



Course: Key Competences

Background:

In 2007, the Royal College of Paediatrics and Child Health (RCPCH) published a new curriculum for postgraduate medical education, which has been approved by the Postgraduate Medical Education and Training Board¹. In addition, the RCPCH has devised an assessment strategy that uses multisource feedback tools to map specifically to assessment standards.

By the completion of Level One training, all trainees are expected to be able to initiate therapy in a child presenting with Asthma. This scenario/ workshop has been designed to assess competence in management of this key condition of childhood.

Curriculum Elements Addressed:

The management of Acute Severe Asthma can be separated into five distinct phases:

- **Assessment**
- **Recognition of the condition**
- **Formulation of differential diagnoses**
- **Investigation**
- **Institution of Emergency therapy and review of Ongoing Therapy**

Assessment (Expected)

Brief history should be obtained (key features – Asthma symptoms triggered by exposure to cat at friends house, Asthma maintenance therapy, Allergies, Pet history, Previous hospital admissions, Interval symptoms). Child should be examined thoroughly. Key features of examination: Afebrile; Tachypnoea 40 breaths.min⁻¹; Prolonged expiration; Recession; Tachycardia 140 beats.min⁻¹, CRT 3-4 sec, NIBP 94/42; Liver edge 2cm below costal margin; unable to complete sentence

Recognition of condition (Expected)

Signs are of lower respiratory tract small airway obstruction.

Formulation of differential diagnosis (Expected)

Diagnostic possibilities include Foreign Body Aspiration, Lower Respiratory Tract Infection and Acute Severe Asthma.

Investigations (Expected)

Pulse oximetry

Laboratory investigations (to include U&Es, FBC, CRP, Blood cultures)

CXR: hyper-inflated lung fields with no focal lesions.

¹ A Framework of Competences for Level 1 Training in Paediatrics.
<http://www.rcpch.ac.uk/Training/Competency-Frameworks>



Definitive Therapy (Expected)

High flow O₂ via Facemask

β₂ Agonists up to 10 puffs via spacer

Nebulised Therapy repeated every 20 to 30 minutes

- Salbutamol 5mg
- Ipratropiumbromide 500micrgrams

Prednisolone 30 – 40mg PO or Hydrocortisone 4mg/kg

Gain intravenous access

Consider IV Salbutamol

- Bolus 15mcg/kg over 10min (5mcg/kg/min for 1 hour)
- Infusion 1 – 5mcg/kg/min

Consider IV Aminophylline

- Bolus 5mg/kg over 20 min
- Infusion 1mg/kg/h

Consider I V Magnesiumsulphate 40mg/kg (max 2g) over 20 min

Discuss Management with Senior Paediatrician

Assessment Domains:

RCPCH Standards	Level of Achievement		
	Good	Adequate	Poor
Effective skills in paediatric assessment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Knowledge of common and serious paediatric conditions and their management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Effective initial management of ill-health and clinical conditions in paediatrics, seeking additional advice and opinion as appropriate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Safe practical skills in paediatrics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Advanced Neonatal and Paediatric Life Support Skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Effective communication and interpersonal skills with colleagues	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Scenario: Acute Severe Asthma

Learning Objectives: At the end of the session candidates should be able to:

1. **Assessment and recognition of the severity of Asthma (Moderate, Severe and Life Threatening)**
2. **Familiarity with BTS Guideline for management of Acute Severe Asthma**
3. **Implementation of treatment and regular review of effect**
4. **Understand when inhalers vs nebulisers indicated**
5. **Understand indications of IV Salbutamol bolus**
6. **Salbutamol vs Aminophylline infusion**
7. **Importance of reassessment of ABC**
8. **Recognition of when to ask for help**

Faculty Script:

A six year old boy is referred to the Paediatric Assessment Unit by his GP. He has a one day history of progressively worsening coughing and wheeze. He is a known Asthmatic and is allergic to cats. GP concerned and wishes him to be assessed in hospital.

Candidates are expected to introduce O₂, back to back nebs and steroids. If initial management is not followed the patient deteriorates to life threatening asthma.

In the event that candidates do not institute correct treatment or escalation in treatment in response to deteriorating clinical state, do NOT allow patient to deteriorate and arrest. Pause the scenario discuss lack of clinical improvement and strategies that may help and restart scenario asking candidate to institute these measures.

Patient Demographics:

Name: Dylan Smith

Gender: M **Age:** 6yrs **Weight:** 20kg

Candidate Brief:

Presenting History (Candidate Storyboard):

A six year old boy is referred to the Paediatric Assessment Unit by his GP. He has a one day history of progressively worsening coughing and wheeze. He is a known Asthmatic and is allergic to cats. GP concerned and wishes him to be assessed in hospital.

Previous Medical History:

Known asthmatic diagnosed 18months ago
No previous ITU admissions

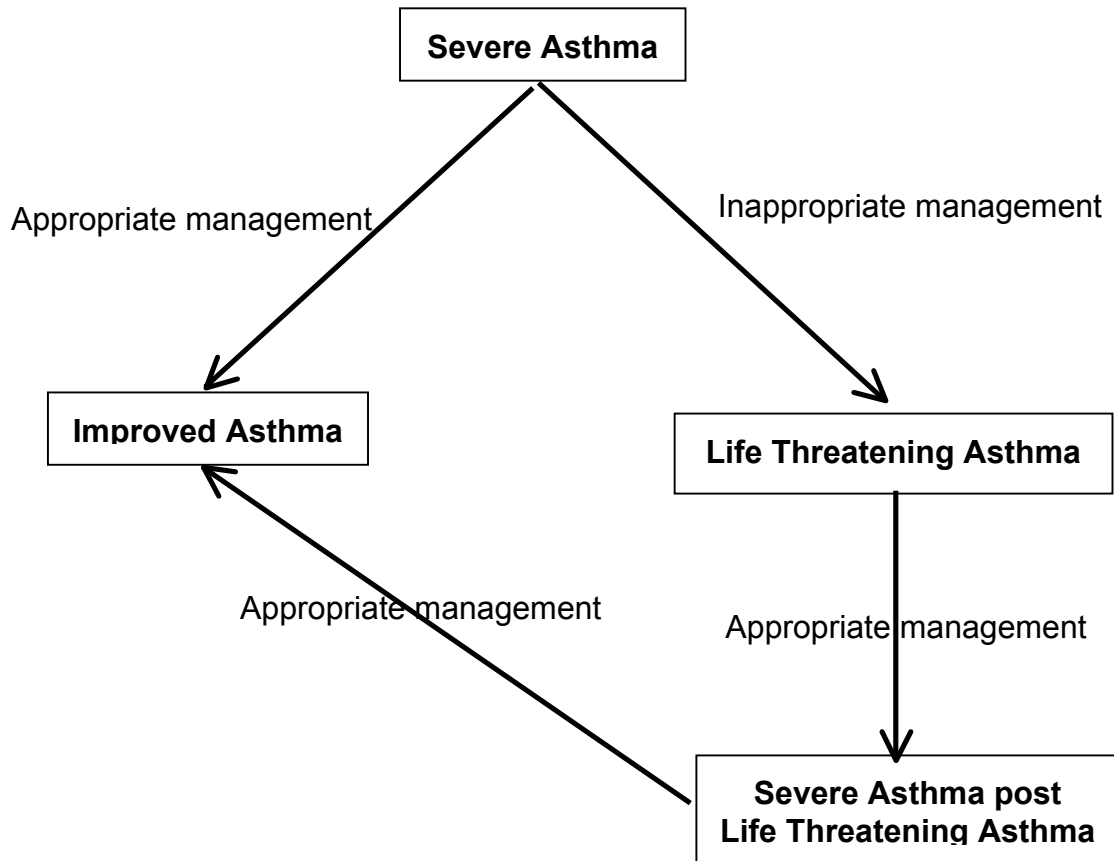
Family Medical History:

No asthma
Both parents smoke





Flowchart of Scenario Progression:



Scenario setup and preparation:

Faculty Recommended: Director **Control**
 Actor/Confederate(s)
 Roles: Parent
 ED Nurse

If you have a multiprofessional group of candidate then you should have a multiprofessional faculty.

Participants:

Medical Roles **Nursing Roles** **AHP Roles**
 Paediatric SHO

Location: Emergency Department

Simulator: Meti Paed ECS, Paediasim or Sim Junior

Monitor Setup: 3 wave format

Monitor Parameters Required:

ECG	<input checked="" type="checkbox"/>	S _a O ₂	<input checked="" type="checkbox"/>	RR	<input checked="" type="checkbox"/>	EtCO ₂	<input type="checkbox"/>	NIBP	<input checked="" type="checkbox"/>	ABP	<input type="checkbox"/>
CVP	<input type="checkbox"/>	PAP	<input type="checkbox"/>	ICP	<input type="checkbox"/>	CPP	<input type="checkbox"/>	Temp (P)	<input type="checkbox"/>	Temp (C)	<input type="checkbox"/>
Other:											



Equipment Checklist:

Respiratory:

Nasal Cannula	<input type="checkbox"/>	O ₂ Facemask	<input checked="" type="checkbox"/>	O ₂ Reservoir Facemask	<input checked="" type="checkbox"/>
Headbox	<input type="checkbox"/>	Wafting O ₂	<input type="checkbox"/>	Nebuliser	<input checked="" type="checkbox"/>
Suction	<input checked="" type="checkbox"/>	Yankuer	<input type="checkbox"/>	Suction Catheter <input type="checkbox"/> size	FG
Self inflating Bag	<input checked="" type="checkbox"/>	Ayers T piece	<input type="checkbox"/>	Nasopharyngeal airway	<input type="checkbox"/>
Oropharyngeal Airway	<input type="checkbox"/>	LMA	<input type="checkbox"/>		
Intubated?	<input type="checkbox"/>	ETT position		length	0.00cm at
Respiratory Support		Non Invasive			
				➔ Settings:	
				Flow	l/min
				Insp O ₂	%
				PIP	
				PEEP	
		Invasive			
				➔ Settings:	
				iTime	sec
				Insp O ₂	%
				Rate	bpm
				PIP	
				PEEP	

Vascular Access:

Line Type	Site
Peripheral (1)	R Hand available when placed
Peripheral (2)	
Central Venous	
Arterial	
Intraosseous	

Other Medical Equipment:

Drug Chart	<input checked="" type="checkbox"/>	Emergency Drug Sheet	<input checked="" type="checkbox"/>	Blood gas Venous
Blood Results Sheet	<input type="checkbox"/>	X Rays	CXR	Imaging
Other Props:				
MDI with spacer				
Nebuliser				
PE Flow meter				





IV Fluids:

Setup	Fluid Type
Fluids Running	
Fluids Available (1)	0.9% Saline
Fluids Available (2)	0.9% Saline + 5% Dextrose
Fluids Available (3)	0.45% Saline + 5% Dextrose
Other Fluids	

Medications: (route, dose/rate)

Infusions (Running)	Dose	Running Rate (ml/hr)
Nil		

Infusions (Available)	Dose	Running Rate (ml/hr)
Salbutamol	1 – 4mcg/kg/min	
Aminophylline	1mg/kg/h	

Bolus Drugs (Available)	Dose
Salbutamol	15mcg/kg over 10min
Aminophylline	5mg/kg over 20 min

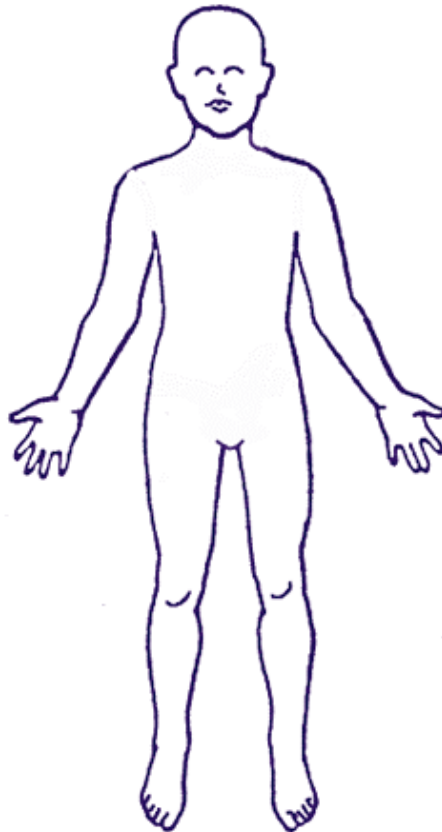




Moulage:

Effect needed

Draw relevant equipment needed on diagram e.g. cannula, wounds etc.





Scenario States:

Name of State		Baseline : Severe Asthma					Duration				
Vital Signs											
Rhythm	SR	HR	120	SBP	100	DBP	50	CVP			
Resp Rate	40	SaO₂	89%	ETCO₂		Temp	36.5	Other			
AVPU	A	GCS	15	Pupils	ERL	ICP		NIRS			
Assessment											
Periph Pulses	normal		Cap refill	2sec		Skin	no rash				
ECG/Heart	Normal										
Airway				Breathing	Prolonged forced expiration						
Air entry	Good			Breath sounds	Wheezy						
WOB	increased			Recession	Subcostal and intercostal						
Neuro				Renal			Hepatic				
Other	Unable to speak in sentences										
Results											
Hb	13.3	WCC	10.97	PLT	354	HCT	0.4	CRP	<10		
PH/ H+	7.3	PaCO₂	40.3	PaO₂	71.7	HCO₃	24	BE	- 2.9	Lactate	1.7
Na²⁺	137	K⁺	3.7	Cl⁻	101	Ur	3.8	Cr	27	Glucose	15.8
Ca²⁺	2.48	Mg²⁺	0.82	PO₄⁻	1.48						
Expected Outcomes:											
Participants should:	<p>Expected Management</p> <ul style="list-style-type: none"> Place patient in 100% O₂ via facemask Establish monitoring Diagnose asthma and recognise severity Commence continuous nebulised Salbutamol (5mg) & Atrovent 500mcg x 3 in first 20min Obtain IV access, take bloods and venous gas → FBC, CRP, U&E, blood cultures Administer Hydrocortisone 4mg/kg IV 										
Facilitators should:	<p>Provide Extra information if requested:</p> <p>Cap refill time 2 sec Peripheral pulses normal Speech not able to speak in sentences</p> <p>Progression:</p> <p>If managed well patient does not deteriorate. Progress to Improved Asthma state</p> <p>If managed suboptimally patient deteriorates to life threatening asthma. Progress to Life threatening Asthma State</p>										



Name of State		Improved Asthma					Duration				
Vital Signs											
Rhythm	SR	HR	102	SBP	100	DBP	50	CVP			
Resp Rate	32	SaO₂	99%	ETCO₂		Temp	36.5	Other			
AVPU	A	GCS	15	Pupils	ERL	ICP		NIRS			
Assessment											
Periph Pulses	normal		Cap refill	2sec		Skin	no rash				
ECG/Heart	Normal										
Airway				Breathing	Prolonged expiration						
Air entry	Good			Breath sounds	soft wheeze						
WOB	improved			Recession	Subcostal and intercostal						
Neuro				Renal			Hepatic				
Other	Able to speak in sentences										
Results											
Hb	13.3	WCC	10.97	PLT	354	HCT	0.4	CRP	<10		
PH/ H+	7.3	PaCO₂	40.3	PaO₂	71.7	HCO₃	24	BE	- 2.9	Lactate	1.7
Na²⁺	137	K⁺	3.7	Cl⁻	101	Ur	3.8	Cr	27	Glucose	15.8
Ca²⁺	2.48	Mg²⁺	0.82	PO₄⁻	1.48						
Expected Outcomes:											
Participants should:	<p>Expected Management</p> <ul style="list-style-type: none"> • Continue treatment • Plan maintenance and reassessment of treatment 										
Facilitators should:	<p>Provide Extra information if requested:</p> <p>Cap refill time 2 sec</p> <p>Peripheral pulses normal</p> <p>Speech able to speak in sentences</p>										





Name of State		Life Threatening Asthma				Duration					
Vital Signs											
Rhythm	SR	HR	150	SBP	80	DBP	30	CVP			
Resp Rate	40	SaO₂	83%	ETCO₂		Temp	35	Other			
AVPU	V	GCS	13	Pupils	ERL	ICP		NIRS			
Assessment											
Periph Pulses	Pulsus Paradoxus		Cap refill	4sec	Skin						
ECG/Heart											
Airway				Breathing		Forced prolonged expiration					
Air entry		poor bilateral/silent		Breath sounds		wheeze/quiet					
WOB		increased		Recession		Subcostal and intercostal					
Neuro		Agitated		Renal				Hepatic			
Other											
Results											
Hb	13.3	WCC	10.97	PLT	354	HCT	0.4	CRP	<10		
PH/ H+	7.22	PaCO₂	70.6	PaO₂	37.5	HCO₃	18.4	BE	- 4.8	Lactate	2.7
Na²⁺	137	K⁺	3.7	Cl⁻	101	Ur	3.8	Cr	27	Glucose	16.3
Ca²⁺	2.48	Mg²⁺	0.82	PO₄⁻	1.48						
Expected Outcomes:											
Participants should:		Expected Management									
		<ul style="list-style-type: none"> • Recognition of deterioration • IV Salbutamol bolus Child < 2yrs age 5mcg/kg over 10 min Child > 2yrs age 15mcg/kg (max 250mcg) over 10 min • Loading dose salbutamol IV 5mcg/kg/min for 1 hour • Infusion IV Salbutamol (following load) 1 – 2mcg/kg/min • Aminophylline Load 5mg/kg (max 500mg) over 20 min Infusion (<40kg) 1mg/kg/h (>40kg) 0.5 – 1mg/kg/h 									
Facilitators should:		<p>Provide Extra information if requested:</p> <p>Cap refill time 4 sec Peripheral pulses pulsus paradoxus Speech moans to pain</p> <p>Progression:</p> <p>If managed well patient moves to State Severe Asthma post Life Threatening Asthma</p> <p>If managed suboptimally DO NOT ALLOW PATIENT TO ARREST.</p> <p>Pause scenario; ask candidates to tell you what clinical problem is and their thoughts on why patient is not responding. DISCUSS.</p> <p>Then restart scenario and allow them to manage patient.</p>									





Name of State		Severe Asthma Post Life Threatening				Duration					
Vital Signs											
Rhythm	SR	HR	120	SBP	100	DBP	50	CVP			
Resp Rate	40	SaO₂	89%	ETCO₂		Temp	36.5	Other			
AVPU	A	GCS	15	Pupils	ERL	ICP		NIRS			
Assessment											
Periph Pulses	normal		Cap refill	2sec		Skin	no rash				
ECG/Heart	Normal										
Airway				Breathing	Prolonged forced expiration						
Air entry	Good			Breath sounds	Wheezy						
WOB	increased			Recession	Subcostal and intercostal						
Neuro				Renal			Hepatic				
Other	Unable to speak in sentences										
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Ca²⁺	2.48	Mg²⁺	0.82	PO₄⁻	1.48						
Expected Outcomes:											
Participants should:	<p>Expected Management</p> <ul style="list-style-type: none"> • Continue 100% O₂ via facemask • Continue monitoring • Reassess and adjust treatment 										
Facilitators should:	<p>Provide Extra information if requested:</p> <p>Cap refill time 2 sec Peripheral pulses normal Speech not able to speak in sentences</p> <p>Progression: If managed well patient does not deteriorate. Progress to Improved Asthma state</p>										





Educational Material:

Epidemiology

In 2008 there were 29 asthma deaths in children under 14 years of age. It is estimated that up to 90% of deaths are potentially avoidable and 75% of admissions preventable. Most deaths occur outside of hospital. Paediatric intensive care unit (PICU) mortality is generally low, with deaths usually due to hypoxic brain injury secondary to out-of-hospital cardiac arrest preceding admission.

Common pitfalls in management

- Underestimation of severity by patient/physicians; measurement of peak flow is relatively insensitive.
- Overestimation of severity; remember salbutamol may worsen ventilation/perfusion mismatching causing hypoxaemia despite improving airway constriction and reducing dyspnoea. If this occurs, check chest X-ray (CXR) to exclude a pneumothorax, but if dyspnoea remains severe do not reduce the dose of salbutamol.
- Inadequate therapy (dosage /nebuliser volume) in severely ill patients.
- Attempting to achieve normal blood gases in ventilated patients

Assessment of severity

Risk Factors for intensive care admission/mortality:

- Previous high dependency/PICU admissions
- Poorly controlled chronic symptoms
- ≥ 3 classes of medication
- Failure to respond to treatment
- Deterioration while receiving steroids
- Poor socio-economic background
- Psychological and psychiatric disorders e.g. depression
- Poor compliance and appointment non-attendance

2 patterns of history have been described in the adult literature. This can be a useful division in children and may help to predict the likely response to treatment.

	Acute Severe Asthma (~70%)	Acute Asphyxic Asthma (~30%)
Gender	Female>Male	Male>Female
Baseline status	Moderate-severe airflow obstruction	Normal/mildly decreased lung function
Onset	Days-weeks	Minutes-hours
Pathology	1. Airway wall oedema	1. Acute bronchospasm
	2. Mucous gland hypertrophy	2. Neutrophilic, not eosinophilic bronchitis
	3. Inspissated secretions	
Response to treatment	Slow	Rapid





Important points in examination

REPEATED clinical examination is the best determinant of severity and response to treatment

- Altered level of consciousness
- Cyanosis/exhaustion
- Use of accessory muscles; dyspnoea and wheezing do not correlate well; beware the 'silent chest'
- Too breathless to talk
- Inability to lie supine
- Pulsus paradoxus (severe >10 mmHg children, > 18 mmHg teenagers); beware as paradox disappears in the fatigued patient

Investigations

Investigations are less important than frequent assessment of clinical signs

Basic monitoring should include continuous oximetry and electrocardiogram (ECG), respiratory rate, blood pressure, and level of consciousness. An arterial line should be placed in intubated patients.

- 1) Pulse oximetry - beware desaturation in air. Normal oxygen saturations may be present despite severely impaired gas exchange.
- 2) CXR - significant abnormalities are present in only 1-5% patients, but a CXR should be done in all children who suddenly deteriorate to exclude pneumothorax, children with atypical presentation to exclude other disease entities e.g. foreign body/pneumonia, and patients who have been intubated. Radiographic evidence of atelectasis is common in acute asthma but does not imply infection.
- 3) Blood gases - arterial puncture is difficult and distressing in small/sick children. Clinical signs are more useful, although a rapidly rising carbon dioxide (PaCO_2) may be an indication for intubation. Metabolic acidosis is commonly due to excessive beta-sympathomimetic usage.

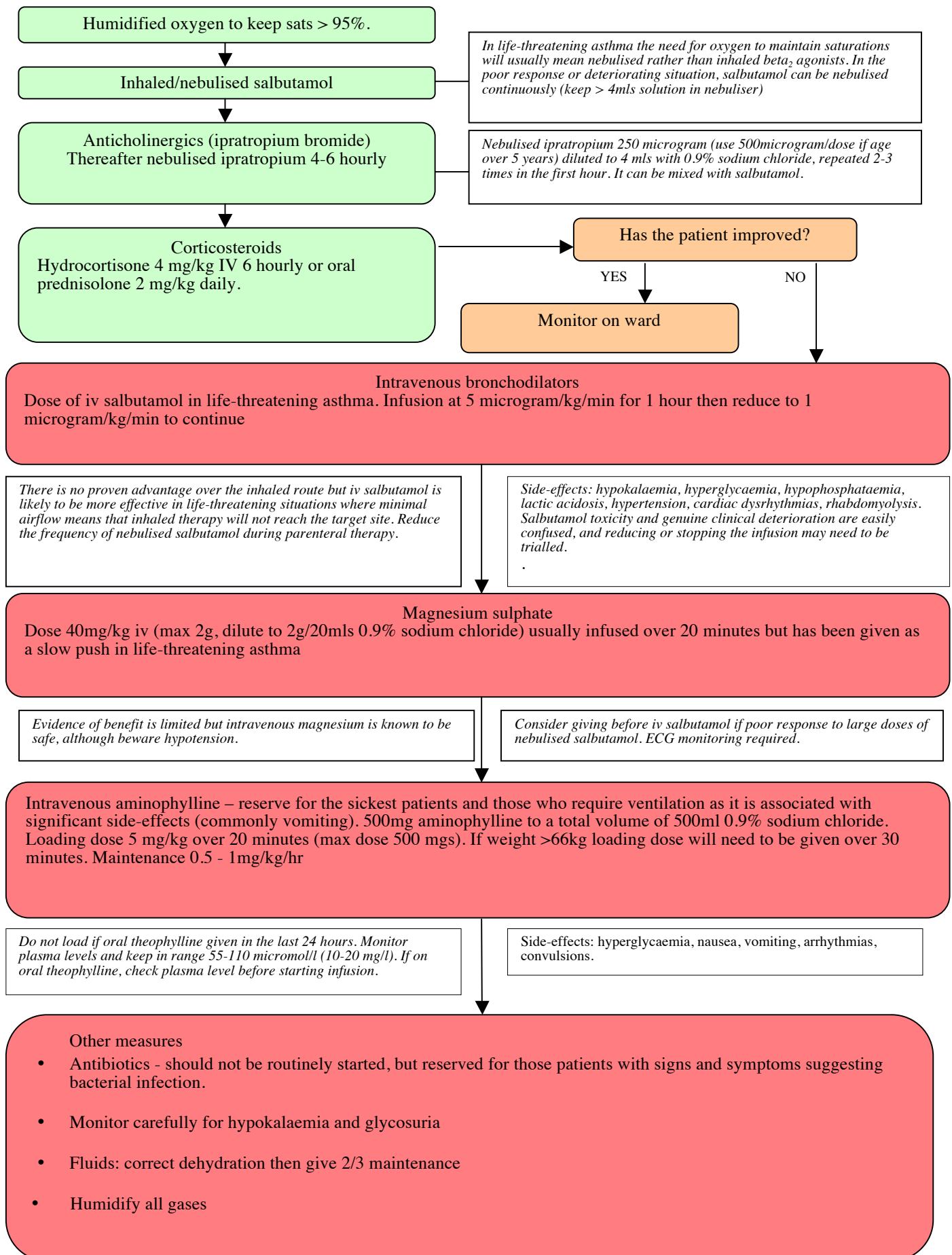
Early oxygen (PaO_2) & PaCO_2 fall, late PaO_2 markedly falls, PaCO_2 rises. Beware a normal PaCO_2 which may be a sign of exhaustion. PaO_2 often 8-10kPa (60-80mmHg), < 8 kPa marks significant hypoxemia.

- 4) Pulmonary function tests - usually not possible in small or acutely distressed patient. Peak flow $< 33\%$ predicted value with no response to therapy is indicative of a severe attack.





Treatment





Other therapies

- IM adrenaline (10microgram/kg) should be given if there is any suggestion of anaphylaxis.
- Non-invasive ventilation may be considered and has been shown to reduce the work of breathing especially in the presence of obesity, although difficult in an agitated or young child.
- Anti-leukotriene agents have a role in mild acute asthma, but as yet are not indicated in the severe/life-threatening situation.
- Inhalational agents – no randomised controlled trials although may be helpful in exceptional circumstance; use sevoflurane rather than isoflurane or halothane. Sometimes used as an induction agent due to bronchodilatory action but beware vasodilatory action causing marked hypotension.
- Heliox, mucolytics, DNase – no benefit shown in randomised controlled trials.
- ECMO – there are survivors in the literature
- Nebulised magnesium – study in progress.



Rapidsystems™

VENOUS SAMPLE

03.02.2009 09:20
SYSTEM NAME EMERGENCY DEPT
SYSTEM ID 2376-25327
PATIENT ID 1483564N
LST NAME SMITH
OPERATOR JONESR

ACID/BASE 37.0 °C
PH 7.41
PCO₂ 32.3 MMHG
PO₂ 43.7 MMHG
HCO₃ - ACT 22.7 MMOL / L
HCO₃ - STD 21.7 MMOL / L
BE (B) -2.9 MMOL / L
BE (ECF) -2.7 MMOL / L

CO-OXIMETRY

HCT 38.3 %
THB 12.4 G / DL
SO₂ 60.7 %
FO₂HB 99.2 %
FCOHB 0.8 %
FMETHB 1.2 %
FHBB %

OXYGEN STATUS 37.0 °C
CTO2(A) ML/DL

ELECTROLYTES

NA⁺ 134.0 MMOL / L
K⁺ 4.4 MMOL / L
CA⁺⁺ 1.0 MMOL / L
CL⁻ 95.0 MMOL / L

METABOLITES

GLU 15.8 MMOL / L
LAC 1.7 MMOL / L
PATM 754 MMHG

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CA⁺⁺ 1.0 MMOL / L
CL⁻ 95.0 MMOL / L

METABOLITES
GLU 15.8 MMOL / L
LAC 1.7 MMOL / L

PATM 754 MMHG



ICS-2290810 Smith, Dylan (06/01/2003)
Request: 09-1109808-Collected: 03/02/09 07:00

Serum/plasma

Magnesium	0.43	mmol/L	(0.70-1.00)
Calcium	2.51	mmol/L	(2.25-2.80)
Calcium (corrected)	2.75	mmol/L	(2.25-2.80)
Phosphate	2.00	mmol/L	(1.30-2.00)
Bilirubin	14	umol/L	(< 17)
Alkaline phosphatase	179	IU/L	(70-250)
Alanine aminotransferase	18	IU/L	(5-40)
Total protein	47	g/L	(62-80)
Albumin	27	g/L	(29-55)
Globulin	20	g/L	(22-36)

Serum/plasma

Creatinine	37	umol/L	(28-60)
Urea	2.7	mmol/L	(1.4-5.4)
Sodium	134	mmol/L	(133-143)
Potassium	5.0	mmol/L	(3.7-5.2)
Chloride	95	mmol/L	(95-105)
Bicarbonate	25	mmol/L	(21-34)
Anion gap	14	mmol/L	(6-14)
C-reactive protein	<10	mg/L	(< 10)

COAGULATION SCREEN

Prothrombin time	10.5	s	(9.5-12.0)
INR	1.0		
Aptt time	31.9	s	(20.0-45.0)
Aptt ratio	1.0		

Hb: **9.8** g/dL (11.5-16.5) Plt: 234 10⁹/L (150-400) Wbc: 10.07 10⁹/L (5.00-19.00)

Rbc	10 ¹² /L	:	3.11	(3.00-5.40)	Neut	10 ⁹ /L	:	3.88	(3.00-9.00)
Hct	l/l	:	0.28	(0.33-0.53)	Lymp	10 ⁹ /L	:	3.25	(3.00-16.00)
MCV	fL	:	89.3	(92.0-116.0)	Mono	10 ⁹ /L	:	1.00	(0.30-1.00)
MCH	pg	:	31.6	(30.0-36.0)	Eosi	10 ⁹ /L	:	1.51	(0.20-1.00)
MCHC	g/dL	:	35.4	(29.0-37.0)	Baso	10 ⁹ /L	:	0.03	(< 0.11)
Hypo	%	:	3.7						



L

507

AP Erect
75/1.1

Bristol PICU Drug Sheet

Name	Dylan Smith		
Date of Birth	06	January	
Weight	20 kg	Height	
Age	6 yrs		(SA estimated from weight alone. Enter height for accurate SA)
			cm (SA 0.79 m ²)



Resuscitation Doses	
Adenosine	0.67 ml (100 mcg/kg). Can use up to 1.7ml (250mcg/kg)
Adrenaline	2 ml 1:10000 (subsequent doses 1:10000)
Atropine	400 mcg (20 mcg/kg) = 0.7 ml (600mcg/ml)
Bicarb 8.4%	20 mmol - give and reassess (20 ml of 8.4%)
Ca Gluc 10%	10 ml - give and reassess
Lignocaine	20 mg (1mg/kg) = 2 ml of 1%
Naloxone	200 mcg (10 mcg/kg) = 0.5 ml (400mcg/ml)

100% fluid requirement = 60 ml/hr

Sedation Infusions	Standard Regime	Calculation	1 ml/hr =
Morphine	1mg/kg made up to 50ml with Dex 5% / Saline 0.9%	20 mg/50ml	20 mcg/kg/hr
Midazolam	5mg/kg made up to 50ml with Dex 5% / Saline 0.9%	100 mg/50ml	100 mcg/kg/hr
Vecuronium	3mg/kg made up to 50ml with Dex 5% / Saline 0.9%	60 mg/50ml	60 mcg/kg/hr
Atracurium	15mg/kg made up to 50ml with Dex 5% / Saline 0.9%	300 mg/50ml	300 mcg/kg/hr
Fent/Vec	Mix 10 mg Vecuronium in 20ml Fentanyl (50 mcg/ml)	N/A	
Fentanyl	neat (50mcg/ml)	2 to 4 ml/hr (5 to 10 mcg/kg/hr)	
Thiopentone	neat (25mg/ml) Bolus: 5mg/kg = 4 ml	Infusion: 0.8 to 4.8 ml/hr (1 to 6 mg/kg/hr)	

Cardiac Infusions	Standard Regime	Calculation	1 ml/hr =
Dopamine	15mg/kg made up to 50ml with Dex 5% / Saline 0.9%	300 mg/50ml	5 mcg/kg/min
Dobutamine	15mg/kg made up to 50ml with Dex 5% / Saline 0.9%	300 mg/50ml	5 mcg/kg/min
Adrenaline	0.3mg/kg made up to 50ml with Dex 5% / Saline 0.9%	6.0 mg/50ml	0.1 mcg/kg/min
Noradrenaline	0.3mg/kg made up to 50ml with Dex 5% / Saline 0.9%	6.0 mg/50ml	0.1 mcg/kg/min
Argipressin	3 Units/kg made up to 50ml with Dex 5% / Saline 0.9%	60.0 U/50ml	0.001 U/kg/min
Milrinone	1.5mg/kg made up to 50ml with Dex 5% / Saline 0.9%	30 mg/50ml	0.5 mcg/kg/min
Dinoprostone (PGE2 / Prostaglandin)	30mcg/kg made up to 50ml with Dex 5% / Saline 0.9%	N/A	N/A
Epoprostenol (Prostacyclin)	neat (10mg/ml)	500 mcg/50ml	8.333 ng/kg/min
SNP	neat (1 mg/ml)	50 mg/50ml	0.83 mcg/kg/min
GTN	neat (1 mg/ml)	50 mg/50ml	0.83 mcg/kg/min
Amiodarone	15mg/kg made up to 25ml with Dex 5% only	300 mg/25ml	10 mcg/kg/min
Lignocaine	neat 1% Lignocaine	1 to 6 ml/hr	(0.5 - 3.0 mg/kg/hr)
High K+	20mmol made up to 40ml with Saline 0.9%	4 to 10 ml/hr	(0.1 - 0.25 mmol/kg/hr)

Bronchodilators	Standard Regime	Calculation
Peripheral		
Salbutamol	10 mg made up to 50ml with Dex 5% / Saline 0.9%	0.3 ml/kg/hr = 1mcg/kg/min Run at 1ml/kg/hr
Aminophylline	500 mg made up to 500ml with Dex 5% / Saline 0.9%	
Central		
Salbutamol	neat (1 mg/ml)	50 mg/50ml = 0.8 mcg/kg/min
Aminophylline	50mg/kg made up to 50ml with Dex 5% / Saline 0.9%	1000 mg/50ml = 1.0 mg/kg/hr

Bolus Drugs	Standard Regime	Intubation Drugs
Aciclovir	#NUM! #NUM!	Atropine 400 mcg (20 mcg/kg) (0.67 ml)
Adenosine	1 mg, to max 5mg	Fentanyl 100 mcg (5 mcg/kg) (2 ml)
Ceftriaxone	1.6 g (80mg/kg, 12h)	Ketamine 40 mg (2mg/kg) (4 ml)
Dex 10%	100 ml bolus for hypoglycaemia	Midazolam 2 mg (100mcg/kg) (0.4 ml)
Lorazepam	2.0 mg	Pancuronium 2 mg (100mcg/kg) (1 ml)
Mannitol	50 ml of 20% = 0.5g/kg	Propofol 2 ml of 1% = 1mg/kg
Mg SO4 50%	4.0 ml, slow iv	Suxamethonium 40 mg (2mg/kg) (0.8 ml)
Phenobarb	#NUM! mg, iv over 30 mins	Thiopentone 4 ml = 5 mg/kg
Phenytoin	360 mg, iv over 30 mins	Vecuronium 2 mg (100mcg/kg) (1 ml)

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