JULY. 2021, ISSUE 15

NHS
Doncaster and Bassetlaw Teaching Hospitals
NHS Foundation Trust

THE PEN

Paediatric Education Newsletter

The respiratory issue

ACUTE ASTHMA AND NEBULISED MAGNESIUM

Asthma is one of the commonest chronic paediatric conditions. Acute severe asthma is an exacerbation which is not responding to standard doses of β2 agonists and glucocorticosteroids.

Classification

Moderate	Severe	Life threatening
SPO2 > 92% Able to talk in complete sentences PEF > 50% best or predicted RR < 40/min (2-5 yrs), < 30/min (> 5 yrs) HR < 140/min (2-5 yrs), < 125/ min (> 5yrs)	SPO2 < 92% Can't complete sentences in one breath or too breathless to talk or feed PEF 33 - 50% best or predicted RR > 40/min (2-5 yrs), > 30/min (> 5 yrs) HR > 140/min (2-5 yrs), > 125/ min (> 5yrs)	SPO2 < 92% Silent chest, cyanosis PEF < 33 best or predicted Poor respiratory effort, hypotension, exhaustion, confusion

Target of therapy

-

Reducing

- Bronchoconstriction
- Airway inflammation
- Mucus Plugging

Aim of treatment

- Correct hypoxia
- Reverse airflow obstruction

MAGNESIUM SULPHATE - NEBULISED VS IV

Nebulised MgSO4 is not in DRI guidance but EMBRACE state 'to consider 150mg mixed into Salbutamol/Atrovent combined nebs in >2years presenting with acute severe asthma & sats <92%.

Physiology of MgSO4 in asthma

- Causes bronchial smooth muscle relaxation
- Anti-inflammatory effects
- Atrial stabilisation leads to reduced tachycardia
- Increases B2 receptor affinity for B2 agonists

NEB vs IV's

Quick administration

Fewer systemic side effects

No need for cannulation

Side effects:

Hypotension, muscle weakness, apnoea, ?longer to onset than IV MgSO4

ACUTE ASTHMA AND NEBULISED MAGNESIUM

What does the British Thoracic Society say?

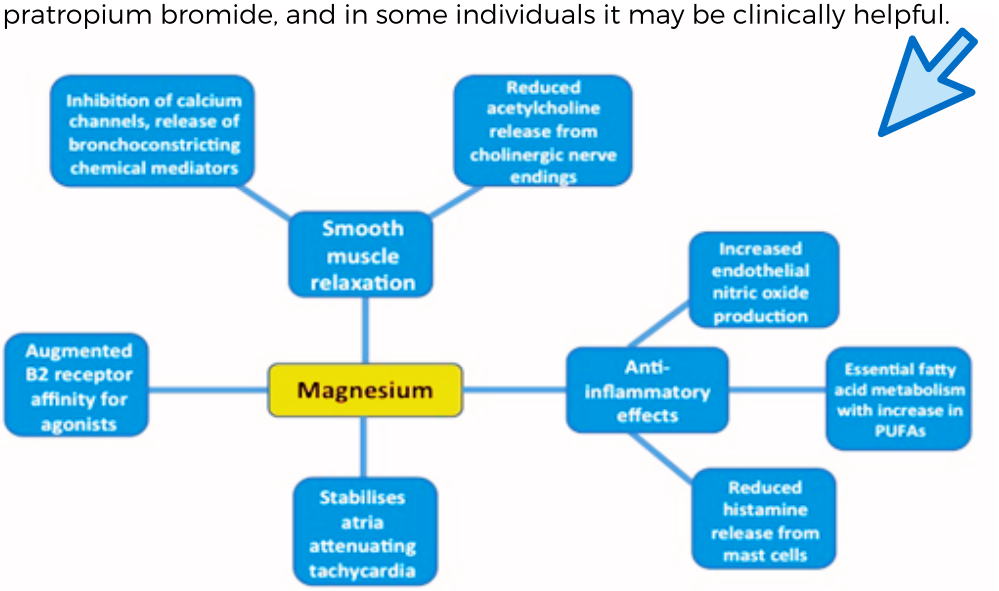
- There is no evidence to support the use of nebulised MgSO4, either in place of or in conjunction with inhaled β2 agonists in children with mild to moderate asthma. Level of evidence - A.
- A sub group analysis from a large RCT (MAGNETIC) suggests a possible role in children with more severe asthma attacks (oxygen saturation less than 92%) or with short duration of deterioration. Further studies are required to evaluate which clinical groups would benefit the most from this intervention.
- Recommendation: Consider adding 150 mg magnesium sulphate to each nebulised Salbutamol and Ipratropium in the first hour in children with a short duration of acute severe asthma symptoms presenting with an oxygen saturation less than 92%. Level of evidence - C (i.e. weak) .

MAGNEsium Trial In Children (MAGNETIC)

Design: Patients randomised to receive 3 doses of MgSO4 or placebo, each combined with Salbutamol + Ipratropium back to back nebs. Asthma severity score (ASS) measured at baseline and at 20, 40, 60 (T60), 120, 180 and 240 mins.
Setting: 2-15 yr olds with acute severe asthma in ED/children's assessment units at 30 hospitals in the UK.
Results: Total of 508 children; 252 received MgSO4 and 256 received placebo.

- Small, but statistically significant difference in ASS at T60 in those children who received nebulised MgSO4, which was sustained for up to 240 minutes. The clinical significance of this gain is uncertain.
- There is evidence of a larger effect in those children with more severe asthma exacerbations (p = 0.034) and those with a shorter duration of symptoms (p = 0.049).
- There were no clinically significant serious adverse events in either group.

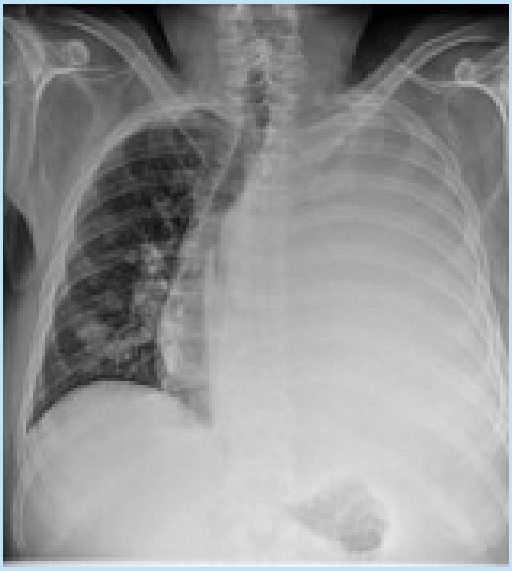
Conclusions: No harm is done by adding magnesium to salbutamol and ipratropium bromide, and in some individuals it may be clinically helpful.



CASE SCENARIO

The 'Whiteout' CXR

A 13-year-old with a background of cerebral palsy, epilepsy and hydrocephalus with VP shunt presented with a a 1 week history of cough and temperature. She was unwell with increased work of breathing and required 15L of oxygen initially to maintain her saturations. She was cannulated and started on IV cefuroxime and maintenance fluids. Her initial CRP was 219.4. A CXR showed a 'whiteout' on the left-hand side. What would be the differential diagnosis? How should this be treated?



A GIRL WITH A WHITEOUT CXR - DIFFERENTIALS 1/3

Empyema

- Request an USS to confirm the diagnosis.
- Give antibiotics with good staph and strep cover e.g. co-amoxiclav or cefuroxime.
- Refer to surgeons at SCH for consideration of drainage.
- Will need a long antibiotic course (e.g. 6 weeks of oral antibiotics) once drained.
- They should have a follow up x-ray as an outpatient when this course is completed.

A GIRL WITH A WHITEOUT CXR - DIFFERENTIALS 2/3

Effusion

- Typically present with shortness of breath often after a recent LRTI
- An USS should be carried out to confirm the diagnosis and decide if drainage is needed.
- If child is clinically well, with good sats and doesn't require drainage - give a long course of antibiotics (e.g. 6 weeks of oral co-amoxiclav) if an infective cause is suspected.
- A follow up x-ray should be done in 6 weeks' time.
- If there is no recent history of LRTI then suspect malignancy e.g. leukaemia. A FBC and film should be done, and further imaging may be indicated after discussion with oncology.

Severe pneumonia

- Consider PVL (Panton Valentine Leukocidin) staphylococcus aureus.
- About 2% of staphylococcus aureus bacteria produces the PVL toxin that can destroy WBCs.
- It usually causes invasive skin and soft tissue infections, but can cause a necrotising pneumonia either following blood borne spread from infected soft tissue or following a viral respiratory tract infection.
- Can cause a rapidly progressive bilateral pneumonia with haemoptysis and raised CRP with low WCC.
- If this is being considered then clindamycin should be added to the antibiotic regime. Linezolid and Rifampicin may then be commenced if the result is confirmed.

UPPER AIRWAY NOISES

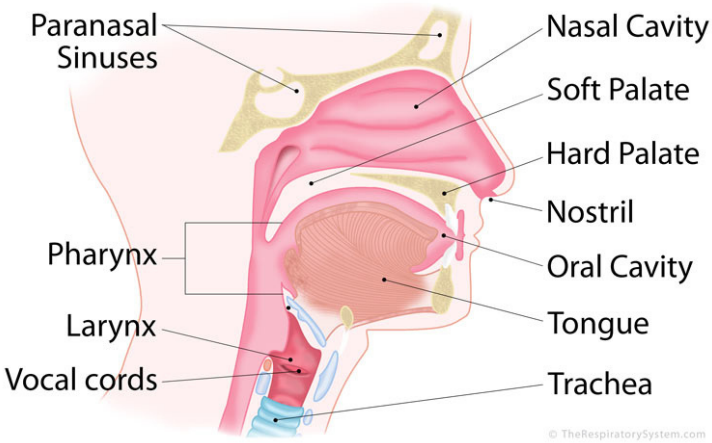
What we are looking for? (Assessment)

STRIDOR
Inspiratory noise - CAN BE both inspiratory and expiratory.

IMPORTANT CONSIDERATIONS
First presentation?
History of previous intubations or previous difficulty with intubation?
Is the airway stable?

KEY ASPECTS OF MANAGEMENT
AVOID UPSETTING THE CHILD
No tongue depressor
No cannula
Do not force oxygen mask on face

Upper Respiratory Tract



SEVERE OBSRTUCTION
Adrenaline nebulisers may temporarily relieve severe airway obstruction.
Dose of Adrenaline nebuliser is 0.4 ml/kg of 1:1000 solution, up to a maximum of 5 ml.

CAUSES UPPER AIRWAY NOISES

CROUP

MILD	MODERATE	SEVERE
Consider Dexamethasone 0.15mg/kg orally.	Dexamethasone 0.15- 0.6 mg/kg IV/PO (max 8 mg) single dose OR Nebulised Budesonide 2 mg, if PO not possible. Observation for 2-3 hours for improvement in RR/HR/air entry	Give Nebulised Adrenaline 400microgram/kg OR 0.4ml/kg of 1:1000 solutions up to maximum of 5mls – with O2 via face mask .This dose can be repeated if required. Child might require urgent intubation and transfer to PICU.

RECURRENT/ATYPICAL CROUP

- 2/> more episodes per year;
- Age less than 1 year OR more than 4 years ;
- Multiple hospital admissions with croup;
- Patients with a persistent weak cry or hoarse voice;
- Patients who did not respond to standard treatment of croup

Differential diagnosis of recurrent croup/stridor in children:

Congenital :

Subglottic stenosis, Cardiovascular anomaly- vascular ring, Tracheo-oesophageal fistula, Tracheobronchomalacia, Laryngotracheal cleft, Vocal cord palsy, Tracheal stenosis, Congenital goitre

Acquired :

Subglottic stenosis, Airway foreign body, Allergy, Gastro-oesophageal reflux, Infection- viral/ bacterial,

Tumours:

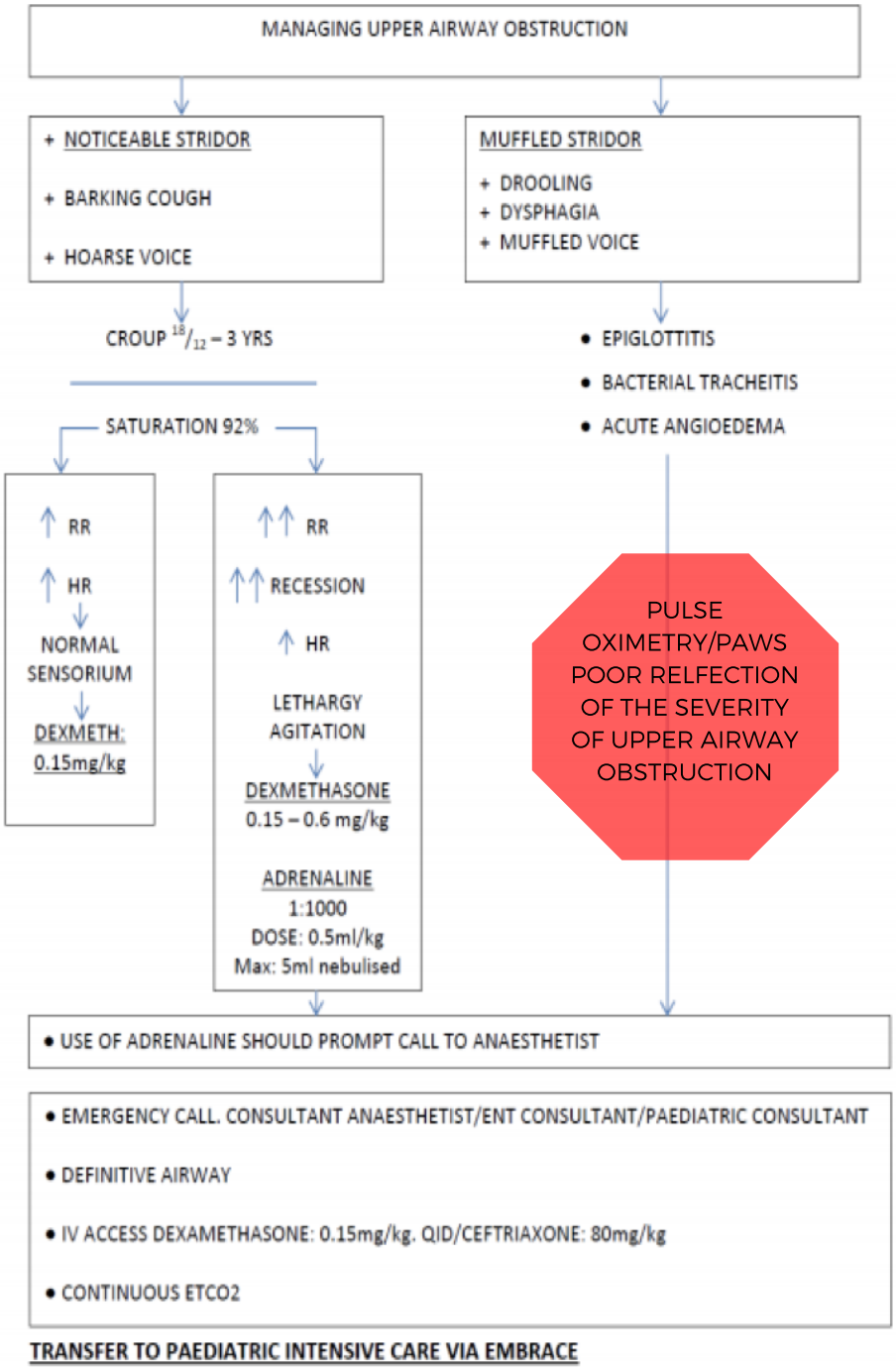
Subglottic haemagioma, Lymphangioma, Thymoma, Lymphoma, Mediastinal mass

WHEN TO INTUBATE

- **Suspected epiglottitis**
- **Inhalational injury**
- **Fall in GCS**
- **Respiratory failure**

EPIGLOTTITIS	FOREIGN BODY	BACTERIAL TRACHEITIS	INHALATION INJURY
Give humidified oxygen as tolerated Administer IV antibiotics only when airway secure Do not attempt oropharyngeal examination, since this may precipitate complete obstruction or attempt cannulation.	The management depends on the site and severity of airway obstruction- anaesthetist may need to clear the object under direct laryngoscopy or may need rigid bronchoscopy by ENT team.	Consider early intubation by anaesthetist. Administer IV antibiotics once the airway has been secured or is considered safe .	Call anaesthetic team and intubate early.

MANAGEMENT OF UPPER AIRWAY OBSTRUCTION



EXTRA RESOURCES AND JOURNAL ARTICLES

Links for additonal reading

- Acute asthma
- Bronchiolitis
- Stridor

WHAT ABOUT 2% LESS?

Bronchiolitis - what difference does 2% difference in SPO2 at discharge make?

NICE recommends that all patients be provided with supplemental oxygen if SPO2 persistently < 92% and may only be discharged if able to maintain oxygen saturations > 92% over a period of 4 hours and during sleep.

The American Academy of Paediatrics (2006) and WHO recommend that children with LRTI (commonly bronchiolitis), do not necessarily require supplemental oxygen and may be discharged if able to maintain SPO2 > 90% in room air. The AAP's recommendation is based on the benefit harm assessment. The benefits being decreased hospitalisations, length of stay and costs. Furthermore, the AAP states that an oxyhaemoglobin saturation >89% is adequate to oxygenate tissues, hence the risk of hypoxemia with oxyhaemoglobin saturation >89% is minimal. The WHO's stance is considered more of a pragmatic approach applicable in low-resource settings.

In 2015, BIDS was the first RCT that looked at the target SPO2 in bronchiolitis. From Oct to March 2012 & 2013, infants were randomly assigned to 2 groups, the first with standard oximeters and the second with modified oximeters that displayed an oxygen level of 94% when the real measured level was 90%. The RCT found that the time taken for symptoms to resolve was the same regardless of group. It was also found that when managed to 90% SpO2, fewer infants needed oxygen, and if needed, required oxygen for a shorter duration. They were also discharged home sooner. It was also found that infants managed at the lower target of 90% may regain satisfactory feeding and be back to normal sooner as well as have fewer readmissions to hospital.

Recent RCPCH guidelines (2021) have also advocated for discharging children with bronchiolitis with SPO2 in room air > 90% and there are no other clinical or social indications for admission.