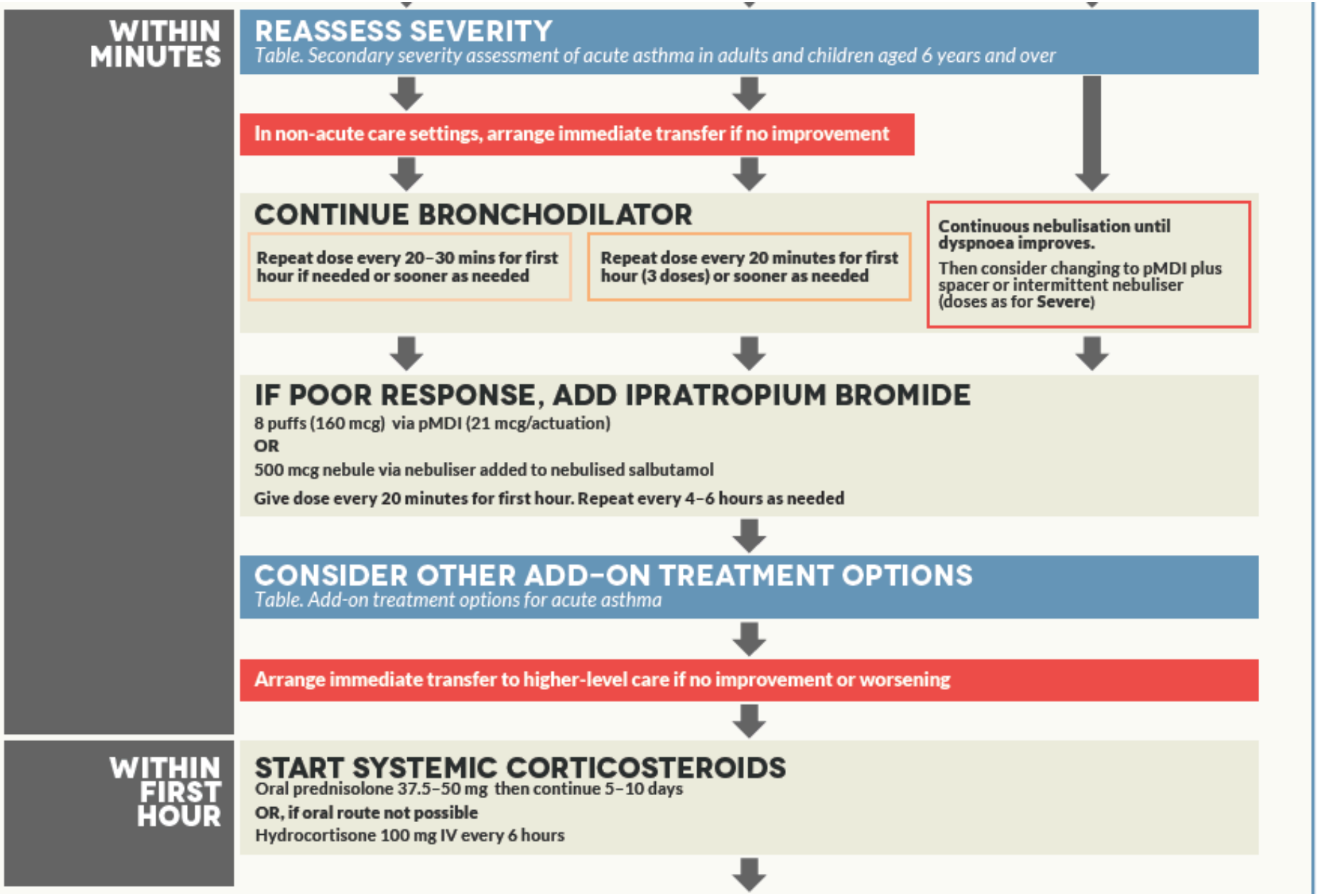
Ventilate if required (NPPV or intubate and ventilate)

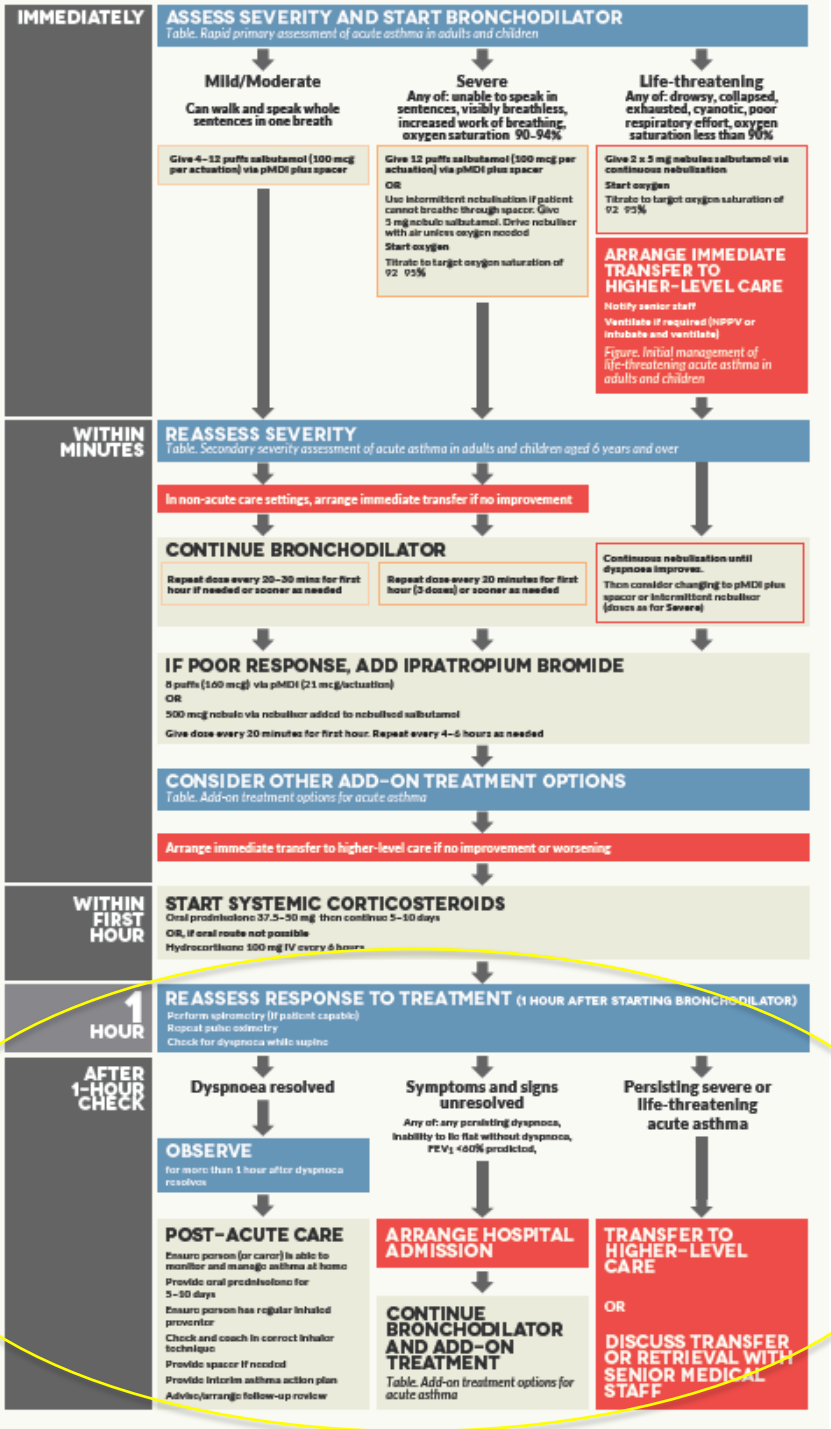
Figure. Initial management of life-threatening acute asthma in adults and children

Secondary severity assessment

	Mild/Moderate (all of):	*Severe (any of):*	*Life-threatening (any of):*
Speech	Can finish a sentence in one breath	Can only speak a few words in one breath	Can't speak
Posture	Can walk	Unable to lie flat due to dyspnoea Sitting hunched forward	Collapsed or exhausted
Breathing	Respiratory distress is not severe	Paradoxical chest wall movement: inward movement on inspiration and outward movement on expiration (chest sucks in when person breathes in) or Use of accessory muscles of neck or intercostal muscles or 'tracheal tug' during inspiration or Subcostal recession ('abdominal breathing')	Severe respiratory distress or Poor respiratory effort
Consciousness	Alert	†	Drowsy or unconscious
Skin colour	Normal	†	Cyanosis
Respiratory rate	<25 breaths/min	≥25 breaths/min	Bradypnoea (indicates respiratory exhaustion)
Heart rate	Adults: <110 beats/min Children: normal range	Adults: ≥110 beats/min Children: tachycardia	Cardiac arrhythmia or Bradycardia (may occur just before respiratory arrest)
Chest auscultation	Wheeze or Normal lung sounds	†	Silent chest or Reduced air entry
Oxygen saturation (pulse oximetry)	>94%	90-94%	<90% or Clinical cyanosis
Blood gas analysis (adults, if performed) ‡	Not indicated	Not indicated	PaO_2 <60 mmHg $PaCO_2$ >50 mmHg§ $PaCO_2$ within normal range despite low PaO_2 pH <7.35#


IMMEDIATELY
ASSESS SEVERITY AND START BRONCHODILATOR
Table. Rapid primary assessment of acute asthma in adults and children
Mild/Moderate
Can walk and speak whole sentences in one breath
Severe
Any of: unable to speak in sentences, visibly breathless, increased work of breathing, oxygen saturation 90–94%
Life-threatening
Any of: drowsy, collapsed, exhausted, cyanotic, poor respiratory effort, oxygen saturation less than 90%
Give 4–12 puffs salbutamol (100 mcg per actuation) via pMDI plus spacer
Give 12 puffs salbutamol (100 mcg per actuation) via pMDI plus spacer
OR
Use intermittent nebulisation if patient cannot breathe through spacer. Give 5 mg nebule salbutamol. Drive nebuliser with air unless oxygen needed
Start oxygen
Titrate to target oxygen saturation of 92–95%
Give 2 x 5 mg nebules salbutamol via continuous nebulisation
Start oxygen
Titrate to target oxygen saturation of 92–95%
ARRANGE IMMEDIATE TRANSFER TO HIGHER-LEVEL CARE
Notify senior staff
Ventilate if required (NPPV or intubate and ventilate)
Figure. Initial management of life-threatening acute asthma in adults and children
WITHIN MINUTES
REASSESS SEVERITY
Table. Secondary severity assessment of acute asthma in adults and children aged 6 years and over
In non-acute care settings, arrange immediate transfer if no improvement
CONTINUE BRONCHODILATOR
Repeat dose every 20–30 mins for first hour if needed or sooner as needed
Repeat dose every 20 minutes for first hour (3 doses) or sooner as needed
Continuous nebulisation until dyspnoea improves.
Then consider changing to pMDI plus spacer or intermittent nebuliser (doses as for Severe)
IF POOR RESPONSE, ADD IPRATROPIUM BROMIDE
8 puffs (160 mcg) via pMDI (21 mcg/actuation)
OR
500 mcg nebule via nebuliser added to nebulised salbutamol
Give dose every 20 minutes for first hour. Repeat every 4–6 hours as needed
CONSIDER OTHER ADD-ON TREATMENT OPTIONS
Table. Add-on treatment options for acute asthma
Arrange immediate transfer to higher-level care if no improvement or worsening
WITHIN FIRST HOUR
START SYSTEMIC CORTICOSTEROIDS
Oral prednisolone 37.5–50 mg then continue 5–10 days
OR, if oral route not possible
Hydrocortisone 100 mg IV every 6 hours
1 HOUR
REASSESS RESPONSE TO TREATMENT (1 HOUR AFTER STARTING BRONCHODILATOR)
Perform spirometry (if patient capable)
Repeat pulse oximetry
Check for dyspnoea while supine
AFTER 1-HOUR CHECK
Dyspnoea resolved
Symptoms and signs unresolved
Any of: any persisting dyspnoea, inability to lie flat without dyspnoea, PEV1 <60% predicted,
Persisting severe or life-threatening acute asthma
OBSERVE
for more than 1 hour after dyspnoea resolves
POST-ACUTE CARE
Ensure person (or carer) is able to monitor and manage asthma at home
Provide oral prednisolone for 5–10 days
Ensure person has regular inhaled preventer
Check and coach in correct inhaler technique
Provide spacer if needed
Provide interim asthma action plan
Advise/arrange follow-up review
ARRANGE HOSPITAL ADMISSION
CONTINUE BRONCHODILATOR AND ADD-ON TREATMENT
Table. Add-on treatment options for acute asthma
TRANSFER TO HIGHER-LEVEL CARE
OR
DISCUSS TRANSFER OR RETRIEVAL WITH SENIOR MEDICAL STAFF


WITHIN MINUTES
REASSESS SEVERITY
Table. Secondary severity assessment of acute asthma in adults and children aged 6 years and over
In non-acute care settings, arrange immediate transfer if no improvement
CONTINUE BRONCHODILATOR
Repeat dose every 20–30 mins for first hour if needed or sooner as needed
Repeat dose every 20 minutes for first hour (3 doses) or sooner as needed
Continuous nebulisation until dyspnoea improves.
Then consider changing to pMDI plus spacer or intermittent nebuliser (doses as for Severe)
IF POOR RESPONSE, ADD IPRATROPIUM BROMIDE
8 puffs (160 mcg) via pMDI (21 mcg/actuation)
OR
500 mcg nebule via nebuliser added to nebulised salbutamol
Give dose every 20 minutes for first hour. Repeat every 4–6 hours as needed
CONSIDER OTHER ADD-ON TREATMENT OPTIONS
Table. Add-on treatment options for acute asthma
Arrange immediate transfer to higher-level care if no improvement or worsening
WITHIN FIRST HOUR
START SYSTEMIC CORTICOSTEROIDS
Oral prednisolone 37.5–50 mg then continue 5–10 days
OR, if oral route not possible
Hydrocortisone 100 mg IV every 6 hours


IMMEDIATELY
ASSESS SEVERITY AND START BRONCHODILATOR
Table. Rapid primary assessment of acute asthma in adults and children
Mild/Moderate
Can walk and speak whole sentences in one breath
Severe
Any of: unable to speak in sentences, visibly breathless, increased work of breathing, oxygen saturation 90–94%
Life-threatening
Any of: drowsy, collapsed, exhausted, cyanotic, poor respiratory effort, oxygen saturation less than 90%
Give 4–12 puffs salbutamol (100 mcg per actuation) via pMDI plus spacer
Give 12 puffs salbutamol (100 mcg per actuation) via pMDI plus spacer
OR
Use intermittent nebulisation if patient cannot breathe through spacer. Give 5 mg nebule salbutamol. Drive nebuliser with air unless oxygen needed
Start oxygen
Titrate to target oxygen saturation of 92–95%
Give 2 x 5 mg nebules salbutamol via continuous nebulisation
Start oxygen
Titrate to target oxygen saturation of 92–95%
ARRANGE IMMEDIATE TRANSFER TO HIGHER-LEVEL CARE
Notify senior staff
Ventilate if required (NPPV or intubate and ventilate)
Figure. Initial management of life-threatening acute asthma in adults and children
WITHIN MINUTES
REASSESS SEVERITY
Table. Secondary severity assessment of acute asthma in adults and children aged 6 years and over
In non-acute care settings, arrange immediate transfer if no improvement
CONTINUE BRONCHODILATOR
Repeat dose every 20–30 mins for first hour if needed or sooner as needed
Repeat dose every 20 minutes for first hour (3 doses) or sooner as needed
Continuous nebulisation until dyspnoea improves.
Then consider changing to pMDI plus spacer or intermittent nebuliser (doses as for Severe)
IF POOR RESPONSE, ADD IPRATROPIUM BROMIDE
8 puffs (160 mcg) via pMDI (21 mcg/actuation)
OR
500 mcg nebule via nebuliser added to nebulised salbutamol
Give dose every 20 minutes for first hour. Repeat every 4–6 hours as needed
CONSIDER OTHER ADD-ON TREATMENT OPTIONS
Table. Add-on treatment options for acute asthma
Arrange immediate transfer to higher-level care if no improvement or worsening
WITHIN FIRST HOUR
START SYSTEMIC CORTICOSTEROIDS
Oral prednisolone 37.5–50 mg then continue 5–10 days
OR, if oral route not possible
Hydrocortisone 100 mg IV every 6 hours
1 HOUR
REASSESS RESPONSE TO TREATMENT (1 HOUR AFTER STARTING BRONCHODILATOR)
Perform spirometry (if patient capable)
Repeat pulse oximetry
Check for dyspnoea while supine
AFTER 1-HOUR CHECK
Dyspnoea resolved
Symptoms and signs unresolved
Any of: any persisting dyspnoea, inability to lie flat without dyspnoea, PEV1 <60% predicted,
Persisting severe or life-threatening acute asthma
OBSERVE
for more than 1 hour after dyspnoea resolves
POST-ACUTE CARE
Ensure person (or carer) is able to monitor and manage asthma at home
Provide oral prednisolone for 5–10 days
Ensure person has regular inhaled preventer
Check and coach in correct inhaler technique
Provide spacer if needed
Provide interim asthma action plan
Advise/arrange follow-up review
ARRANGE HOSPITAL ADMISSION
CONTINUE BRONCHODILATOR AND ADD-ON TREATMENT
Table. Add-on treatment options for acute asthma
TRANSFER TO HIGHER-LEVEL CARE
OR
DISCUSS TRANSFER OR RETRIEVAL WITH SENIOR MEDICAL STAFF

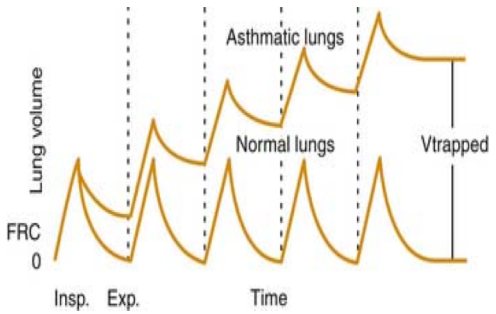
Severe Asthma Traps

- Waiting for test results before treating

- Not recognising deterioration despite treatment
  - Decreasing respiratory effort
  - “they’re just sleeping”
  - The difference between improved air flow versus a “silent chest”
  - Decreasing SaO_2
  - “Normal” pCO_2

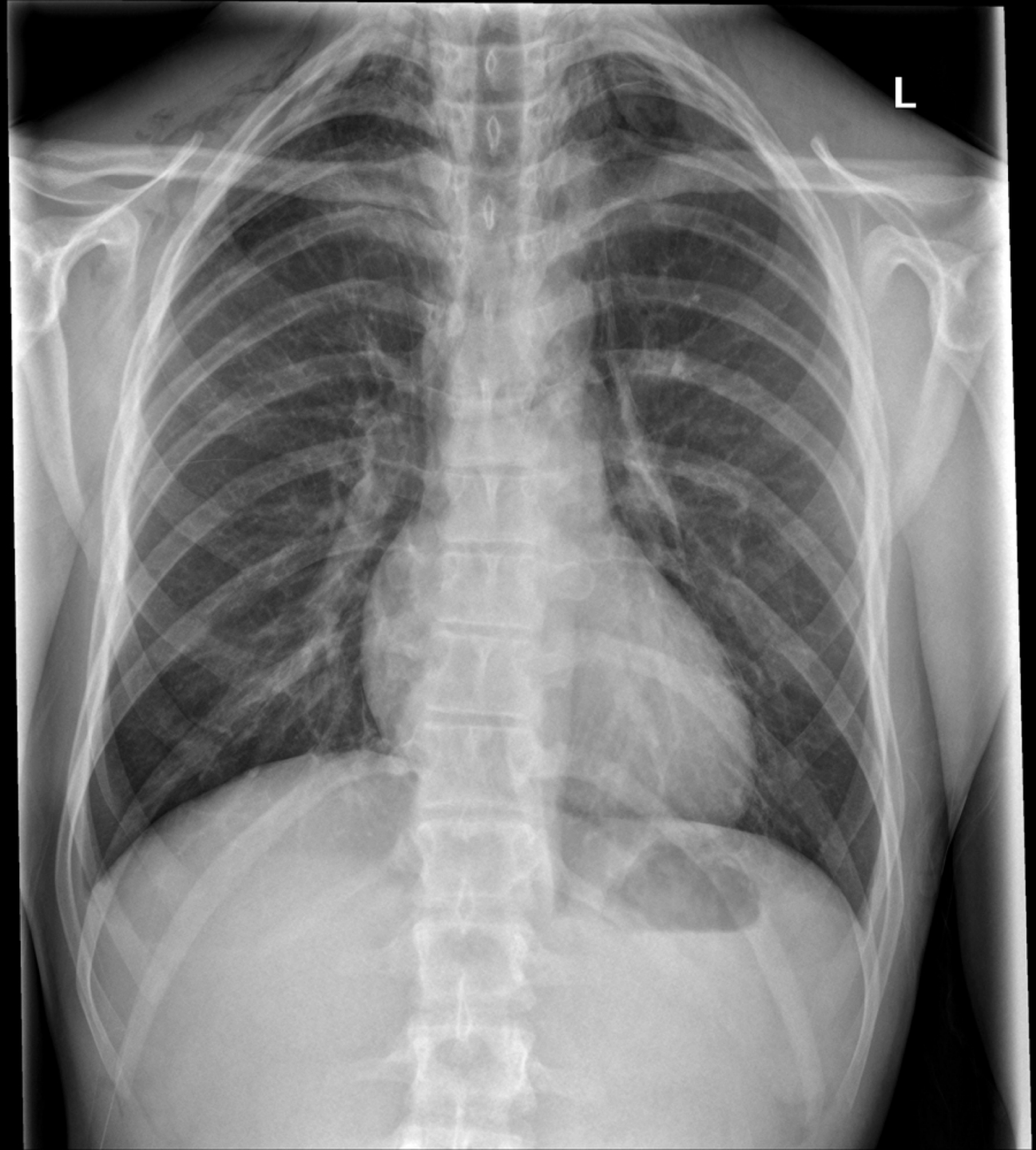
Barotrauma in Asthma

- Dynamic Hyperinflation



- Air leaks
  - Pneumomediastinum
  - Pneumothorax

- Haemodynamic instability


L


PORTABLE
L
000449
AMH
1969
AP
PORT CHEST
UPRIGHT

Blood Gases in Severe asthma

- BGs initially reveal respiratory alkalosis (mild/mod asthma)
- Generally no hypoxia until late in severe/LTA episodes (think other disease present)
- Normal or high CO_2 is worrying
  - Hypercarbia occurs in 10% of cases presenting to the ED
  - Indicates greater airway obstruction

Mild to Moderate Asthma Episode

- Acute alveolar hyperventilation with hypoxemia

pH	$PaCO_2$	HCO_3^-	PaO_2
↑	↓	↓(Slightly)	↓

B2-agonists



- Short-acting, inhaled B2–agonists (SABAs)
  - Mainstay for treating acute asthma
  - Onset of action is rapid (5 min) with duration of actin up to 6 hrs
  - Side-effects are well tolerated.
- Beware
  - Tachycardia, tremor & agitation
  - Monitor K^+ and BGL (especially if using IV)



Metered Dose Inhaler
(MDI)



Spacer

Continuous?





Ipratropium bromide



- Mild additional bronchodilating effect when added to B2-agonists that might only be significant in severe asthma.
- The safety profile and the fact that individual patients might obtain benefit have resulted in aerosolized ipratropium being recommended for the treatment of acute severe asthma.
- No unfavourable interactions between these two classes of agents have been reported.

Corticosteroids



- Reducing airway inflammation, airway reactivity and decrease airway secretions.
- Increase number and sensitivity of beta-receptors on the bronchial smooth muscle.
- Objective improvements in airflow obstruction not usually seen for 6-12 hr in acute asthma.
- Should be used in most patients who present to the ED with asthma

Corticosteroids



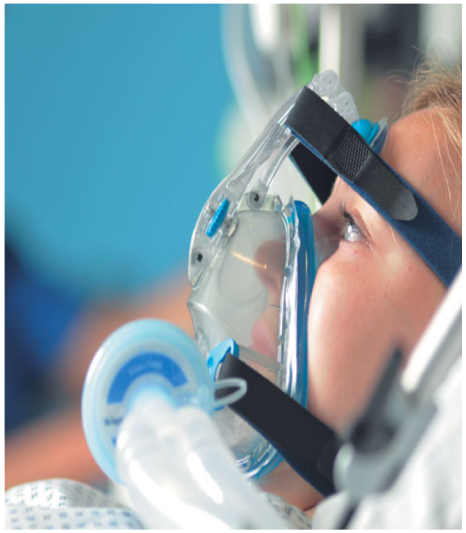
- "Low" dose corticosteroids (80 mg/day methylprednisolone or 400 mg/day of hydrocortisone) appear efficacious.
- Oral and IV routes of are equally efficacious for resolution of airflow limitation
- Beware
  - BGL in diabetics
  - Myopathy (especially in mechanical ventilation)
    - Non-depolarising muscle relaxants should be limited if able

Magnesium Sulphate



- May have anti-inflammatory properties
- Several systematic reviews conclude that this agent is most effective in patients with severe asthmatic exacerbations (defined as severe airflow limitation, a relative failure to respond to inhaled bronchodilators and high risk of admission).
- 2g of IV magnesium sulphate over 20 mins

NIV for severe asthma



- No RCTs as with COPD
  - 2005 Cochrane review in favour
  - May reduce endotracheal intubation rate
- Additional treatment in severe or LTA with increasing CO_2
  - Additional PEEP overcomes $PEEP_i$, reduces WoB
- Suggested settings
  - CPAP 5cm H_2O if using CPAP alone (up to 7-10cm H_2O)
  - BiPAP: Fi2 1.O, IPAP 10 (up to 15) cm H_2O, EPAP 5 (up to 10) cm H_2O
  - Goal is to achieve RR < 25 /min and tidal volume 7ml/kg

Emergency Department Flowchart for the Management of Life Threatening Asthma

Emergency Care Institute NEW SOUTH WALES

Rapidly deteriorating asthmatic?

NO → Follow mild/mod or severe asthmatic treatment algorithm

YES

Call for help:
- ED Staff specialist
- ICU registrar (Contact no:_____)
- Anaesthetic registrar (Contact no:_____)

1. Continuous oxygen driven **nebulised salbutamol** AND 20 minutely **ipratropium bromide** 500mcg AND **start BIPAP**

AND

2. **IV Magnesium Sulphate** 10mmol in 100mL NaCl 0.9% over 20 minutes

AND

3. **IV Salbutamol** Initial loading dose of 250mcg (0.5mL of a 500mcg ampoule) over 1 minute, followed by an infusion (See protocol)

AND

4. **IV Hydrocortisone** 100mg if not already given

BIPAP Settings (guidelines only):
FiO2 1.0, IPAP 10, EPAP 5
Urgent VBG

Improving? → **Admit HDU/ICU** for ongoing treatment and monitoring

Patient deteriorating? → Consider adrenaline IV infusion

BIPAP not tolerated or patient deteriorating and on maximal medical therapy?

Intubate and ventilate
RSI in position of comfort then lay flat.
Induction with Ketamine 2mg/kg IV
Paralyse with Suxamethonium 1.5mg/kg IV
Optimally fluid load, anticipate need for ALS
Maintenance of sedation and paralysis
Propofol infusion
Rocuronium 50mg IV
Admit ICU

Monitor & treat:
Salbutamol side effects
- Hypokalaemia
- Lactic acidosis
- Tachyarryhthmias (rare if given MgSO4 prior)

Magnesium side effects
- Flushing
- Hypotension & respiratory depression (rare in doses advised)

Ventilator Settings (guidelines only):
SIMV – volume control, FiO2 1.0, RR 8, TV 6-8mL/kg (ideal body weight), PEEP 0-5cm H20, I:E ratio 1:4, plateau pressure <30 cmH2O

Periarrest
Adrenaline:
0.5ml (500mcg) of 1:1000 IM
OR
5mL (500mcg) of 1:10,000 IV given slowly from a minijet
- Consider adrenaline infusion

Presents in cardiac arrest
- Start ALS
- Intubate and ventilate
- Medical treatments 1-4
- Consider adrenaline infusion post ROSC (if not already started)
- Investigate for pneumothorax

Deteriorates on ventilator
- Immediately disconnect ventilator & allow expiration
- Attach bag at 15L/min O2 & gently ventilate
- Assess ***MASH*** & ***DOPES***
- Treat reversible causes
- Consider ECMO in consultation with Intensivist / Anaesthetist.

MASH: **M**ovement of chest, **A**rterial sats, **S**kin colour, **H**aemodynamic stability

DOPES: **D**isplacement or **O**bstruction of ETT, **P**atient factors (inadequate sedation/paralysis, pneumothorax, bronchospasm), **E**quipment (ventilator problems), breath **S**tacking

Other Stuff

- IV Salbutamol
  - As add-on if patient not responding to inhaled
  - Beware additive side effects (hypoK, lactic acidosis, hyperglycaemia)

- IV adrenaline
  - As add-on in hypotension not associated with dynamic hyperinflation
  - Worse lactic acidosis than salbuatmol

- Aminophylline
  - historical interest only……

- Heliox
  - rarely except in ICU

- Inhalational anaesthetic agents (eg. Halothane, enflurane, isoflurane)

- Antibiotics
  - Only if identified infective process (pneumonia on CXR)



The Crashing Asthmatic

- Severe hypercapnia, acidosis and fatigue *might not* warrant immediate intubation
  - Aggressive, continuous therapy
  - NIV
  - Look for other stuff
    - Dehydration
    - Breath stacking (DHI)

- Crashing asthmatic:
  - Deteriorating consciousness
  - Severe exhaustion (sudden decreased respiratory effort)
  - Sudden hypotension
  - Cardiopulmonary arrest are absolute indications for intubation and mechanical ventilation.

Intubation and mechanical ventilation in the asthmatic increase mortality, so try to avoid the crash…

Intubation of the severe asthmatic patient

- 1-3% of acute severe asthma requires intubation
- Prevention of intubation and mechanical ventilation are the goals of managing acute severe asthma



- Best achieved by maximising pre-intubation therapy *BUT* don't want to wait too long

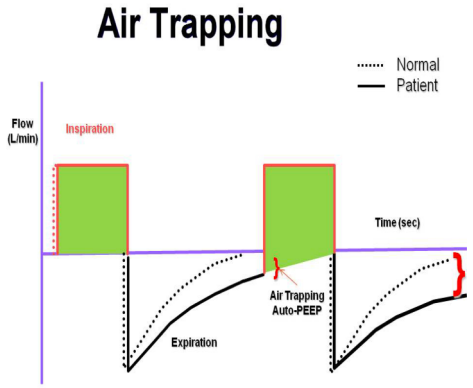
RSI for severe asthma

- Best operator and best team with checklist
- Rapid sequence intubation
- The best agents to use are those most familiar to the operator (but ketamine is a good choice)
- Beware potential haemodynamic compromise and arrest when ventilation commences
  - Hypovolaemia
  - Breath stacking with increased ITP and decreased RV filling
  - Tension Pneumothorax

Post-intubation Paralysis

- Usually not an ED issue but……
- Ongoing paralysis significant risk of critical illness polyneuromyopathy
  - especially given the combination with steroids
- Incidence of myopathy in asthmatics on long-term NDNB agents up to 30%
- Neuromuscular blockade should be withdrawn as soon as possible
  - Aggressive appropriate sedation

Ventilation strategy

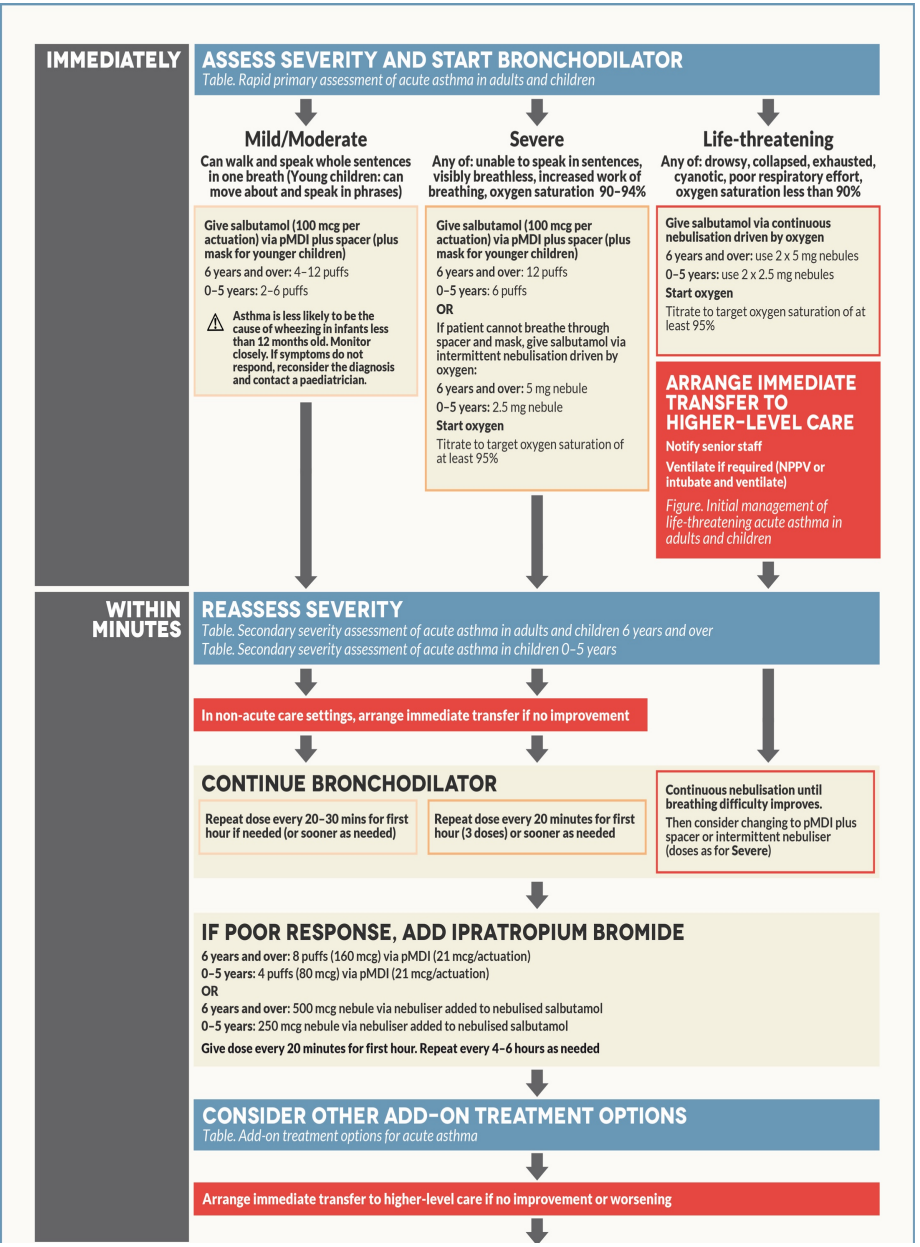


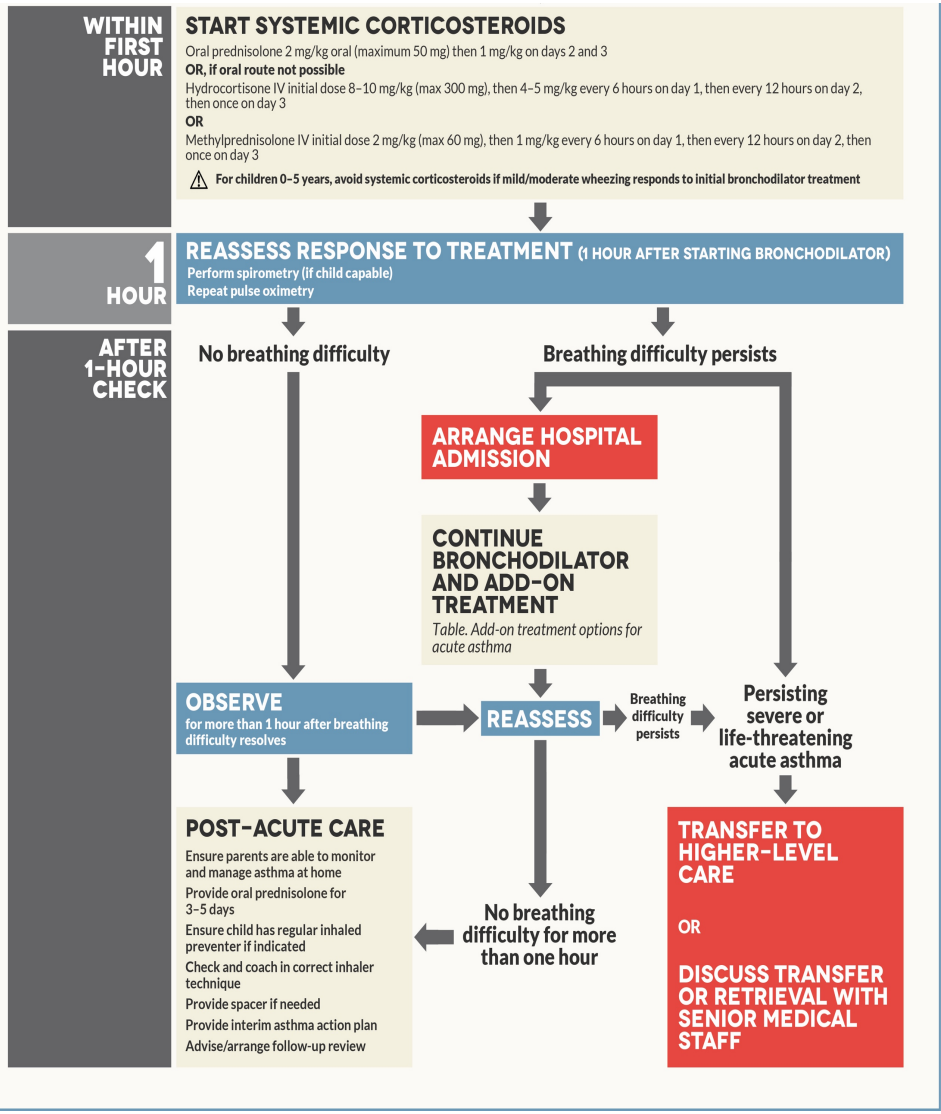
- Post-intubation
  - Initial BVM ventilation
    - Assessment of severity of bronchospasm
    - Avoid dynamic hyperinflation
      - using a slow breath rate of 4–5 breaths/min with low tidal volume (permissive hypercapnia)
  - When considered stable an attempt to mechanically ventilate the patient is made
  - Sedation and muscle relaxation
    - Note post-intubation myopathy

Initial ventilation strategy

- SIMV mode – volume control
- iO2 1.0, then titrate to keep SpO2 92-95%
- Tidal volume 6-8 mL/kg
- Ventilator rate 8 breaths/min
- Long expiratory time (I:E ratio 1:4)
- Minimal PEEP 0-5 cm H_2O
- Limit peak inspiratory pressure to <40 cmH2O
- Target plateau pressure <30 cmH2O
- Ensure effective humidification

Managing acute asthma in children





Managing acute asthma in children

- Same basic principles as adults:

1. Inhaled bronchodilators
2. Add ipratropium if salbutamol not enough
3. Remembers add-ons
   - Magnesium, IV salbutamol
4. Steroids within first 60 minutes
5. Trial of NIV if deteriorating

Summary

- Severe asthma is mostly a clinical diagnosis.
- Most severe asthma attacks can be managed with appropriate medical management.
- Intubation of the severe asthmatic should be avoided, if possible as it introduces a number of significant risks.
- If intubation is indicated an appropriate RSI and mechanical ventilation strategy is essential to reduce the risk of cardiopulmonary arrest.