

Children's respiratory conditions

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Learning outcomes

Be able to:

- Be able to describe the pathophysiology of asthma, bronchitis, bronchiolitis, croup and epiglottitis.
- Recognise the cardinal symptoms of croup and describe the pharmacological rationale for steroid therapy.
- Provide relevant evidence based education to patients and carers regarding the pathophysiology and treatment of bronchitis and bronchiolitis.
- Describe the appropriate signs and symptoms and referral of a patient with suspected epiglottitis
- Describe typical antibiotic and corticosteroid therapy for patients with epiglottitis.

COMMONWEALTH OF AUSTRALIA

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Common respiratory conditions in children

- Asthma in children – previously covered in Asthma lecture
- Croup
- Bronchitis
- Bronchiolitis
- Epiglottitis - uncommon but rapidly life threatening

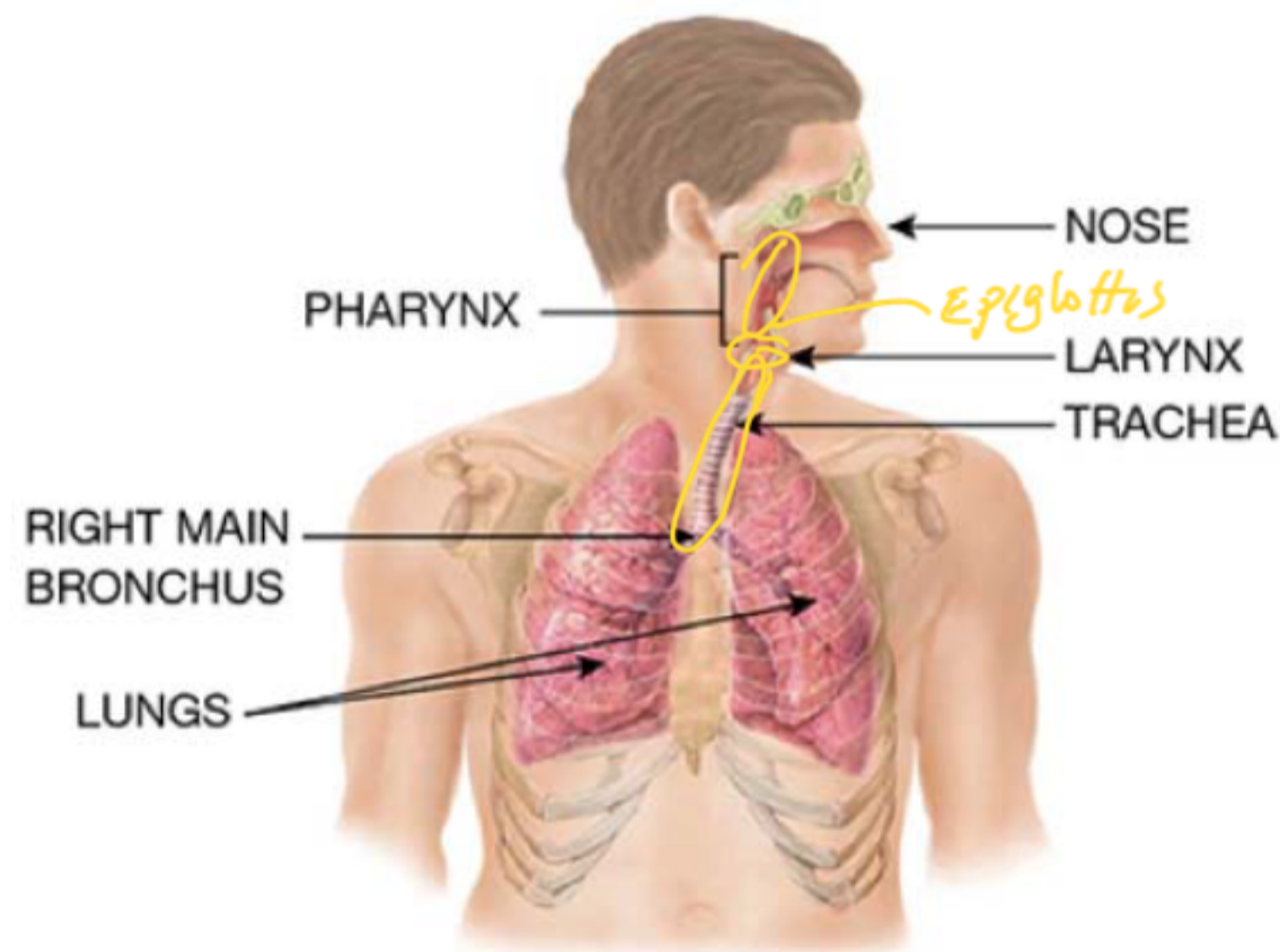


Croup

- Also known as laryngotracheobronchitis
- Common childhood disease
- Characterised by a sudden onset of distinctive barking or brassy cough accompanied by
 - Stridor – a noisy high pitched inspiratory breathing sound
 - Hoarse voice in children who are old enough to talk
 - Upper airway obstruction causing respiratory distress
 - Usually accompanied by fever and coryza (inflammation of the mucous membrane in the nose)
- More common in children under the age of 5
 - More common in children 1-3 years
 - but can occur at any age.
- Adults less susceptible due to larger airways
- Mostly a self-limiting disease and relatively easily treated with a short course of corticosteroids but can be life threatening
 - Duration usually around 2-5 days
 - Post-infective cough may persist
 - Treatment is indicated for all presentations of Croup
- More severe cases may require hospitalisation / overnight monitoring
- Infrequently can cause death – less common now as Croup is better understood in the community

Croup

- Caused by a viral infection leading to swelling of the larynx and



(a) Anterior view showing organs of respiration

Image taken from Tortora, GJ., Derrickson, B., Burkett, B., Peoples, G., Dye, D., Cooke, J., et al. Principles of anatomy and physiology. Second Asia-Pacific ed. Queensland, Australia: John Wiley & Sons; 2019.

- Croup usually caused by parainfluenza, influenza or other virus
- Swelling of the airway narrows airway and causes distinctive symptoms
- Croup is a clinical diagnosis – based on the signs rather than a laboratory diagnostic test
- Nasopharyngeal aspirate (NPA) confirms croup but does not alter management

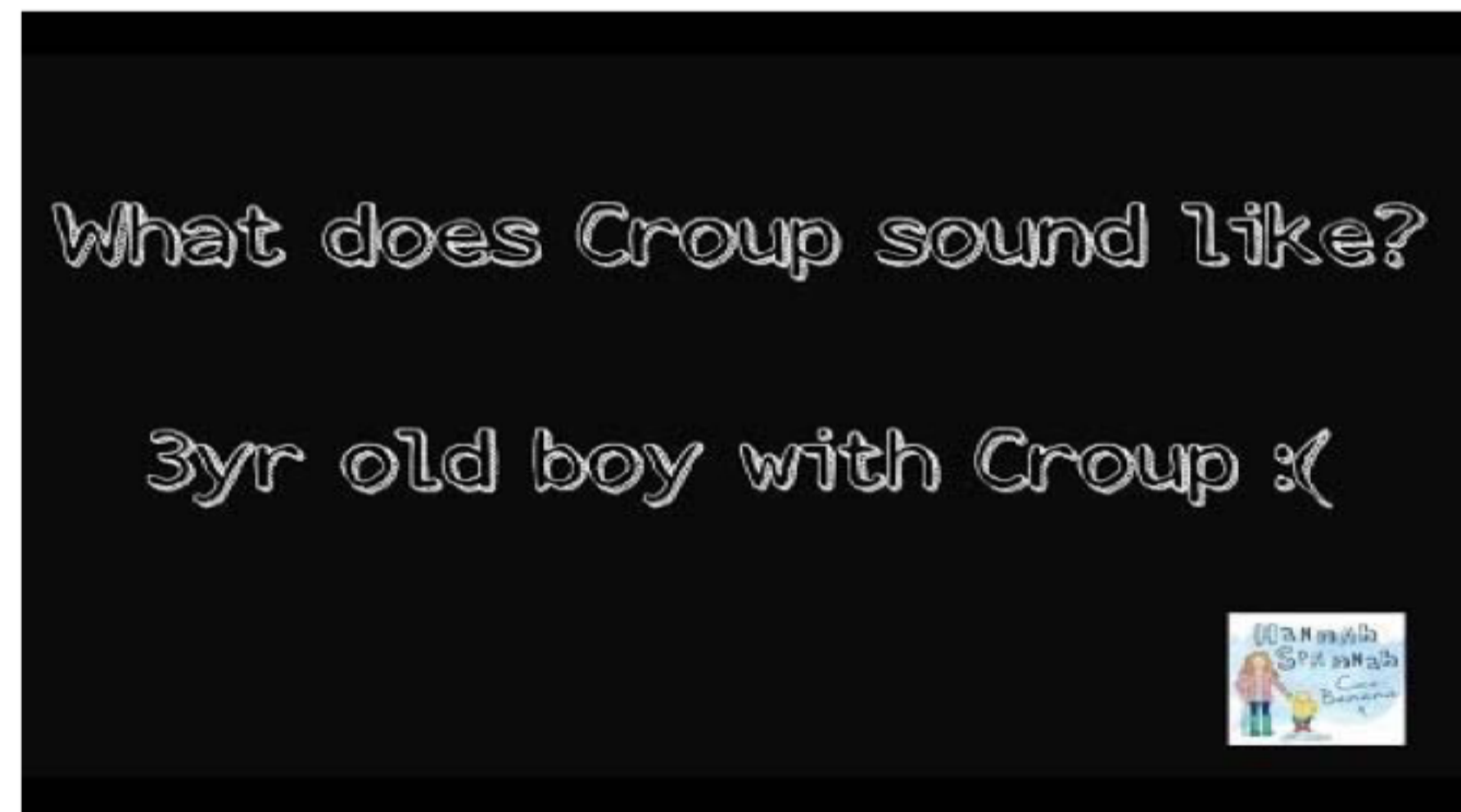
The barking cough and stridor or croup



Infant with croup and a barking cough
<https://youtu.be/fGP0vKQO4CY>



Stridor audio - <https://youtu.be/vDdJo0RPKa8>



3 year old boy with croup and a barking cough
<https://youtu.be/s7qomuX0Gjw?t=20>

You can review those videos via the links in the subject site

Croup

- Croup symptoms features more predominantly at night or early in the morning as the diurnal levels of endogenous glucocorticoids are lower

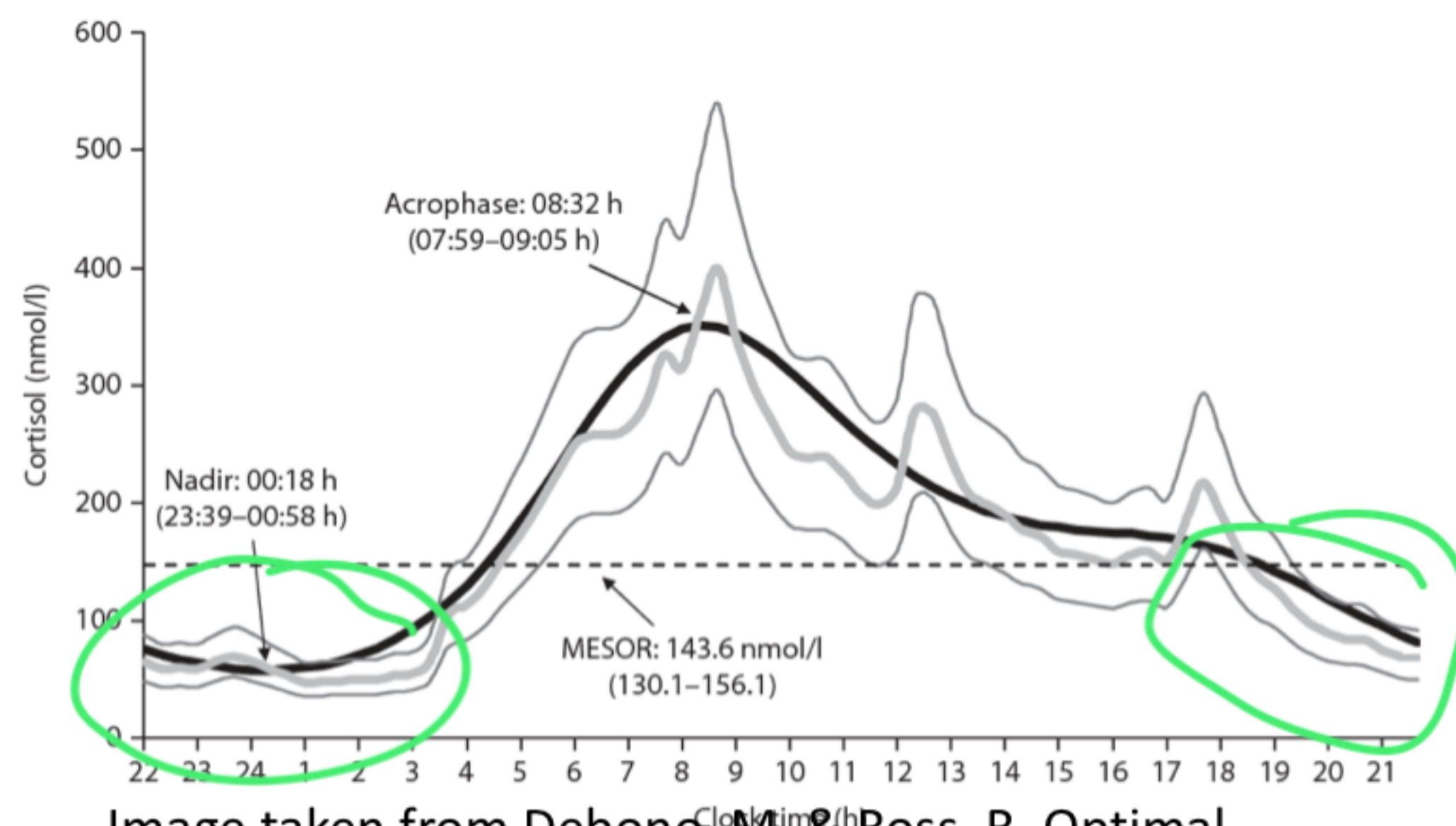


Image taken from Debono, M. & Ross, R. Optimal glucocorticoid therapy (Figure 1). *Endocrine development*. 2011;20:173-180. [10.1159/000321241](https://doi.org/10.1159/000321241). Accessed date 11 February 2020.

Croup

- Severity assessed on clinical features which will direct therapy
 - Increased respiratory rate
 - Increased heart rate
 - Presence of anxiety, agitation or confusion
 - Use of accessory muscles indicating increased work of breathing
 - Presence and degree of stridor
 - Hypoxia – a late sign
- Management is simple
 - Mild to moderate croup
 - Oral corticosteroids
 - Single dose budesonide 2mg via nebulizer
 - Dexamethasone 0.15mg/kg orally as a single dose
 - Prednis(ol)one 1mg/kg
 - Observation for first hour
 - Allow child to adopt the most comfortable position
 - Do not upset the child (will worsen the symptoms)

Croup

- Severe or life threatening Croup
 - Urgent nebulised adrenaline 1:1000 x 5ml undiluted. Use oxygen as driving gas if possible. Repeat after 30 minutes if no improvement plus
 - Nebulised or oral corticosteroids – as per mild-moderate croup
 - Ambulance to hospital
- Observation for at least 4 hours after treatment with adrenaline
- Allow child to adopt the most comfortable position
- Do not upset the child (will worsen the symptoms)



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 - Ambulance to hospital
 - Observation for at least 4 hours after treatment with adrenaline
 - Allow child to adopt the most comfortable position
 - Do not upset the child (will worsen the symptoms)
- Improvement in symptoms fairly fast
 - Nebulised adrenaline – 10-30 minutes
 - Effect can last for as little as 2 hours – watch rebound airway obstruction
 - Oral corticosteroids – improvement in around 6 hours.

Croup

- Benefits of steroids in Croup
 - Moderate to severe Croup
 - Improve respiratory symptoms
 - Reduction in hospital administration
 - Reduced hospital stay
 - Reduced admission to ICU
 - Reduction in representation to GP
 - Mild Croup (normal mental state, no stridor or only when distressed, no accessory muscle use, normal heart rate, can talk)
 - Still benefit
- All children with Croup benefit from corticosteroids – irrespective of duration or severity

Croup

- Refer all suspected cases of Croup to GP or in severe cases – ambulance to hospital – do not delay referral
- Affected children may also have asthma – treatment is the same

- Not recommended
 - Hydrocortisone as treating steroid – shorter duration of action does not give adequate coverage
 - Upsetting the child – keep child with carer - do not separate
 - Humidifiers or steam – no evidence of benefit
 - Examining the airway in a pharmacy setting
 - Antibiotics (most common cause parainfluenza virus)

Table 14-6 Comparison of oral/parenteral corticosteroids

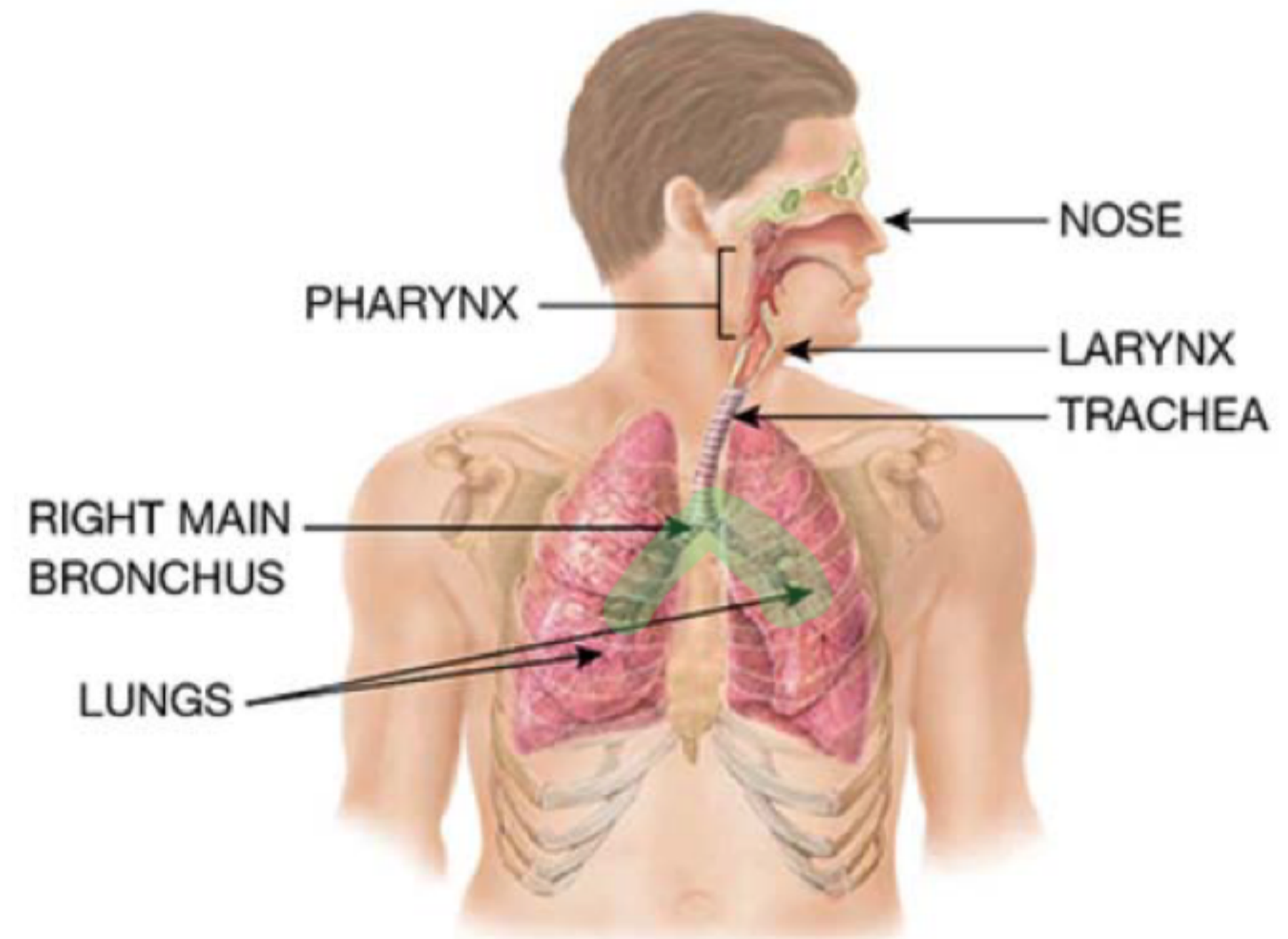
Drug	Routes	Equivalent anti-inflammatory oral or IV dose	Anti-inflammatory potency ¹	Sodium-retaining potency ²
betamethasone	IM, intra-articular, intradermal, soft tissue injection <i>36-72 HOURS</i>		25	0
cortisone	oral <i>DURATION 8-12 HOURS</i>	25 mg	0.8	0.8
dexamethasone	oral, IV, IM, intra-articular, soft tissue injection	0.75 mg	25	0
fludrocortisone	oral		10	125
hydrocortisone	oral, IV, IM	20 mg	1	1
methylprednisolone	acetate: intra-articular, intradermal, IM; sodium succinate: IV, IM	4 mg	5	0.5
prednisolone	oral <i>DURATION 12-36 HOURS</i>	5 mg	4	0.8
prednisone	oral	5 mg	4	0.8
triamcinolone	IM, intra-articular, intradermal		5	0

¹ relates to glucocorticoid activity
² relates to mineralocorticoid activity

Table 14-6 Comparison of oral/parental corticosteroids in section 14.5.2 Corticosteroids (page 677) in the Australian Medicines Handbook (2019).

Bronchitis

- Acute self-limiting lower respiratory tract infection of the bronchi
- Most common cause of presentation of cough in General Practice
- 90% of cases caused by common respiratory virus
 - Influenza
 - Respiratory syncytial virus (RSV)
 - Parainfluenza virus
 - Adenoviruses
- Less common cause
 - *Mycoplasma pneumoniae*
 - *Chlamydoiphila pneumonia*
- *Bacterial infection less common*



(a) Anterior view showing organs of respiration

Image taken from Tortora, GJ., Derrickson, B., Burkett, B., Peoples, G., Dye, D., Cooke, J., et al. Principles of anatomy and physiology. Second Asia-Pacific ed. Queensland, Australia: John Wiley & Sons; 2019.

Bronchitis

- Non-specific symptoms
 - purulent or coloured sputum
 - dyspnoea
 - wheeze
 - chest discomfort or pain (due to frequent coughing)
 - nasal congestion
 - headache
 - fever.
- Cough typically lasts for 2-3 weeks and is resolved within 4 weeks for most patients
- Cough may persist for up to 8 weeks.

Bronchitis

- Self-limiting condition
 - Viral in nature
 - Antibiotics not typically indicated
 - Patient expectation
 - Antibiotics are reasonably commonly prescribed despite lack of evidence for benefit and risk of harm
 - May be used if the patient is at high risk of developing / has developed pneumonia
 - Pain from cough and fever:
 - NSAIDs or paracetamol
 - Quit smoking
 - Avoid irritants – dust, chemical fumes, other air pollutants
- Useful to communicate this risk to patients who might ask you about antibiotics and bronchitis
 - Antibiotic resistance
 - Thrush infections
 - Clostridium difficile
 - Diarrhoea
 - Rash
 - Nausea
 - Hypersensitivity reactions

Bronchitis and bronchiolitis

- Bronchitis

- Affects bronchi – larger airways and is more common in older children and adults

- Bronchiolitis

- Affects the smaller bronchioles and is more common in children under two years of age

Bronchiolitis

- Viral infection of the lower respiratory tract
- Affects children more commonly under the age of 1 year– more common in that group under the age of 6 months
- Risk factors
 - Exposure to smoke
 - Premature birth
 - Hematological malignancy
 - Male children
- Usually begins with an acute upper respiratory tract infection followed by
 - Cough
 - Tachypnoea
 - Intercostal recession
 - Widespread inspiratory crackles
 - Expiratory wheeze
 - Fever
- Post-viral cough may persist for weeks after resolution of bronchiolitis

Bronchiolitis

- Diagnosis based on clinical presentation
- No investigations
- No pharmacological management
 - Supporting feeding and fluid intake
 - Small frequent feeds or
 - Nasogastric tube feeding
 - Oxygenation as required (when SpO₂ < 90%)
 - Minimal handling of infant
 - Admission to hospital for moderate to severe bronchiolitis
- Normally self limiting
- Peak severity usually around day 2-3 of illness with resolution over about 7-10 days
- Admission to hospital typically required for symptomatic care
 - difficulty feeding
 - moderate to severe work of breathing
 - increased respiratory rate.
 - oxygen saturation measured by pulse oximetry (SpO₂) less than 94%.

Bronchiolitis

- Not useful
 - B2-agonists
 - Corticosteroids
 - Adrenaline unless in arrest or peri-arrest
 - Nebulised hypertonic saline
 - Antibiotics
 - antivirals



Antibiotics may be used when there is evidence of a secondary bacterial lung infection

Epiglottitis – acute upper airway obstruction

- Epiglottitis small tissue covered cartilage flap that closes over the larynx and trachea to protect airway during swallowing
- During epiglottitis, the epiglottis and surrounding tissue swells and can block off the larynx / airway
- Very serious event

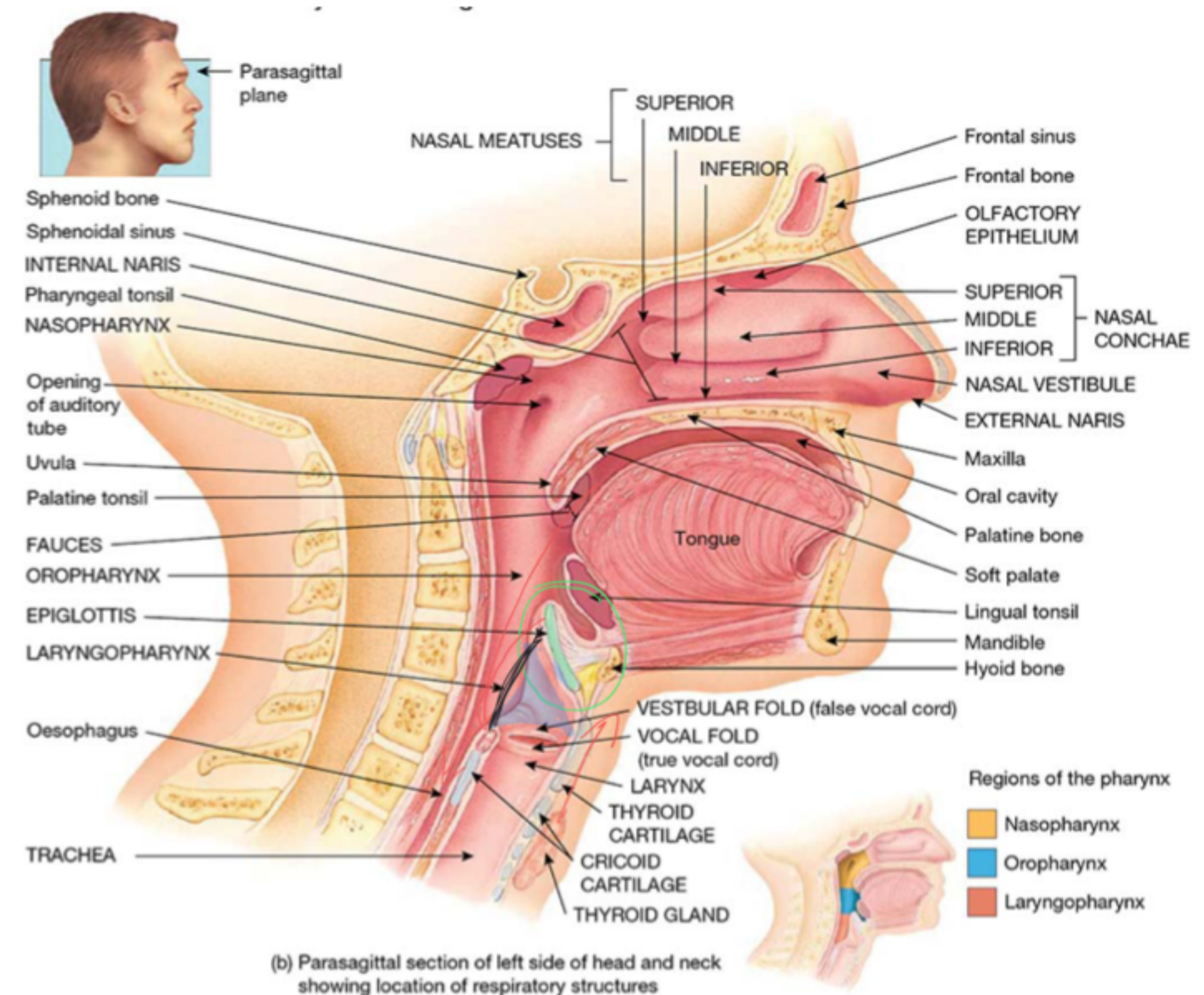
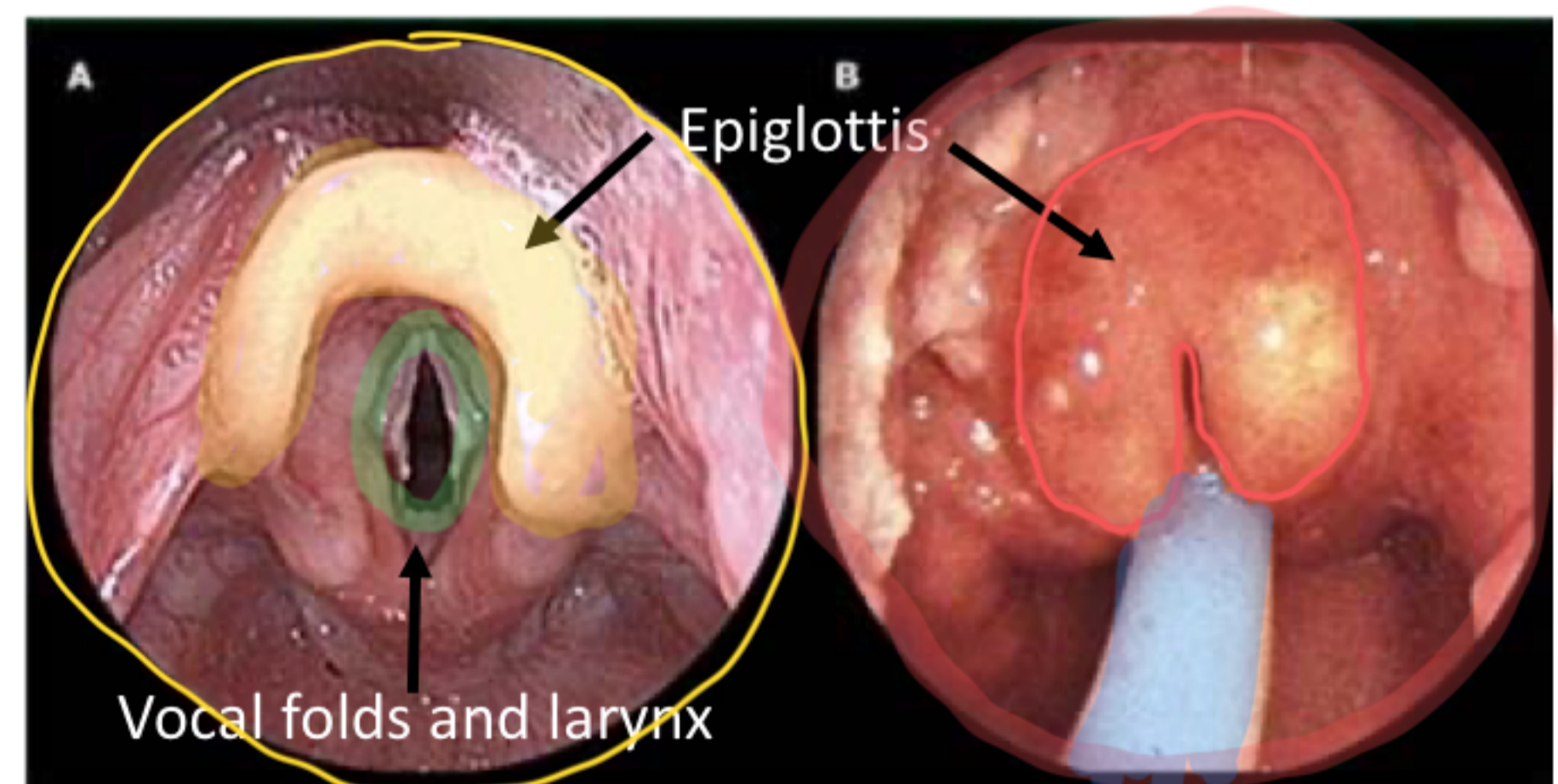


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Epiglottitis

- Can be caused by bacterial infection of the epiglottis and surrounding tissue
 - *Haemophilus influenzae* type B
 - *Streptococcus pneumoniae*
- Before the routine vaccination against *Haemophilus influenzae* type B with the Hib vaccine (at 2, 4, 6 and 18 months), infection most common in children
- now more common in adults and those not vaccinated against *Haemophilus influenzae* type B

- Children as still at greater risk of poor outcome due to smaller airway compared with adults
- Still potential fatal in both groups



A. Normal epiglottis and vocal folds

B. Epiglottitis with ETT tube inserted

Scope of epiglottitis

<https://youtu.be/4ghkNlg86tU>

Epiglottitis

- Sudden development of symptoms
 - Severe throat pain
 - Difficulty / pain swallowing
 - Fever
 - Drooling
 - Change in voice – sounds muffled
- Sepsis often accompanies epiglottitis
- Treatment
 - Airway management – ETT
 - Tracheotomy
 - IV Antibiotics
 - Maybe steroids
 - Transition to oral therapy
(ANTIBIOTICS)
- Prevention
 - Haemophilus influenzae type B vaccine

Epiglottitis

- Treatment
 - If you suspect epiglottitis – do not look at the throat – it can trigger a complete closure of the larynx and respiratory arrest
 - Epiglottitis is a medical emergency and needs to be sent to hospital
 - Keep the person calm and comfortable
 - Keep carer with child
 - Call ambulance
- Examination of the airway needs to be done with airway management facilities at hand
 - ED
 - Theatre
 - ICU

Epiglottitis

- IV antibiotics for acute epiglottitis
 - ceftriaxone 1 g (child 1 month or older: 50 mg/kg up to 1 g) intravenously, **daily**;
 - for patients with septic shock or requiring intensive care support, use ceftriaxone 1 g (child 1 month or older: 50 mg/kg up to 1 g) intravenously, **12-hourly**.
- cefotaxime 1 g (child: 50 mg/kg up to **1 g**) intravenously, 8-hourly;
- for patients with septic shock or requiring intensive care support, use cefotaxime **2 g** (child: 50 mg/kg up to 2 g) intravenously, 8-hourly.

Epiglottitis

- Alternative to ceftriaxone or cefotaxamine is moxifloxacin
- IV Dexamethasone
 - 0.15mg/kg up to 10 mg single dose
 - Can repeat after 24 hours if necessary
 - Evidence weak for benefit of corticosteroids but still commonly administered in epiglottitis
- Once patient begins to improve
- Switch to oral therapy
 - Amoxicillin + Clavulanate 875+125 mg 12 hourly
or
 - Cefuroxime 12 hourly
or
 - moxifloxacin