

PEM QUIZ: RESPIRATORY EMERGENCIES ANSWERS

1. B: While all of the physical findings listed are concerning, the presence of grunting is most indicative of significant respiratory distress and potential decompensation.
2. C: Though similar in presentation to other serious upper airway infections such as epiglottitis and retropharyngeal abscess, bacterial tracheitis is characterized by the production of copious amounts of sputum and secretions.
3. D: While many different viruses can cause bronchiolitis in infants (eg. adenovirus, parainfluenza, influenza, rhinovirus), RSV is the most common and is responsible for the majority of cases.
4. C: While FB ingestion is always important to consider, it is unlikely at this young age. A congenital airway anomaly is also possible but unlikely. The time course is too long for RSV, and pertussis is characterized by a preceding (catarrhal) stage of URI symptoms followed by a severe cough (paroxysmal stage). Chlamydia, on the other hand, is often characterized by a prolonged, dry, staccato cough in young infants (which *can* be confused with pertussis). If the infant also has a history of conjunctivitis, the diagnosis of chlamydia is even more likely. Fever is often absent.
5. D: Just like in asthma, the bronchodilating properties of ketamine makes it useful in bronchiolitis due to the frequent RAD component to the respiratory distress/failure. Though perhaps equally useful in infants < 3 months-old, it has not been FDA approved for use in this age group.
6. C: As “periodic breathing” with occasional pauses of up to 10 seconds or longer can be normal in young infants, it is important to have strict criteria for the evaluation of possible apnea in the absence of other concerning features in the history (eg., cyanosis or pallor, altered mental status, bradycardia, loss of muscle tone).
7. A: While all of the conditions listed are potentially serious, croup (viral laryngotracheobronchitis, a *clinical* diagnosis) is extremely unlikely to result in acute upper airway obstruction or precipitous deterioration. That is why most patients with croup are discharged home without any diagnostic testing, after treatment with steroids &/or nebulized racemic epinephrine followed by brief ED observation.
8. E: Peritonsillar abscesses are very uncommon in children < 12 years old, and are more likely to present with severe sore throat and drooling than with stridor. In contrast, up to 50% of retropharyngeal abscesses occur in children less than 12 months old and should always be considered in an infant with stridor but *without* a cough consistent with croup. (The diagnosis can be pursued by ordering a lateral soft tissue neck X-ray.)
9. E: While most patients with any of the other findings on exam or CXR will need to be hospitalized, pneumomediastinum can be seen in otherwise uncomplicated RAD exacerbations. After a brief observation period (eg. 4-6 hours) and repeat CXR, these patients *may* be able to go home if symptomatically improved without worsening of the CXR findings.
10. TRUE. Numerous recent studies have shown that MDI's, when used properly with a spacer, are as effective as nebulizers in all age groups. Here are several recent papers on this topic:
 - Leversha AM et al., Costs and effectiveness of spacer versus nebulizer in young children with moderate and severe asthma. *J Pediatr* 2000. 136: 497-502.
 - Rubilar L et al., Randomized trial of salbutamol via metered-dose inhaler with spacer versus nebulizer for acute wheezing in children less than 2 years of age. *Pediatr Pulmonol* 2000. 29: 274-9.
 - Mandelberg A et al., Is nebulized aerosol treatment necessary in the pediatric emergency department? *Chest* 2000. 117: 1309-13;
 - Schuh S et al., Comparisons of albuterol delivered by a metered dose inhaler with a spacer versus a nebulizer in children with mild acute asthma. *J Pediatr* 1999. 135:22-7.
11. D: Although the treatment for bronchiolitis is in general supportive (eg. hydration and oxygen as needed), bronchodilators seem to result in significant improvement in *some* patients. While research is ongoing on the topic of steroids and bronchiolitis, no form of steroids has yet been shown to result in significant clinical improvement and their use is therefore not generally recommended. (A recent study by Schuh S. et al., Efficacy of oral dexamethasone in outpatients with acute bronchiolitis. *J Pediatr* 2002, 140:27-32, suggests a possible improvement in bronchiolitics under 24 months treated with dexamethasone, but further studies are needed.)
12. C: The pediatric laryngeal structures are located relatively more *anterior* than in the adult. For this reason, a straight blade is generally preferred in younger children (in order to gain a more direct line of sight from the oropharynx to the cords). While the straight blade is often used to lift the epiglottis directly and expose the cords, it can also be used to displace the epiglottis indirectly much like a curved (eg. Macintosh) blade.

13. This has been shown to be TRUE, and has been generally accepted into clinical practice (unlike the use of albuterol MDI's instead of nebulizers, which is just now making its way from the literature into practice).
14. C: The knowledge that each of these patients has RSV might result in a change in clinical management *except* for the previously healthy 4-month-old with a URI and bronchiolitis – this patient can be treated according to the severity of his/her symptoms alone (ie., it doesn't matter whether he/she is RSV + or not). In contrast, a neonate or ex-preemie with underlying lung disease should probably be admitted for observation (the recommended cut-off for admission based on age alone varies in the literature from 4 to 8 weeks in *term* infants), and the critically-ill intubated patient's antimicrobial management may be guided by specific microbiologic testing including RSV and influenza A&B.
15. D: Pertussis is typically a prolonged illness and is characterized by three stages. The first stage (Catarrhal) lasts for 1-2 weeks and involves non-specific URI symptoms. The second stage (Paroxysmal) lasts for 2-4 weeks and involves the classic paroxysms of coughing with severe difficulty breathing afterwards (hence the name "whooping cough"). The third stage (Convalescent) lasts another 1-4 weeks during which recovery occurs. While an elevated WBC with a marked lymphocytic predominance strongly supports the clinical diagnosis, the WBC can be normal as well. Over 40% of cases occur before the age of 1 year, and 65% of cases occur before age 4. Pertussis does *not* usually involve significant fever, however, and if significant fever is part of the presentation then other diagnoses should be more strongly considered.
16. B: While the most common CXR finding is hyperinflation with increased peribronchial markings, interstitial infiltrates and segmental atelectasis are common as well and can be difficult to distinguish from pneumonia. Only about 10% of CXR's are strictly "normal".
17. FALSE: Unless given during the prodromal (Catarrhal) stage of the illness, during which the cough has not yet developed, antibiotic treatment (with Erythromycin or trimethoprim/sulfamethoxazole) does not shorten the course of symptoms (which can last for up to 6 months). Antibiotic treatment *is* important, however, in order to limit the spread of the disease. Children with laboratory-confirmed pertussis should not return to school until completing the full 14-day course of Erythromycin.
18. B: Although they may also present with cough and stridor, as in croup, patients with bacterial tracheitis tend to look sicker and fail to respond to treatment for croup (oral or IM Decadron, plus nebulized racemic epinephrine *if* inspiratory stridor occurs at rest or is severe). In addition, bacterial tracheitis is characterized by the production of significant sputum or secretions, which is not true for croup. If tracheitis is suspected, then a lateral neck film should be ordered to look for edema or soft-tissue densities within the trachea.
19. B: Even when promptly recognized and aggressively treated, pneumonia in the neonate still has a high mortality rate (up to 50% if GBS is the cause). Although not as common as in older children, viral infections including pneumonia are still relatively common in neonates and include RSV, influenza, varicella and CMV.
20. A: This is a classic case of *Mycoplasma*, which is the most likely cause of mild to moderate pneumonia in children over 5 years of age. Treatment options include erythromycin, clarithromycin and azithromycin.
21. D: Children who have received racemic epinephrine for stridor while in the ED should be observed for 3-4 hours prior to discharge (1 hour is too brief).

BONUS QUESTION. E: Methemoglobinemia, which is diagnosed by co-oximetry, often presents with cyanosis and a low pulse-ox (trending towards 85% as the level of methemoglobin increases) which is only partially responsive to oxygen. This condition has been associated with diarrhea in infants, as well as exposure to toxins and a long list of other causes. Given the cyanosis, low p^{ox} and tachypnea, it can easily be confused with a primary pulmonary process or congenital heart disease. However, a normal CXR, plus the poor response to 100% oxygen, makes either of these disease categories less likely. An ABG rarely provides a specific diagnosis, and in the context of methemoglobinemia will reveal a normal paO₂ (despite the low pulse-ox). With RSV bronchiolitis, if an infant were sick enough to be hypoxemic and in apparent severe respiratory distress, the lung examination would not be normal (there would be wheezing or crackles).