

NREMT Paramedic - Quiz Questions with Answers

Airway, Respiration & Ventilation

Airway, Respiration & Ventilation

1.

You are on-scene with a six-year-old who is unconscious and unable to protect his own airway. He is of average height, and his estimated weight is 23 kg. Which of the following endotracheal tube sizes would be most appropriate for this patient?

5.5-millimeter uncuffed endotracheal tube

5-millimeter cuffed endotracheal tube

7-millimeter cuffed endotracheal tube

4-millimeter uncuffed endotracheal tube

Correct answer: 5.5-millimeter uncuffed endotracheal tube

The Endotracheal Tube (ETT) size formula, $(\text{age}/4) + 3.5$ is used for cuffed ETT, or the formula $(16+\text{age})/4$ or $(\text{age}/4) + 4$ to calculate the uncuffed pediatric ETT size.

The appropriate size endotracheal tube for a 23-kg, six-year-old child would be a 5- to 5.5-mm internal diameter tube. However, since the child is six, he has a natural narrowing around the cricoid cartilage and does not require the use of a ballooned or cuffed endotracheal tube. A cuffed endotracheal tube may not correctly seal this patient's airway due to the narrowing or cause mucosal injury. Uncuffed ETT should be used in patients under 8 years of age.

A 5-mm cuffed ET tube would more appropriate for a very small adult or child who is over the age of eight. At eight years old, the natural narrowing of the cricoid cartilage expands to normal dimensions. Cuffed tubes should be used on all patients over age eight.

A 7-mm cuffed ET tube would be used on an average weight and height adult patient. It would not be appropriate for use on a 23-kg, six-year-old child.

A 4-mm uncuffed ET tube would be appropriate for use on a 10- or 11-kg toddler, not a six-year-old, 23-kg child.

2.

Which of the following would be considered normal respiratory rates?

Select the three correct answer options.

12-day-old with 52 breaths per minute

6-month-old with 46 breaths per minute

4-year-old with 26 breaths per minute

8-year-old with 32 breaths per minute

Normal pediatric respiratory rates:

- *Neonates (first 28 days of life): 30–60*
 - *Infant (one month to one year): 30–53*
 - *Toddler (one to two years): 22–37*
 - *Preschooler (three to five years): 20–28*
 - *School-aged child (six to 12 years): 18–20*
 - *Adolescent (12 to 15 years): 12–22*
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3.

After intubating an apneic adult patient, you quickly auscultate decreased breath sounds on the left side. Which of the following is most likely to cause this abnormal finding?

The ET tube has entered the right mainstem bronchus

The ET tube has entered the left mainstem bronchus

The tip of the ET tube is against the carina

The patient may be experiencing a left-sided pneumothorax

Correct answer: The ET tube has entered the right mainstem bronchus

If breath sounds are decreased or absent in the left lung, the ET tube may have passed into the right mainstem bronchus effectively bypassing the origin of the left main bronchus.

If the ET tube enters the left mainstem bronchus, it would occlude the right lung and cause decreased breath sounds on the right side, not the left. Also, the natural shape of the bronchus will usually cause the tube to enter the right lung, not the left.

If left lung sounds are diminished, it is not likely that the tube is against the carina of the lungs. If this were the case, bilateral lung sounds would be diminished, and the patient would be difficult to ventilate.

Left-sided diminished breath sounds are common when the tube is advanced too far. It is much more likely that this is the case rather than a pneumothorax.

4.

Your fifty-year-old COPD patient presents with a productive cough, pleuritic chest pain, and a fever with chills. Which of the following should you suspect due to the patient's signs, symptoms, and history?

Bacterial pneumonia

COPD exacerbation

Congestive heart failure

Chronic bronchitis

Correct answer: Bacterial pneumonia

Pneumonia can be classified as viral, bacterial, mycoplasmal, or aspiration. Bacterial pneumonia normally manifests with the classic signs and symptoms of a productive cough, pleuritic chest pain, and a fever with chills. Bacterial pneumonia is often referred to as typical pneumonia.

The classic signs associated with a COPD exacerbation include a cough and chest tightness. The patient may even have a productive cough and wheezing; however, the fever with chills is a tell-tale sign of an infectious disease such as pneumonia.

Patients with congestive heart failure will likely present with a cough, orthopnea, and nocturnal dyspnea. However, there is no fever associated with congestive heart failure.

Patients with chronic bronchitis present with a productive cough but not with fever and chills.

5.

Which of the following are indicators of lower airway obstruction?

Select the 3 answer options which are correct.

Rales

Rhonchi

Wheezing

Stridor

Wheezing is associated with bronchospasm, indicating lower airway obstruction. Rales, also known as crackles, are associated with fluid in the alveoli and indicate a lower airway issue. Rhonchi are sounds caused by mucus or other secretions in the larger airways, indicating lower airway obstruction.

Stridor is a high-pitched, wheezing sound caused by disrupted airflow, typically indicating an upper airway obstruction.

6.

You decide to administer CPAP to your spontaneously breathing patient who is complaining of dyspnea. What should the initial pressure valve setting be on a fixed rate FiO₂ CPAP device?

Between 5 and 10 cm H₂O

Between 2 and 5 cm H₂O

Between 1 and 3 cm H₂O

Greater than 10 cm H₂O

Correct answer: Between 5 and 10 cm H₂O

CPAP can be attached to a well-fitting face mask that is delivering oxygen to the patient. The breathing circuit may have a fixed or adjustable FiO₂ setting and a programmable pressure valve. The initial pressure valve setting for the CPAP device in the pre-hospital setting should be between 5 and 10 cm H₂O. This setting should deliver enough pressure to help keep the alveoli open at the end of the respiratory cycle without altering perfusion at the tissue level.

A pressure valve setting below 5 cm H₂O will not deliver enough end of respiration pressure to the alveoli to keep them from collapsing.

A pressure valve setting on the CPAP device that exceeds 10 may be needed to effectively improve perfusion by keeping the alveoli open at the end of respiration; however, most local protocol and medical command physicians recommend initial pressure settings of between 5 cm and 10 cm H₂O, increased in 1cm increments until the desired effect is achieved and perfusion improves.

7.

All the following are indications that artificial ventilation is adequate except:

ETCO₂ levels are above 45 cm/H₂O

The pulse returns to a normal rate

Adequate chest rise and fall

SpO₂ rises from 88% to 94%

Correct answer: ETCO₂ levels are above 45 cm/H₂O

ETCO₂ levels can be an indicator of adequate ventilations. Normal ETCO₂ levels are 35–45 cm/H₂O, so a level above 45 would most likely indicate that ventilations are not adequate.

Artificial ventilations are indicated for a patient with insufficient breathing. Using a bag-valve mask is the most effective way to deliver artificial ventilations. Indications that ventilations are effective include adequate chest rise and fall, oxygen saturation level increases, and the pulse returning to a normal rate. Another indication would be if lung sounds can be auscultated during ventilations.

8.

You are preparing to intubate an apneic patient and decide to use a Macintosh blade. When using a curved blade on an adult, where should the tip of the laryngoscope blade be placed?

Directly into the vallecula

Directly under the epiglottis

Space below the vallecula

Directly on the epiglottis

Correct answer: Directly into the vallecula

When using a curved blade, advance the tip of the blade into the vallecula (the space between the base of the tongue and the pharyngeal surface of the epiglottis).

It would not be appropriate to place the tip of the blade below the epiglottis. This would not allow the direct line of vision that a curved blade provides when it is placed and used appropriately. Although it is normal practice to place the tip of a straight blade directly under the epiglottis, placing the tip of the curved blade into the space below the vallecula would place the tip too low and destroy the straight-line visibility of the vocal cords. It would not be appropriate to place the tip of the blade on the epiglottis. After placing the blade tip, it is lifted up and away. Therefore, there is a lot of pressure put on the blade. The epiglottis would be damaged, and the improper placement would not help line up the trachea for intubation.

9.

Which of the following is a complication of extubating a patient?

Laryngospasm

Seizure

Bradycardia

Bronchoconstriction

The most common complications of extubation are overestimation of the patient's ability to manage their own airway and acute laryngospasm. Paramedics should anticipate laryngospasm when performing extubation.

Seizure, bradycardia, or bronchoconstriction are not complications of extubating a patient.

10.

What is the medication type of choice for relieving bronchospasm associated with COPD in the pre-hospital setting?

Beta-agonists

Steroids

Anticholinergics

Sympathomimetics

Correct answer: Beta-agonists

The medications used in the pre-hospital setting to relieve bronchospasm and reduce constriction of the lower airways are the beta-agonist agents such as albuterol and levalbuterol.

Other medication types such as steroids may be prescribed for the patient after ER physician evaluation. Steroids include medications such as methylprednisolone.

Nebulized anticholinergics are often prescribed after physician evaluation to help relieve bronchoconstriction that has not improved with beta-agonists and steroids.

Sympathomimetic medications have both alpha and beta effects and are often prescribed by the patient's physician. They are not often ordered in the pre-hospital setting due to the higher incidence of side effects.

11.

Which of the following advanced airway procedures is considered a supraglottic airway device?

King LTD airway

Endotracheal tube

Double lumen endotracheal tube

Oropharyngeal airway

Correct answer: King LTD airway

Supraglottic airway devices deliver oxygen to an area of the trachea above the glottic opening or vocal cords. This type of advanced airway control is achieved with devices such as a King LTD, a Combitube, and a laryngeal mask airway.

Endotracheal tubes deliver O₂ below the level of the vocal cords.

There is not a double-lumen endotracheal tube, only cuffed single-lumen or uncuffed ET tubes.

An oropharyngeal airway is inserted in the oropharynx to keep the airway patent by preventing the tongue from covering the epiglottis. It is not considered a supraglottic airway device.

12.

After being unable to clear a foreign body obstruction from the airway of your now unconscious adult patient using the Heimlich maneuver, which of the following interventions would be the most appropriate?

Initiate chest compressions

Supine abdominal thrusts

Direct laryngoscopy and Magill forceps

Blind finger sweeps

Correct answer: Initiate chest compressions

If a conscious patient, becomes unconscious while attempting supine abdominal thrusts, immediate chest compressions are indicated.

Supine abdominal thrusts should have already been attempted when the Heimlich maneuver was being attempted. Therefore, repeating the abdominal thrust is not likely to produce results.

Magill forceps and direct laryngoscopy are not recommended until after chest compressions.

Blind finger sweeps would not be appropriate when attempting to clear the obstruction, especially after employing the use of a laryngoscope. Use Magill forceps to remove any visible foreign matter only.

13.

You are performing orotracheal intubation on an average-sized, apneic adult. At what depth marking should the airway be properly positioned 2 to 3 cm above the carina?

19 to 23 centimeters

9 to 13 centimeters

32 to 36 centimeters

29 to 32 centimeters

Correct answer: 19 to 23 centimeters

The paramedic must check the depth markings on the ET tube during intubation. In an average-sized adult, the tube is properly positioned when the patient's teeth are between 19 and 23 cm. The carina is usually located within 27 cm, so inserting the tube to the 19 to 23 cm mark will place the tube about 2 to 3 cm above the carina.

The distance from the teeth to the carina is around 27 cm in the average adult. Therefore, it would not be appropriate to stop at the 9 to 13 cm mark. The tube would not be in the trachea or esophagus at that depth.

Inserting the ET tube to 29 to 36 cm would most likely put the tip of the tube into the left mainstem bronchus, occluding airflow to the right lung.

14.

Which of the following medical conditions or injuries is most likely to cause problems with both the internal and external processes of normal respiration?

Emphysema

Congestive heart failure

Lung cancer

Chronic hypertension

Correct answer: Emphysema

Emphysema is an obstructive airway disease that progresses over years. Patients with emphysema have problems with getting inspired air into their lungs due to decreased lung compliance (external respiration) and problems with the oxygen/carbon dioxide exchange at the tissue level. This interferes with internal respiration or gaseous exchange (internal respiration).

Patients with congestive heart failure have problems exchanging oxygen/carbon dioxide at the tissue level (internal respiration) due to the presence of pulmonary edema and fluid shift. However, they do not have problems with the actual process of breathing (external respiration).

Patients with lung cancer have diffusion problems in the lungs making the normal exchange of oxygen and carbon dioxide impossible at the cellular/tissue level (internal respiration). Lung CA patients without COPD (emphysema, asthma, chronic bronchitis), do not have problems with the actual inspiratory/expiratory phase of respiration (internal respiration).

Patients with chronic hypertension may have problems with proper oxygen/carbon dioxide exchange at the cellular/tissue level (internal respiration) due to the high pressure involved. However, chronic hypertension patients without COPD do not have problems with the actual act of breathing (external respiration).

15.

Which of the following are nondepolarizing neuromuscular blocking agents used for Rapid Sequence Intubation (RSI)?

Select the 3 answer options which are correct.

Vecuronium bromide (Norcuron)

Pancuronium bromide (Pavulon)

Rocuronium bromide (Zemuron)

Succinylcholine (Anectine)

Rocuronium bromide (Zemuron), pancuronium bromide (Pavulon) and vecuronium bromide (Norcuron) are nondepolarizing neuromuscular blocking agents used in Rapid Sequence Intubation (RSI).

Succinylcholine (Anectine) is the only depolarizing neuromuscular blocking agent used for RSI. Use succinylcholine with caution; it causes muscle fasciculations and may have contraindications.

16.

Which of the following medication types are used to decrease the workload of the heart by blocking sympathetic stimulation of receptors that work on the SA node and myocardial cells, thus decreasing the force of myocardial contraction and directly reducing a patient's heart rate?

Beta-blockers

Calcium-channel blockers

Sodium-channel blockers

Alpha-adrenergic agents

Correct answer: Beta-blockers

Beta-blockers are a group of cardiac medications that effectively reduce heart rate by blocking sympathetic stimulation of the beta receptors that stimulate the SA node and other myocardial cells. They effectively decrease the force of the myocardial contractions, causing a direct reduction in heart rate. Examples of beta-blocking agents include metoprolol, labetalol, sotalol, and propranolol.

Calcium-channel blockers work by relaxing smooth muscles to provide vasodilation as well as reducing heart rate and stroke volume of the heart. They do not effectively block the beta-receptors on the SA node. Examples include diltiazem (or Cardizem), verapamil, and nicardipine.

Sodium-channel blockers work by impairing conduction of sodium ions through sodium channels used in the treatment of cardiac dysrhythmias. They do not effectively block the sympathetic stimulation of the beta-cells that work on the SA node. An example of this type of agent is lidocaine.

Alpha-adrenergic blockers are used to lower blood pressure by dilating peripheral blood vessels, causing a decrease in peripheral vascular resistance. They do not block the beta-cells nor do they slow heart rate. Common examples include Cardura, Minipress, and Flowmax.

17.

Which of the following are considered lower airway infections?

Select the 3 answer options which are correct.

RSV

Bronchiolitis

Pneumonia

Cystic fibrosis

Respiratory Syncytial Virus (RSV), bronchiolitis, and pneumonia are considered lower airway infections.

Cystic fibrosis is a disease that affects the lower airways and is caused by genetic factors, not an infection.

18.

Which of the following may be indicated for an adult patient with pulmonary edema?

Select the 2 answer options which are correct.

Nitroglycerin

CPAP

Albuterol

Aspirin

Nitroglycerin has proven to be highly beneficial when used for patients with pulmonary edema, as it leads to a reduction in arteriolar pressure that decreases hydrostatic pressure in the capillary bed. This reduces fluid being forced out of the capillary into the lungs. Continuous positive airway pressure (CPAP) treats pulmonary edema by increasing pressure in the alveoli, forcing fluid back into the interstitial space and out of the lungs.

Albuterol is a bronchodilator used frequently to reverse bronchospasm, but it has little effect on pulmonary edema. Aspirin is used in acute coronary syndromes to reduce thrombosis and slow the progression of a myocardial infarction (MI). It is not useful in managing pulmonary edema.

19.

Your adult motor vehicle accident patient has sustained a closed pneumothorax that is quickly approaching a tension pneumothorax while you are still twenty minutes from the trauma center. He is tachycardic, breathing rapidly with decreased breath sounds on the right side, and increasing jugular vein distension. At last reassessment, he begins showing signs and symptoms of shock and hypotension. What should be your next intervention in this situation?

Chest decompression using an 8-mm or larger, 10- or 14-gauge IV catheter inserted in the second intercostal space in the midclavicular line, just above the rib

Chest decompression using a 5-mm or longer, 8- or 10-gauge IV catheter inserted in the second or third intercostal space laterally on the unaffected side

Chest decompression using a 6-mm or larger, 10- or 14-IV catheter inserted in the first intercostal space in the midclavicular line, just below the rib

Chest decompression using a 5-mm or larger, 10- or 14-gauge IV catheter inserted in the second intercostal space in the midaxillary line on the affected side

Correct answer: Chest decompression using an 8-mm or larger, 10- or 14-gauge IV catheter inserted in the second intercostal space in the midclavicular line, just above the rib

If a paramedic is forced to decompress a tension pneumothorax in the pre-hospital setting, it is important to contact medical command for direction. Once the decision has been made to decompress a patient's chest, it should be accomplished by using an 8 mm or larger, 10- or 14-gauge IV catheter. The site of choice, if possible, is the second intercostal space in the midclavicular line. The tip of the catheter should enter anteriorly, just above the rib, to avoid damaging the nerve, artery, and vein that runs under each rib.

A 5-mm IV catheter is too short to effectively pierce the chest wall and pleural space in any adult decompression situation. Also, the catheter should be inserted in the fourth or fifth intercostal space laterally on the affected side, not the second or third intercostal space on the unaffected side. A 6-mm or larger catheter would likely be too short to effectively pierce the chest wall and pleural space. In addition, the catheter should not be inserted in the first intercostal space and never below the rib. A 5-mm IV catheter would be too small to effectively pierce the chest wall and pleural

space; it requires an 8-mm or larger. The catheter should be inserted in the fourth or fifth intercostal space laterally, not the second.

20.

If a patient is suffering from pulmonary edema, which of the following will be helpful in increasing the patient's lung volume and vital capacity while reducing venous return to the heart and helping to diminish the overall work of breathing without affecting blood pressure?

Placing the patient in a sitting position with legs dependent

Administering 0.04 mg of nitroglycerin sublingually

Administering 2 mg of morphine sulfate intravenously

Placing the patient on the left side and ventilating at a fast rate with BVM

Correct answer: Placing the patient in a sitting position with legs dependent

The paramedic should place the patient with pulmonary edema in a sitting position with their legs dependent. This position increases the patient's lung volume and vital capacity. It also directly reduces venous return and the work of breathing.

Nitroglycerin is a powerful vasodilator; it is not effective in increasing lung volume or capacity.

Morphine is a narcotic analgesic effective in reducing venous return and reducing work of breathing but does not increase lung volume or vital capacity.

Placing the patient on the left side will not decrease venous return to the heart, BVM may help increase ventilation but not the vital capacity or volumes without risk of barotrauma.

21.

Which of the following conditions will cause changes in breath sounds?

Select the three correct answer options.

Cystic fibrosis

Tension pneumothorax

Hemothorax

Pulmonary embolism

Cystic fibrosis is a genetic disorder that affects the lungs and can cause crackles or wheezes. A tension pneumothorax occurs when air in the pleural cavity displaces the lung and results in an absence of breath sounds on the affected side. A hemothorax is an accumulation of blood in the pleural space and results in diminished or absent lung sounds on the affected side.

A pulmonary embolism is a clot or obstruction of a pulmonary blood vessel and does not affect lung sounds.

22.

Your adult patient was involved in a structure fire and received possible airway burns. The patient complains of shortness of breath, but there are no obvious burns noted in the oropharynx. However, the patient's dyspnea fails to improve after several minutes of high-flow oxygen therapy, and their lung sounds reveal a grating sound during equal inspiration/exhalation.

Which of the following should you suspect?

A loss of pulmonary surfactant

Fluid accumulation in the small airways

Bronchoconstriction

Associated rib fracture

Correct answer: A loss of pulmonary surfactant

One effect of toxic smoke inhalation, even in the absence of acute airway burns, is the destruction of pulmonary surfactant. Pulmonary surfactant is a thin film made by the alveolar cells. The purpose of this fluid is to allow the alveoli to expand and contract as needed during ventilation without collapsing. The absence of surfactant can often be heard as a grating sound during auscultation, similar to a pleural rub. Medical control may order CPAP if the patient exhibits signs of respiratory failure.

Edema can be caused by airway burns and toxic smoke inhalation. However, this is heard as wet lung sounds during auscultation. Breath sounds, such as rales and rhonchi, are common with pulmonary edema.

Bronchoconstriction can be caused by airway burns and toxic smoke inhalation. However, this would be evident by wheezing, use of accessory muscles, and other signs and symptoms of a narrowed airway.

There is no reason to assume a rib fracture exists in a patient who does not complain of associated trauma based solely on the presence of grating sounds heard during respiration and shortness of breath.

23.

Which of the following tubes would be most appropriate for nasotracheal intubation for an average height and weight adult?

Cuffed 6.0–6.5 mm endotracheal tube

Uncuffed 6.0–6.5 mm endotracheal tube

Cuffed 7–8 mm endotracheal tube

Uncuffed 7–8 mm endotracheal tube

Correct answer: Cuffed 6.0–6.5 mm endotracheal tube

At times, nasotracheal intubation may be the preferred method of airway control. This may be the case in patients who have spontaneous respirations, when laryngoscopy is determined too difficult due to anatomy or laryngospasm or when the motion of the cervical spine must be very limited. Conscious patients tolerate a nasal tube better; they cause less tracheal trauma. The best nasal tube for intubating an average height and weight adult would be a tube that is one size smaller than the optimal tube size for endotracheal intubation and cuffed.

When performing nasal intubation, it is important to choose a tube that is cuffed and one size smaller than the optimal endotracheal tube for the patient. Therefore, using an uncuffed tube of any size would not allow the paramedic to seal the air from escaping from around the tube, making the tube useless.

Using a 7–8 mm cuffed ET tube for nasally intubating an average height and weight adult would likely be too large a diameter to fit into the nostrils without causing unneeded trauma. Remember, the optimal nasal tube is cuffed, and one size smaller than the appropriate endotracheal tube would have been.

A 7.0–7.5 mm cuffed ET tube is considered the correct size for orotracheal intubation of an average height and weight adult patient.

24.

Which of the following illnesses result from infection and will most likely cause respiratory distress in pediatric patients?

Select the three correct answer options.

RSV

Croup

Epiglottitis

Asthma

Croup is a viral infection of the upper airway. Epiglottitis is swelling of the epiglottis that results from an upper respiratory infection. RSV (respiratory syncytial virus) is a common respiratory viral infection. All these are likely to cause respiratory distress in pediatric patients.

Asthma is a reactive airway disease and is not caused by an infection. It will also likely cause respiratory distress in pediatric patients.

25.

Which of the following are signs of respiratory distress in the pediatric patient?

Select the 3 answer options which are correct.

Nasal flaring

Retractions

Inspiratory stridor

Jugular vein distention

Signs of pediatric respiratory distress include:

- *Nasal flaring*
- *Retractions*
- *Inspiratory stridor*
- *Irritability*
- *Tachypnea*
- *Grunting*
- *Abdominal breathing*

Jugular vein distention is a sign of pediatric heart failure, not respiratory distress.

26.

After intubating your apneic patient, you use the primary placement confirmation method to determine the ET tube is most likely in the trachea. Using mechanical confirmation means, such as a colorimetric capnography device, what color would confirm the tube is in the trachea?

Yellow

Purple

Tan

Pink

Correct answer: Yellow

When a colorimetric device is attached to the ET tube, the color of the indicator changes when elevated levels of carbon dioxide are detected. The high levels of carbon dioxide can be expected to come from the lungs via the trachea but not the esophagus. Yellow indicates a high level of carbon dioxide and indicates the tube is most likely in the trachea.

A memory aid for colorimetric devices is as follows: yellow (yes, the tube is in the trachea), tan (think about it; the tube may be in the trachea), and purple (problem, the tube is not in the trachea).

Pink is not a color used on most colorimetric devices.

27.

After intubating your adult patient, you quickly auscultate decreased breath sounds on the left side and breath sounds on the right are clear. Which of the following is most likely to cause this to occur?

A right mainstem intubation

A left mainstem intubation

Tip of the tube against the carina

The patient is elderly and likely suffered a pneumothorax during the event

Correct answer: A right mainstem intubation

When an endotracheal tube is advanced too far into the trachea, it will most likely end up in the right mainstem bronchus in adults. This is because of the natural slope involved in the branching of the two main bronchi. This becomes evident when initial breath sounds reveal unequal breath sounds and expansion. The patient can be expected to have decreased breath sounds on the left side of the chest due to the blocking of air entering the lung by the ET tube itself. The patient will have right-sided breath sounds with adequate expansion due to the tube directly ventilating the right lung only.

The tip of endotracheal tubes does not normally end up in the left mainstem bronchus when the tube is initially advanced too far during intubation, but it is possible. The key finding in the event of a left mainstem bronchus intubation is decreased breath sounds on the right side and adequate breath sounds with normal or hyper-expansion on the left side of the chest.

If the tip of the tube is advanced to the point of lying against the carina of the lungs, the patient would most likely present with equal but diminished breath sounds. The key finding is a patient that is hard to bag after intubation with a tube that may be advanced past the 23-cm mark.

It is not appropriate to initially assume that your newly-intubated patient suffered a pneumothorax during the intubation. Training tells us to confirm the proper placement of an ET tube after intubation as well as any time the patient is moved. Diminished breath sounds should quickly point the paramedic to the probability of a mainstem intubation.

28.

An adult asthma patient is experiencing severe respiratory distress with laryngospasm, making orotracheal intubation impossible. What is the most appropriate immediate action to manage this patient's airway?

Initiate bag-valve-mask (BVM) ventilation with positive pressure

Attempt nasotracheal intubation

Administer nebulized bronchodilators

Perform immediate cricothyrotomy

Correct answer: Initiate bag-valve-mask (BVM) ventilation with positive pressure

In a patient with laryngospasm and severe respiratory distress, initiating bag-valve-mask (BVM) ventilation with positive pressure is the most appropriate immediate action. Positive pressure ventilation can help force air past the obstruction caused by laryngospasm, potentially relieving the spasm and providing critical oxygenation. BVM ventilation is non-invasive and can be rapidly applied in an emergency setting.

Attempting nasotracheal intubation is contraindicated because laryngospasm involves closure of the vocal cords, making this approach highly unlikely to succeed and potentially exacerbating the situation.

Administering nebulized bronchodilators may be useful in treating asthma, but it is not the most immediate action needed for airway management when laryngospasm is present. Airway patency must be addressed first.

Cricothyrotomy is an invasive procedure typically reserved for situations where all other less invasive airway management techniques have failed. Since BVM ventilation is a viable option, cricothyrotomy is not the first-line intervention in this scenario.

29.

Your unconscious cardiac history patient is showing signs and symptoms of cardiogenic shock including difficulty breathing. Which of the following interventions would be contraindicated?

High-flow oxygen therapy with continuous positive airway pressure

The administration of inotropic agents

Ventilatory assistance using a bag valve mask if needed

IV line with lactated Ringer's solution to keep vein open

Correct answer: High-flow oxygen therapy with continuous positive airway pressure

Patients suffering from cardiogenic shock should receive high-flow oxygen therapy to increase myocardium oxygen delivery. It is contraindicated to apply Continuous Positive Airway Pressure (CPAP) to the face mask, delivering oxygen to the patient in suspected cardiogenic shock. CPAP is contraindicated in any patient who is unconscious or has an altered level of consciousness or any patient in shock.

Patients suffering from cardiogenic shock would benefit from the administration of inotropic agents, such as dopamine, to help increase blood pressure and decrease venous return. Therefore, they are not contraindicated in cardiogenic shock patients.

Patients in cardiogenic shock should receive ventilatory assistance if needed. Assisting ventilations in any patient who needs it is never contraindicated.

It is appropriate to establish an intravenous line using lactated Ringer's solution in patients suffering from cardiogenic shock. A fluid bolus may be contraindicated in cardiogenic shock patients but establishing an IV to keep the vein open is appropriate.

30.

All of the following can result from positive pressure ventilation except:

Increased blood pressure

Decreased preload

Decreased cardiac output

Gastric distention

Correct answer: Increased blood pressure

Positive pressure ventilation causes an increase in intrathoracic pressure. This would create a pressure gradient that the heart must pump blood against, which causes an increase in afterload. High intrathoracic pressure from positive pressure ventilation can squeeze the heart and vena cava, which will cause a decrease in preload, blood pressure, and cardiac output. Gastric distention occurs because of the force of volume and rate.

31.

Continuous Positive Airway Pressure (CPAP) is used in the management of patients with acute pulmonary edema. Which of the following would be contraindications for using CPAP?

Select the 2 answer choices that are correct.

Patient is unable to protect their own airway

History of recent upper GI surgery

Respiratory distress after a recent submersion incident

Respiratory rate is rapid

Continuous Positive Airway Pressure (CPAP) provides pressure to keep alveoli open and reverse atelectasis caused by pulmonary edema. If a patient is unable to maintain their own airway, had recent upper GI surgery, has altered mental status, hypotension, a closed head injury, or signs of a pneumothorax, CPAP would be contraindicated.

Patients with respiratory distress after a recent submersion incident may be experiencing pulmonary edema and would benefit from CPAP if they do not exhibit any contraindications. Patients who need CPAP commonly have rapid respiratory rates, so it is not a contraindication.

32.

Why should you choose an uncuffed endotracheal tube for a six-year-old child who is apneic?

Children under eight years old have a natural narrowing at the level of the cricoid cartilage

Balloon cuffs can cause significant tissue necrosis in this age group

The proper-sized ET tube has a significantly larger diameter and does not leave enough room for a balloon cuff in this age group

The balloon cuff would not allow the exhalation of carbon dioxide and would cause air-trapping

Correct answer: Children under eight years old have a natural narrowing at the level of the cricoid cartilage

Infant and pediatric tubes are available with and without balloon cuffs. Children under the age of eight have a natural narrowing at the level of the cricoid cartilage that will function as an ET tube cuff. Therefore, it is best to choose an ET tube that does not have the cuff when intubating a child under the age of eight.

Balloon cuffs can cause tissue necrosis in cases where the cuff is overinflated. However, a properly inflated cuff is not likely to cause tissue necrosis. The main reason to choose a non-cuff tube is because of the natural narrowing of the airway seen in children under the age of eight years. The proper-sized tube does not have a larger internal diameter for children than other tubes for adults. The balloon cuff does not block the exhalation of any gases. It is meant to block the passage of the stomach contents into the airway, not for gas exchange.

33.

You are on-scene with a 60-year-old COPD patient complaining of shortness of breath. During your exam, you note the presence of clubbed fingertips. Which of the following is most likely to cause this finding?

Long-term hypoxemia

Congestive heart failure, especially left ventricular failure

Hypocapnia resulting from low carbon-dioxide levels

Peripheral vasoconstriction

Correct answer: Long-term hypoxemia

Clubbing occurs when the tips of a patient's fingers, including the fingernail, become enlarged when compared to the surrounding tissue. It is caused by a prolonged state of hypoxemia (low oxygen content in the blood).

Congestive Heart Failure (CHF) is more likely to cause pitting edema and/or pulmonary edema. If clubbing occurs in a CHF patient, it is caused by the years of hypoxia and not so much the disease process itself.

Hypocapnia is a lower than normal level of carbon dioxide and would not likely cause clubbed fingers. Hypercapnia from the hypoxemia is more likely in this case.

Clubbed fingers are likely caused by low oxygen levels in the distal circulation. Peripheral vasoconstriction is not likely to cause this finding; hemoglobin with low oxygen levels is more likely the cause.

34.

Which of the following are internal factors that can affect respiration?

Select the 2 answer options which are correct.

Pneumonia

Heart failure

Carbon monoxide (CO) poisoning

High altitudes

Gas exchange in the lungs and tissues is known as respiration. Factors that affect respiration can be categorized as internal or external. Pneumonia causes the alveoli to become saturated with fluid and debris, reducing the surface that is available for gas exchange. It is considered an internal factor. Heart failure causes a backup of fluid in the lung, leading to alveolar collapse. This reduces the area for gas exchange and is considered an internal factor.

Carbon monoxide (CO) is a colorless, odorless, tasteless gas that is caused by incomplete combustion. It has a higher affinity for hemoglobin than oxygen and blocks oxygen binding. This interferes with gas exchange and causes hypoxia. CO is not produced in the body and must be inhaled, so it is considered an external factor.

At high altitudes, the percentage of oxygen remains the same, but the total atmospheric pressure decreases. This can significantly increase the work of breathing and reduce gas exchange. It is an external factor.

35.

Your adult patient presents with dyspnea that developed over the last few days and worsened today. During auscultation of the patient's lungs, the patient's vocal sounds become louder over the left lower lobe of their lung. What does this likely indicate?

Consolidation (fluid, mucus) is present in the left lower lobe of the patient's lung

Consolidation (clear lung sounds) is present everywhere but in the left lower lobe of the patient's lung

A pneumothorax likely exists in the left lower lobe of the patient's lung

The patient is likely experiencing an acute asthma attack

Correct answer: Consolidation (fluid, mucus) is present in the left lower lobe of the patient's lung

Normally, a patient's voice becomes less distinct as the paramedic auscultates the lungs peripherally. Vocal sounds that remain loud at the periphery of the lungs or sounds louder than usual over an area of the lung containing fluid is known as consolidation.

Consolidation does not refer to clear breath sounds; it is a term used to describe the presence of fluid in an area of the lung.

The presence of distal vocal sounds heard while auscultating a patient's lungs does not indicate a pneumothorax is present. It is more likely to point to the presence of consolidation from an embolus or pneumonia due to fluid accumulation and not decreased breath sounds often associated with a pneumothorax.

Patients experiencing an acute asthma attack are more likely to present with wheezing in the lower lobes of both lungs, not only one lung. Asthma does not cause consolidation (fluid) in the lower lobes of the lungs.

36.

While assessing the respiratory function of an ill five-year-old child, you note the presence of inspiratory stridor, even though the patient appears to have adequate oxygenation. Since the stridulous respirations are inspiratory only, what area of the child's respiratory system do you suspect the adventitious breath sounds are originating?

In the upper airway immediately above the glottic opening

Within the alveoli

Just superior to the carina in the lower airway

Within the right or left bronchus

Correct answer: In the upper airway immediately above the glottic opening

Stridor results from foreign body aspiration, infection, swelling, disease, or trauma within or immediately above the glottic opening. Stridor produces a loud, high-pitched sound that is typically heard during the inspiration phase.

Expiratory stridor results from narrowing of the lower airway/trachea due to an illness, injury, or obstruction. Stridor during both inspiratory and expiratory phases of respiration are good indicators of significant airway obstruction at the level of the vocal cords. Stridulous respirations are not often heard in the alveoli due to the depth of the air sacs within the lungs. Often fluid and copious secretions are auscultated in the alveoli.

If stridor is heard at the level of the carina, it normally causes expiratory stridor due to the depth of the carina.

Foreign body airway obstruction often finds its way into the main stem bronchus and wind up in the right main bronchus due to the anatomy. However, stridulous respirations at this level are normally heard on the expiratory phase of respiration.

37.

Which of the following oxygen cylinder sizes/constant flow rates are correct?

Select the 2 answer options which are correct.

D cylinder = 0.16

E cylinder = 0.28

M cylinder = 3.14

K cylinder = 2.41

The formula to calculate the duration of oxygen in a cylinder is (tank pressure in PSI - safe residual pressure) x cylinder constant flow rate/flow rate. The standard sized O₂ cylinders and flow rates are D = 0.16, E = 0.28, M = 1.56, G = 2.41, H = 3.14, and K = 3.14.

38.

Which of the following provides the primary innervation for the diaphragm as well as the associated components of the mediastinum and pleura?

Phrenic nerve

Vagus nerve

Hypoglossal nerve

Abducent nerve

Correct answer: Phrenic nerve

The phrenic nerve is responsible for the innervation of the diaphragm. It sends impulses that allow normal inhalation and exhalation to occur. It is also responsible for innervating the pleura and part of the mediastinum.

The hypoglossal and abducent nerves are cranial nerves. The hypoglossal nerve is cranial nerve XII, and it controls tongue movement. The abducent nerve is cranial nerve VI, and it controls some eye movements. These nerves have no part in innervating the diaphragm.

The vagus nerve is cranial nerve X, and it interfaces with the autonomic nervous system and affects the lungs, heart, and GI tract. It does not innervate the diaphragm.

39.

Your adult patient was involved in an accident with a truck hauling organophosphate chemicals. If the patient was exposed to a potentially toxic amount of inhaled organophosphates, which of the following is most likely to occur?

Respiratory and heart rate decrease due to cholinergic stimulation

Respiratory and heart rate increase due to anticholinergic stimulation

Decrease in level of consciousness and pulmonary edema due to fluid shift

A decrease in lacrimation, sweating, urination and inability to focus on objects in field of vision

Correct answer: Respiratory and heart rate decrease due to cholinergic stimulation

Organophosphate agents and some nerve agents inhibit the effects of acetylcholinesterase, which causes a cholinergic overdrive or crisis to occur. This disrupts normal nerve transmissions in the central and peripheral nervous system and causes a decrease in heart rate and blood pressure and an increase in tear production and excessive saliva as well as other signs and symptoms.

The cholinergic overstimulation caused by organophosphate poisoning causes a decrease in heart rate and respiratory rate, not an increase.

A decrease in level of consciousness is possible with low to moderate exposure; however, the patient is not likely to present with pulmonary edema initially.

Patients exposed to organophosphate agents are likely to experience excessive tear production, saliva, and sweating and increased urination, not a decrease in fluids. They do not often present with visual disturbances other than excessive watery eyes.

40.

You are assessing a 22-year-old patient with difficulty breathing. She has itching, urticaria, and hives after a bee sting. During the possible allergic reaction, what is occurring at the cellular level?

The mast cells have degranulated, releasing serotonin and histamines into the general circulation

The mast cells are retaining the vasoactive amines, resulting in a localized response to the sting

The cells begin a hypermetabolic state associated with the patient's increased activity level after the sting

An anaerobic metabolism has begun at the local level and is now moving into the vasculature

Correct answer: The mast cells have degranulated, releasing serotonin and histamines into the general circulation

When the tissue is injured, as in a sting from a bee or hornet, the mast cells discharge their granules (degranulation) as part of the inflammatory response. This response results in a hypersensitivity reaction (commonly referred to as an allergic reaction).

During an allergic reaction, the mast cells are not responsible for retaining the vasoactive amines resulting in an allergic reaction. It causes a histamine/serotonin release.

The increased activity of the sympathetic nervous system is not associated with the release of histamine and serotonin at the cellular level in response to the antigen.

Anaerobic metabolism is not a factor in the initial stages of an allergic reaction. The cells are responding to the release of histamine and serotonin.

41.

Your patient is suffering cardiac arrest with adequate CPR and ACLS interventions initiated, including intubation by your crew. Once capnography is introduced to monitor the effectiveness of the resuscitation effort, what can the paramedic expect to see on the monitor if the patient has a return of spontaneous circulation (ROSC)?

A waveform that suddenly rises from around 10–20 mmHg with high-quality CPR to above 40 mmHg

A waveform that gradually decreases from 45 mmHg to less than 10 mmHg

A waveform that looks like a shark's fin and is above 45 mmHg

A sudden, complete loss of waveform from around 10 mmHg to 0 mmHg

Correct answer: A waveform that suddenly rises from around 10–20 mmHg with high-quality CPR to above 40 mmHg

Capnography can be used to monitor the effectiveness of cardiopulmonary resuscitation and ventilation delivered to intubated patients during the arrest. If adequate cardiopulmonary circulation is being properly provided by the rescuers, a waveform of above 10 mmHg is the goal. If the waveform suddenly surges within one waveform from 10 mmHg to well above 40 mmHg, it is most likely the patient has a Return Of Spontaneous Circulation (ROSC). CPR should be stopped, and the patient assessed for a pulse.

A waveform that gradually decreases from 45 mmHg is most likely on a ventilator. If the waveform gradually decreases in intensity until it is under 10 mmHg, it is most likely caused by an ET tube cuff problem or tube obstruction. This is not a finding indicative of patients with ROSC.

Waveforms that appear as if they are shark fins are most likely caused by bronchospasm, not ROSC.

A sudden, complete loss of waveform during continued adequate chest compressions and ventilations is most likely caused by a disconnected or kinked ET tube.

42.

Your adult respiratory distress patient presents with a productive cough, fever, and shaking chills. Which of the following conditions is most likely occurring?

Pneumonia

Asthma

Bronchitis

Adult respiratory distress syndrome

Correct answer: Pneumonia

Pneumonia is a group of specific infections (bacterial, viral, or fungal). These infections cause an acute inflammatory process of the respiratory bronchioles and the alveoli. Pneumonia usually presents with classic signs and symptoms, including a productive cough with associated fever and shaking chills.

Asthma, bronchitis, and adult respiratory distress do not present with fever, productive cough, or chills.

43.

All the following are parts of the pediatric assessment triangle except:

Awareness

Circulation

Appearance

Work of breathing

Correct answer: Awareness

The pediatric assessment triangle has been developed to help EMS providers form a from the doorway general impression of pediatric patients. It is composed of appearance, work of breathing, and circulation to skin. Awareness is not part of the pediatric assessment triangle.

44.

Which of the following are considered supraglottic airway devices available for EMS use?

Select the 2 answer options which are correct.

i-Gel

LMA

Shiley

Endotracheal tube

The i-Gel and Laryngeal Mask Airway (LMA) are all considered supraglottic airway devices and are available for EMS use, depending on local protocols.

The Shiley is a tracheostomy tube placed in a surgical opening of the trachea that is referred to as a stoma. It is not a supraglottic airway available for EMS use. An endotracheal tube is placed directly into the glottic opening and is not considered a supraglottic airway.

45.

You are preparing to initiate rapid sequence intubation on a pediatric patient who is exhibiting a borderline hypotensive state. Which medication would be indicated as the first paralytic given, following sedation of the patient for the procedure?

Succinylcholine

Ketamine

Lidocaine

Atropine

Correct answer: Succinylcholine

Succinylcholine is a powerful paralytic usually administered as the first medication following sedation to paralyze the conscious patient's airway and gag reflex to make intubating the patient possible without a laryngeal spasm.

Ketamine is a sedative often used to sedate patients who are about to be intubated. It is often the medication of choice when the patient's blood pressure may be lower than normal, as it achieves sedation without lowering the blood pressure.

Lidocaine is not a paralytic agent; it is given during rapid sequence intubation to help prevent an increase in intracranial pressure.

Atropine is not a paralytic but is administered in some cases before the administration of a paralytic or neuromuscular blocking agent to prevent bradycardia.

46.

Your 23-year-old asthma patient is experiencing a severe asthma attack and is alert and oriented but struggling to breathe with inspiratory wheezing noted. The patient's respirations are 30 per minute with a SpO₂ of 88.

Which of the following may prove beneficial in managing the bronchospasm after nebulized albuterol and oxygen therapy fail to improve the patient's condition?

Continuous positive airway pressure (CPAP)

Rapid sequence intubation

Levalbuterol

Magnesium sulfate

Correct answer: Continuous positive airway pressure (CPAP)

Continuous Positive Airway Pressure (CPAP), or Bi-PAP, can be effective in treating reactive airway disease but should only be considered in adult patients who are alert and have an adequate respiratory rate. CPAP is effective in improving the overall respirations of a patient suffering from a reactive airway disease by allowing a small amount of pressure to remain in the alveoli after normal respiration, keeping the alveoli open.

In rare cases, rapid sequence intubation is required for conscious patients experiencing severe or prolonged asthma attacks, who are extremely hypoxic with impending respiratory failure suspected. However, it would be less invasive and more appropriate to attempt to improve the alert patient's respirations with the use of CPAP or Bi-PAP, depending on protocol.

An asthma patient who fails to respond well to medication, such as albuterol and oxygen therapy, is not likely to improve with the administration of another nebulized medication, like levalbuterol, that acts and is very similar to albuterol. At this point in the intervention, it would be more appropriate to attempt to improve the patient's respiratory status using CPAP with oxygen administration.

Mag sulfate is sometimes effective and indicated for the treatment of asthma with poor pulmonary function when used intravenously with corticosteroids and after nebulized medication. However, CPAP is more effective in alert adult patients who can tolerate its use.

47.

Your patient developed sudden-onset difficulty breathing and diaphoresis and has a past history of atherosclerosis and a recent hip replacement surgery. Which of the following should be suspected until proven otherwise?

Pulmonary embolus

Air embolus

Pulmonary aspiration

Deep vein thrombosis

Correct answer: Pulmonary embolus

A Pulmonary Embolus (PE) is a sudden blockage of a pulmonary artery by a clot that formed elsewhere and traveled to the lungs before becoming lodged in the lung. Most PEs originate in the lower extremities in patients with histories including high cholesterol, atherosclerosis, and other venous disease processes. The paramedic should suspect a PE in any patient who presents with sudden-onset difficulty breathing that cannot be easily ruled out by the presence of pneumothorax or other obvious cause. PE should especially be suspected when the patient has a history of high cholesterol, atherosclerosis, or another venous disease.

An air embolus is usually a result of improper IV catheter or hemodialysis treatment that allows air to enter the venous system. It is not usually associated with high cholesterol, atherosclerosis, or another venous disease.

Pulmonary aspiration would cause difficulty breathing but would also be accompanied by extreme irritation and coughing due to the stomach contents now irritating the lung tissue and epiglottis.

Often a PE starts as a deep vein thrombosis, normally in the lower extremities. The thrombosis or clot breaks off and travels through the right side of the heart before lodging in a pulmonary artery. Then the signs, symptoms, and problems begin for the patient.

48.

Which of the following are signs of adequate bag-valve-mask ventilation?

Select the three correct answer options.

Improvement in pulse oximetry

Chest rising with ventilations

Skin color becoming less cyanotic

Absent lung sounds during auscultation

Blood pressure increases

Signs of adequate bag-valve-mask ventilation include:

- *Improvement in pulse oximetry*
- *Chest rise and fall with ventilations*
- *Lung sounds during auscultation*
- *Improvement in patient skin color*

Absent lung sounds are a sign of inadequate lung function. Positive pressure ventilation with a bag mask can actually lower the blood pressure due to increased intrathoracic pressure. Blood pressure changes are not a sign of adequate ventilation.

49.

What is the best way to increase a conscious and alert, dyspneic patient's lung volume and improve her vital capacity while reducing the venous return to the heart and her overall work of breathing?

Place the patient in the sitting position with her legs dependent and apply oxygen

Assist ventilations using a bag-valve-mask and supplemental oxygen

Place the patient supine with the head and foot of the stretcher elevated 10 degrees while applying oxygen

Administer a nebulized albuterol treatment with supplemental oxygen

Correct answer: Place the patient in the sitting position with her legs dependent and apply oxygen

A dyspneic patient is suffering from air hunger and is in need of supplemental oxygen as well as a better lung environment for gaseous exchange. The best way to accomplish this in a conscious and alert patient is to sit the patient up and have her legs hanging dependently, which will improve her overall lung volume and capacity while diminishing the work of breathing and venous return to the heart.

It will not improve the patient's lung volume or capacity if a paramedic attempts to ventilate a conscious and alert patient. This would also not be helpful in reducing venous return or reducing the work of breathing because the patient is likely to fight the bag-valve-ventilation attempt.

It is not an acceptable patient positioning technique to raise the head of the stretcher and the foot of the stretcher ten degrees. An EMS professional should either raise one or the other, never both ends of the stretcher. In this case, neither the head nor the foot elevated would help improve lung and vital capacity or reduce venous return.

A nebulized albuterol treatment may be effective in improving the quality of a patient's spontaneous respirations by inducing bronchodilation to the constricted air passages, but it does not affect the lung volume and capacity as well as venous return to the heart.

50.

Which of the following effectively measures the amount of carbon dioxide in a patient's exhaled air?

EtCO₂

CPAP

PEEP

BiPAP

Correct answer: EtCO₂

Capnography, known as EtCO₂ or PetCO₂, measures carbon dioxide concentrations in a patient's exhaled air. It is often used as a secondary means of endotracheal tube placement confirmation.

Continuous Positive Airway Pressure (CPAP) is an adjunct to airway support that transmits positive pressure into the lower airways of spontaneously breathing patients throughout the respiratory cycle. It does not measure carbon dioxide levels in the exhaled air.

PEEP is Positive End-Expiratory Pressure. It is an airway support adjunct that maintains a degree of positive pressure at the end of exhalation, not throughout the respiratory cycle like with CPAP.

BiPAP is Biphasic Positive Airway Pressure. It is an airway support adjunct that combines partial ventilatory support and continuous positive airway pressure; it allows the pressure to vary during each breath cycle.

51.

Which of the following may cause erroneous pulse oximeter readings?

Select the three correct answer options.

Bright ambient light

Nail polish

Low perfusion

Hypoxia

Bright ambient light may interfere with pulse oximeter function and can create an incorrect reading. Poor perfusion can make it difficult for the pulse oximeter to sense a pulse and generate a reading. Nail polish interferes with the sensor function and may prevent the pulse oximeter sensor from obtaining an accurate reading.

Hypoxia would not cause an erroneous pulse oximeter reading but would be reflected as a low reading. One of the purposes of using pulse oximetry is to detect hypoxia.

52.

Your adult apneic patient is becoming increasingly difficult to ventilate using a bag-valve mask due to changes in thoracic and inspiratory pressures. What are these changes known as?

Decreased compliance

Fick principle

Atelectasis

Bohr effect

Correct answer: Decreased compliance

Compliance is the ease with which the lungs and thorax expand during pressure changes. The greater the compliance, the easier the lung expansion. One example is when an apneic patient is being ventilated using a bag-valve mask (regardless if the patient is intubated or not), and it becomes increasingly difficult to ventilate the patient. It indicates a higher than normal intrathoracic pressure, making it more difficult to ventilate the patient or a decrease in compliance.

The Fick principle does not refer to intrathoracic pressures. It deals with the assumption that the amount of oxygen delivered to a cell is the amount of oxygen that the cell will use, each and every time.

Atelectasis is an abnormal condition characterized by the collapse of lung tissue preventing the proper exchange of respiratory gases. It does not refer to the ease at which the lungs expand.

The Bohr effect describes the property of hemoglobin in relation to oxygen and carbon dioxide. It does not refer to the effects of pressure on the normal expansion of the lungs.

53.

Which of the following would not increase the FiO_2 level on a non-breathing, ventilated patient?

Select the 3 answer options which are correct.

Increase the rate of ventilation

Decrease expiratory time

Decrease respiratory rate

Increase oxygen flow rate

Changing the ventilation rate, inspiratory time, or expiratory time will not affect the FiO_2 .

FiO_2 levels stands for Fraction of Inspired Oxygen. The most effective way to increase the amount of oxygen inspired is to increase the oxygen flow rate on a ventilator. If you need to increase oxygen saturation on a ventilated patient, increasing the FiO_2 may be necessary.

54.

You are preparing to intubate an unresponsive 9-kg infant. Which laryngoscope blade would be most appropriate in this case?

A number 1 Miller

A number 1 Macintosh

A number 3 Miller

A number 2 Macintosh

Correct answer: A number 1 Miller

A 9-kg infant is very small and has an even smaller airway. To successfully intubate a 9-kg infant, it would be appropriate to use a small size 0-1 straight blade such as a Miller number 1.

A curved blade is not recommended for intubating an infant.

A number 3 Miller Blade (straight) would be more suited for use on a larger toddler or child. It would likely be too large to use appropriately in a 9-kg infant and is more suited for a 20- or 30-kg child.

A number 2 straight blade may be appropriate if it is all that is available. A number 2 Macintosh is not indicated as curved blades are not recommended in infants.

55.

You are intubating a 26-year-old who is apneic. Once the endotracheal tube passes through the vocal cords, how much farther should the endotracheal tube be advanced before inflating the cuff and confirming proper placement?

1-2.5 cm (0.5 to 1 inch)

2.5-6.4 cm (1 to 2.5 inches)

3 cm

Less than 1 cm

Correct answer: 1-2.5 cm (0.5 to 1 inch)

After viewing the tip of the endotracheal tube passing through the vocal cords, the tube itself should be carefully advanced another 1 to 2.5 cm or 0.5 to 1 inch. This places the tip of the tube about halfway between the cords and the carina. This positioning allows for a little more movement without dislodging the tube.

1 to 1.25 inches or 2 to 3 centimeters would most likely place the tip of the tube either against the carina or in the right mainstem bronchus. This is evident by decreased breath sounds with difficulty ventilating or left-sided diminished breath sounds.

Advancing the tube only 1 cm past the cords would not be acceptable. This would place the intubation and ventilation at risk.

56.

You are on-scene with an apneic adult who collapsed one to two minutes prior to your arrival, according to bystanders. Which of the following endotracheal tube size ranges would be most appropriate for an average adult respiratory arrest patient who shows no signs of airway trauma or obstruction?

7.5–8.0 ET tube

4.5–6.5 ET tube

9.0–10.0 ET tube

6.5–8.5 ET tube

Correct answer: 7.5–8.0 ET tube

Recommended tube sizes for average height and weight adult patients are between 7.5–8.0 ET. Size 7.5 tubes are best suited for average height and weight patients, while an 8.0 to 8.5 would be better suited for a slightly larger framed adult or someone with an obviously larger or longer neck.

A 4-mm ET tube is a small endotracheal tube that does not have a balloon cuff on the tube. It is best suited for children around age eight. A 9-mm or 10-mm ET tube would be best suited for large to very large-framed adult patients, including some obese patients.

57.

After intubating your apneic patient, what tube placement confirmation means should be assessed first?

Auscultate over the epigastric region for the presence or absence of breath sounds

Auscultate each lung field for the presence of breath sounds

Attach an end-tidal carbon dioxide detector

Attach capnography to determine the presence of ventilatory waveform

Correct answer: Auscultate over the epigastric region for the presence or absence of breath sounds

The initial confirmation means for determining the proper placement of the endotracheal tube during the intubation process is to auscultate with a stethoscope over the epigastric region in the area of the stomach. If the ET tube inadvertently entered the esophagus instead of the trachea, a gurgling sound (that does not resemble normal bowel sounds) can be heard in the stomach.

It is appropriate to auscultate over each lung field only after listening for the presence of gurgling in the stomach. The quickest way to determine esophageal intubation is to listen (auscultate) over the epigastric region first. Attaching an end-tidal CO detector is appropriate after first ensuring the patient is intubated properly. This is first achieved by auscultating over the stomach to ensure the tube is not in the esophagus, followed by listening to each lung field to ensure the presence of adequate breath sounds. Capnography can be used in conscious and breathing patients or intubated patients in cardiac arrest. It is also useful in determining ET tube placement; however, it is a secondary means of confirmation that should not take the place of auscultating the epigastric region and lungs first. It is also useful to determine chest compression effectiveness and bronchoconstriction.

58.

You are called to assist an adult at a local bar for an unknown reason. On arrival, you are met by a man who has his arms crossed, grasping at his throat with both hands, and unable to speak to you. What should you do at this point to assist your patient?

Perform abdominal thrusts while he remains conscious

Lay him supine, and perform chest compressions until the obstruction is relieved

Deliver five back blows and five abdominal thrusts until the obstruction is relieved

Encourage him to cough, and initiate a safe, rapid transport to the hospital for definitive care

Correct answer: Perform abdominal thrusts while he remains conscious

The best treatment for a patient who is conscious and exhibiting signs and symptoms of an obstructed airway should receive abdominal thrusts as quickly and effectively as possible before he becomes unconscious and the obstruction becomes harder to clear.

It is not appropriate to perform chest compressions when a conscious adult has an obstructed airway.

Back blows may be effective in a child or adult, but the initial procedure for a conscious adult involves performing abdominal thrusts while he remains conscious.

Encouraging the patient with a completely obstructed airway to cough is an ineffective use of time that should be directed at clearing the obstruction by administering the Heimlich maneuver.

59.

You are concerned that your adult MVA patient may have trouble protecting their own airway due to a suspected closed head injury and an obvious decreased level of consciousness. You and your partner have elected to perform rapid sequence intubation. Your partner administers succinylcholine, and you are able to intubate your patient successfully. You are aware that you have a long transport time to the hospital, so you choose to administer a long-acting paralytic.

Of the following, which medication and dosage is the best choice for this patient?

Vecuronium 0.1–0.2 mg/kg via IV push

Vecuronium 1–2 mg/kg via IV push

Rocuronium 6 mg–12 mg via IV push

Rocuronium 1.6–2.2 mg/kg via IV push

Correct answer: Vecuronium 0.1–0.2 mg/kg via IV push

The standard dose for Vecuronium as a maintenance paralytic in rapid sequence intubation is 0.1–0.2 mg/kg via IV push. The pediatric dose is 0.1–0.3 mg/kg via IV push.

The standard dose for Rocuronium as a maintenance paralytic in rapid sequence intubation is 0.6–1.2 mg/kg via IV push.

60.

You are preparing to intubate an apneic child who is 12 years old and weighs 29 kg. Which of the following endotracheal tube sizes would be most appropriate for this patient?

A 6.5 mm ET tube with a balloon cuff

A 6 mm ET tube without a balloon cuff

A 4 mm ET tube without a balloon cuff

A 4 mm ET tube with a balloon cuff

Correct answer: A 6.5 mm ET tube with a balloon cuff

When choosing an appropriately sized ET tube for a child, it is recommended to divide the child's age by 4 and add 3.5 to choose an appropriately sized tube. In this case, a 6.5 mm tube would be most appropriate.

It is not appropriate to attempt to intubate a 12-year-old child with an ET tube that does not have a balloon cuff. Children at this age do not commonly have the natural narrowing at the level of the cricoid cartilage that seals the tube. A balloon cuff is needed to seal the airway properly.

A size 4 mm ET tube would not be large enough to seal the airway with or without a balloon cuff.

61.

What is the most appropriate way to provide airway suctioning of a patient intubated with an ET tube?

Gently rotate the suction catheter between your fingers while withdrawing the catheter with 80 to 120 mmHg suction applied

Insert suction tubing without a catheter attached to the end of the ET tube

Insert the soft suction catheter with 80 mmHg suction applied into the tube until resistance is felt

Hyperventilate the patient with the Ambu-bag and 100% oxygen prior to and after the procedure

Correct answer: Gently rotate the suction catheter between your fingers while withdrawing the catheter with 80 to 120 mmHg suction applied

When suctioning an intubated patient, it is appropriate to insert the soft suction catheter down the tube after properly oxygenating the patient. Once suction is applied at between 80 mmHg and 120 mmHg, depending on the nature of the secretions to be suctioned, gently rotate the suction catheter between your fingers while withdrawing the catheter with 80 to 120 mmHg suction applied.

It is never appropriate to insert suction tubing into an ET tube.

Never apply suction while inserting a suction catheter. Suction should be applied at 80 to 120 mmHg on the way out only.

It is not appropriate to hyperventilate an intubated patient. The patient should be pre-oxygenated with normal ventilation for several minutes prior to suction being applied, never hyperventilated.

62.

You have elected to place an iGel into the airway of your apneic adult patient. Your patient is 135 pounds. Which size iGel is indicated?

Size 4 (Green)

Size 5 (Orange)

Size 2 (Pink)

Size 3 (Yellow)

Correct answer: Size 4 (Green)

The iGel comes in three sizes. For a patient weighing 110-198 lbs., size 4 (green) is recommended.

Patients weighing 66-132 lbs. will require a size 3 (yellow).

Patients weighing more than 198 lbs will require a size 5 (orange).

Size 2 (pink) is for pediatric patients, not adults.

63.

Overaggressive ventilation with a bag-valve-mask device may complicate a respiratory failure situation and can cause which of the following?

Select the three correct answer options.

Gastric distention

Vomiting

Barotrauma

Hypercapnia

Hypertension

Overaggressive ventilation with a bag-valve-mask device can cause barotrauma from too much tidal volume or excessive pressure in the airway. Other causes are gastric distention, which can lead to vomiting and aspiration. Hypocapnia, an excessive loss of carbon dioxide, is also common in overaggressive ventilation due to high minute volumes.

Too much carbon dioxide, or hypercapnia, is common in airway obstruction or low respiratory drive states such as narcotic overdose and would not generally be a result of overaggressive ventilation.

Positive pressure ventilation increases intrathoracic pressure, resulting in a decrease in cardiac output. Because of this, hypotension is likely with aggressive ventilation, rather than hypertension.

64.

Which of the following best describes or defines bronchiolitis?

A viral infection caused by RSV that affects children between 6 and 18 months old

A viral infection of the upper airway caused by influenza affecting children between 1 and 2 years old

A bacterial infection that afflicts children over 3 years old from an unknown cause

An inflammatory disease causing restrictive airway compromise in infants 1 to 5 months old

Correct answer: A viral infection caused by RSV that affects children between 6 and 18 months old

Bronchiolitis is a viral infection of the lower airways that occurs primarily in infants under the age of 18 months. It is characterized by expiratory wheezing, respiratory distress, inflammation, and obstruction at the level of the bronchioles. It is not considered an inflammatory disease and does not cause reactive airway disease. Bronchiolitis is commonly mistaken for reactive airway disease/asthma. One key finding to help differentiate asthma from bronchiolitis is the presence of a fever.

65.

If the number of erythrocytes in a patient's blood drops, the patient may report shortness of breath with mild exertion. What causes this to occur?

Decreased oxygen molecules being delivered to the lungs and tissues

Increased albumin causes the blood to thicken, making oxygen exchange difficult

Increases the amount of fibrinogen in the lungs, blocking the uptake of oxygen molecules

Increased carbon dioxide levels reduce the affinity of oxygen molecules

Correct answer: Decreased oxygen molecules being delivered to the lungs and tissues

The primary function of erythrocytes (red blood cells) is to carry oxygen from the lungs to the various tissues of the body. It is also responsible for carrying carbon dioxide from the tissues back to the lungs for excretion. So, if the number of available erythrocytes is low, then the amount of oxygen reaching the tissues is decreased. This becomes most evident with mild exertion.

Albumin is a protein in the plasma portion of the blood. It does not involve oxygen transport or erythrocytes (red blood cells). Decreased erythrocytes in the blood do not cause an increase in the plasma protein fibrinogen.

Fibrinogen is a key protein involved in blood clotting and does not play a role in oxygen transport or affect lung oxygen uptake directly. It's a critical component of the clotting cascade, which helps to stop bleeding by forming a fibrin clot.

Erythrocytes deliver carbon dioxide from the cells to the lungs for reoxygenation and elimination of the carbon dioxide through ventilation. So, a decrease in erythrocytes would cause an increase in carbon dioxide levels dissolved in the plasma. Conditions such as acidosis or temperature can affect the affinity of oxygen molecules, but increased carbon dioxide levels do not.

66.

You have just inserted a nasogastric (NG) tube in your intubated patient to relieve gastric distension. Which of the following confirmation means is most appropriate for determining the placement of an NG tube?

Auscultate the epigastric region while injecting 20 to 30 mL of air into the NG tube

Ensure the pre-measurement black line on the tube is located at the patient's nares

Attach suction to the tube and watch for the distension to decrease

Roll the patient onto their left side and apply suction for a few seconds

Correct answer: Auscultate the epigastric region while injecting 20 to 30 mL of air into the NG tube

The primary confirmation means of ensuring proper placement of the NG tube is to instill between 20 and 30 mL of air directly down the NG tube using a syringe while listening with a stethoscope over the epigastric region. If the NG tube is properly placed, the paramedic will hear a gurgling sound as the air mixes with the stomach contents. If the gurgling sound is not present, the NG tube is not likely in the stomach.

It is a good idea to keep an eye on the pre-measurement black line you placed on the tube prior to insertion. However, the line is considered a guide, not confirmation. The only way to ensure the tube is properly placed is to auscultate over the epigastric region while air is being injected.

It is not appropriate to apply suction to the NG tube before confirming the tube is in the stomach. This is best accomplished by inserting 20 to 30 mL of air into the stomach while listening for the air to cause gurgling.

Rolling the patient on their side would not be beneficial in evaluating the proper placement of an NG tube.

67.

Patients experiencing hyperventilation must have their respiratory rate decreased to prevent an excessive loss of exhaled carbon dioxide. If the ventilatory rate is not quickly regulated, the decrease in carbon dioxide leads to hypocapnia. If a patient is experiencing hypocapnia, what signs and symptoms can the paramedic expect to occur?

Paresthesia, dizziness, and lightheadedness/euphoria

Atelectasis, hemiplegia, and pedal spasm

Confusion, cyanosis, and extremity numbness

Agitation, combativeness, and decorticate posturing

Correct answer: Paresthesia, dizziness, and lightheadedness/euphoria

Hyperventilation causes excessive loss of exhaled carbon dioxide, which produces hypocapnia; this results in cerebral vascular constriction and reduced cerebral perfusion. If not quickly corrected and hyperventilation continues, paresthesia (tingling sensation), dizziness, and/or feelings of euphoria may be present.

Patients experiencing hyperventilation suffer an excessive loss of carbon dioxide. Hypocapnia does not usually present with alveolar collapse (atelectasis) or hemiplegia (one-sided paralysis). They may present with pedal spasms associated with hyperventilation and hypocapnia. Hyperventilation with hypocapnia may cause confusion and some extremity numbness, but cyanosis is not likely. A hyperventilation patient with severe hypocapnia may present with agitation and some degree of combativeness secondary to confusion. However, decorticate posturing is not associated with hypoventilation; it is associated with injury deep in the cerebral cortex.

68.

Which of the following conditions can cause abnormal lung sounds but would not warrant a diuretic?

Select the 2 answer options which are correct.

Pneumonia

Asthma

Left ventricular failure

Pulmonary edema

Crackles may be heard in pneumonia patients due to increased sputum production. Asthma patients commonly have wheezing secondary to bronchospasm but may also exhibit crackles due to the increased mucus production in the distal airways. Giving diuretics to patients with pneumonia or asthma may worsen their overall condition by dehydrating them.

Left ventricular failure and renal failure patients will most likely need diuretics to remove fluid. Pulmonary edema causes crackles/rales and may likely need the administration of a diuretic.

69.

During a detailed physical exam of your dyspneic 73-year-old female patient, you palpate small pockets of air in the subcutaneous tissue of the skin in the upper right region of her chest, just below her clavicle. Which of the following medical conditions is most likely to cause this abnormal finding?

Spontaneous pneumothorax

Bacterial pneumonia

Chronic obstructive pulmonary disease

Dry pleurisy

Correct answer: Spontaneous pneumothorax

A spontaneous pneumothorax (SP) occurs when "blebs" or weak spots on the surface of a patient's lung burst. It commonly occurs from coughing against a closed glottis. Spontaneous pneumothorax is more likely to occur in young, tall, white men of European descent, but it can happen to anyone. When a bleb ruptures, it creates a hole in the lung that allows some or all of the air in the lung to escape into the tissue around the pleural space. Air in the subcutaneous space, commonly called subcutaneous emphysema, normally makes its way to the highest possible point in the chest due to gravity. Subcutaneous air is best palpated in the tissue just below the clavicle on the affected side or both sides. It is described as a "snap, crackle, pop" sensation under the skin when palpated. It is a key finding when a pneumothorax is suspected in the pre-hospital setting.

Other respiratory-based medical conditions can be life-threatening and cause a patient to present with severe dyspnea. These conditions include bacterial pneumonia, chronic obstructive pulmonary disease (COPD), or dry pleurisy. Bacterial pneumonia would likely present with night fever. COPD is normally characterized by wheezing, pulmonary edema, or issues with air-trapping. Dry pleurisy is most likely to present with painful, grating respirations. However, these conditions are not likely to cause air to escape the lung and cause subcutaneous air.

70.

You are preparing to initiate a rapid sequence intubation on a pediatric patient who is exhibiting a borderline hypotensive state with a decreased level of consciousness and hypoventilation. She is quickly becoming hypoxic with a SpO₂ of 77% and a delayed capillary refill.

Which medication would be most effective in sedating this patient for the procedure?

Ketamine

Midazolam

Succinylcholine

Propofol

Correct answer: Ketamine

Ketamine is a nonbarbiturate anesthetic indicated for patients two years and older. It safely produces temporary amnesia and blocks pain perception. It may be administered prior to RSI as a sedative-hypnotic agent. It also may increase the hypotensive patient's blood pressure and heart rate as well.

Midazolam is a short-acting benzodiazepine that can be administered prior to tracheal intubation for sedation and pain relief. It is effective in children; however, it is not appropriate to administer to patients who have decreased vital signs.

Succinylcholine is a paralytic agent that is used prior to rapid sequence intubation; it is not indicated for sedation and may induce hypotension.

Propofol is a neuromuscular blocking agent often used during rapid sequence intubation in adults only.

71.

Once a paramedic visualizes the endotracheal tube pass through the vocal cords, how far should the tube be advanced before inflating the cuff and assessing the proper placement of the tube?

1 to 2 cm

2 to 2.5 inches

At least 5 cm

At least 3.5 inches

Correct answer: 1 to 2 cm

After viewing the tip of the tube pass through the vocal cords, advance the tube another 1 to 2 cm. This places the tip of the tube halfway between the vocal cords and the carina.

The tip of the tube would likely end up in the right mainstem bronchus if the tube is advanced more than 2 cm past the cords. This would be evident by decreased breath sounds on the left side and can cause serious lung problems from atelectasis.

72.

You are assessing a 70-year-old patient for mild shortness of breath. She is breathing 28 times per minute with an SpO₂ of 90% on room air. What can you expect the patient's partial pressure of oxygen (PO₂) to do at this point?

Decrease to 60 mmHg

Increase to 80 mmHg

Increase to 40 mmHg

Decrease to 27 mmHg

Correct answer: Decrease to 60 mmHg

As a dyspneic patient's blood oxygen saturation (SpO₂) drops to 90%, the paramedic can expect the patient's partial pressure of oxygen at the cellular level to decrease from normal to 60 mmHg.

As a dyspneic patient's blood oxygen saturation decreases to 90%, the partial pressure of oxygen also decreases. Therefore, it is not acceptable to assume that if the SpO₂ decreases the PO₂ will increase. As O₂ saturation decreases to 90%, the patient remains well-ventilated and perfusion continues adequately. However, it is not appropriate to assume the patient's partial pressure of oxygen will rise to a level that is considered extremely low.

If the partial pressure of oxygen dropped to 27 mmHg, the oxygen saturation is reduced to 50%, not 90%.

73.

Your trauma patient is combative with a decreased level of consciousness and GCS less than 8. His spontaneous respirations are between 26 and 30/minutes, and his heart rate is 130 bpm with a blood pressure of 90 mmHg/systolic. Which of the following medications may be used to sedate the patient prior to attempting intubation?

Etomidate

Lidocaine

Succinylcholine

Lorazepam

Correct answer: Etomidate

Sedation is sometimes indicated prior to an intubation attempt in patients who are combative from trauma or conscious with an active gag reflex. A widely used induction agent is etomidate, as it is a hypnotic agent and will sedate the patient, the first sequence in a rapid sequence induction intervention.

Lidocaine is often indicated prior to intubation of patients with known traumatic brain injury. In the case of pediatric patients, atropine should also be administered prior to intubation to prevent vasovagal bradycardia.

Succinylcholine is a powerful paralytic agent used during rapid sequence intubation; it is not indicated for sedation.

Lorazepam is a benzodiazepine often indicated for seizure activity. It is not used for pre-intubation sedation of combative patients.

74.

Your 69-year-old patient awoke with severe dyspnea and is only able to talk in two- to three-word bursts. Her skin is cool, pale, and diaphoretic with labored respirations at 30 with an SPO₂ of 80% on room air. She has audible wheezes and rales with pitting edema peripherally. She has an irregular heart rate of 100 to 110 bpm, and her ECG shows A-fib with no obvious pathological ST elevation or depression. Her blood pressure is 160/100 in an upright sitting position. She has a history of COPD, hypertension, and congestive heart failure.

Which of the following would be a first-line medication for this patient?

Nitroglycerin

Morphine

Albuterol

Furosemide

Correct answer: Nitroglycerin

Nitroglycerin is a powerful vasodilator and is used for patients presenting with acute pulmonary edema. It can help ease symptoms by reducing myocardial preload and creating more venous pooling. It should be noted that if the patient is being administered CPAP, generally, the seal of the mask should not be broken to administer NTG.

While morphine is an effective medication for increasing vasodilation and reducing preload on the heart, it is used more often in combination with NTG, as NTG is quick-onset and can be taken orally before venous access is initiated. It is important to note that because morphine is not being administered for its analgesic properties, fentanyl is not a good alternative, as its muscle relaxant properties are not as potent.

Depending on local protocols, albuterol may or may not be administered to a CHF patient. It should be used with caution, as some studies have shown the possibility of flash pulmonary edema when albuterol is administered to patients with CHF. However, even if medical control allows you to give it, since CHF is cardiac in nature with pulmonary symptoms, medications that reduce preload should be given consideration before albuterol.

While furosemide is indicated for patients with exacerbated CHF in the prehospital setting to help ease symptoms because of its long activation time and length of time

before any relief is seen due to its mechanism, it is not indicated as a first-line CHF medication.

75.

You are on-scene with an adult male who appears to have a partially obstructed airway. Bystanders state he is choking on pizza. He is slightly cyanotic around his mouth and nose as well as his nail beds. He is obviously struggling to breathe with diminished inspiratory/expiratory wheezing in all lobes and an ineffective cough.

What would be the most appropriate intervention at this point?

Initiate a rapid, safe transport and encourage him to cough in an attempt to expel the foreign body

Have him bend over slightly and perform finger sweeps to clear the foreign body from his upper airway

Bend the patient over slightly and administer back blows between his shoulder blades until the foreign body is expelled or he loses consciousness

Initiate safe transport and lay him supine before beginning abdominal thrusts to clear his airway of the foreign body obstruction

Correct answer: Initiate a rapid, safe transport and encourage him to cough in an attempt to expel the foreign body

If a patient has a partially obstructed airway but is still able to adequately move air in and out of his lungs, it is recommended to provide a supportive rapid, safe transport to the hospital for intervention if the patient is not able to cough it out. If the cyanosis becomes worse or the patient's respirations become less effective, the appropriate next step would be abdominal thrusts, followed by further airway management if needed.

It is never appropriate to perform blind finger sweeps on a patient with a partially obstructed airway, especially if he is breathing effectively.

It is not appropriate to attempt to clear a partially obstructed airway when good air exchange is occurring.

It is not appropriate to lay a conscious patient with a partially obstructed airway on their back to deliver abdominal thrusts.

76.

When using a laryngeal mask airway (LMA), how does the paramedic know when the device is successfully inserted?

When the cuff is inflated, the LMA will move slightly upward approximately 0.5–0.75 inch

When the tube cannot be advanced any farther

When the 21-centimeter mark on the tube is located at the patient's chin

When you visualize the tube passing the vocal cords

Correct answer: When the cuff is inflated, the LMA will move slightly upward approximately 0.5–0.75 inch

When the tube has been successfully inserted, the black line marked on the Laryngeal Mask Airway (LMA) rests midline between the patient's upper and lower lips. When the cuff is inflated, the LMA will move slightly upward approximately 0.5–0.75 inch. This is the best indicator, other than assessing lung sounds, that it is inserted correctly.

It is not appropriate to advance an LMA until it cannot be advanced any further. This would put the tube too deep and likely cause irritation at the glottic opening and an ineffective airway.

There are no centimeter markings located on an LMA. Also, 21 cm would place the tube tip well below the glottic opening. In the adult patient, it is located 19–21 cm deep.

An LMA is not advanced through the vocal cords; only an endotracheal tube passes the cords.

77.

Which of the following are contraindications for using a supraglottic airway such as a King LT or LMA?

Select the three correct answer choices.

The patient has a gag reflex

The patient has known esophageal disease

The patient has ingested a caustic substance

Intubation attempts have failed

The patient is apneic

Having an intact gag reflex or known esophageal disease are contraindications for all supraglottic airway devices. Ingestion of caustic substances is also a known contraindication of King Airways.

An apneic patient or failed intubation are indications for using a supraglottic device such as a King LT (laryngeal tube) or LMA (laryngeal mask airway).

78.

Your adult asthma patient is experiencing a severe asthma attack that is not improving after oxygen and maximal bronchodilator therapy. In which of the following situations should you consider intubating an asthma patient?

The patient's PCO₂ is increasing after maximum therapy

The patient's PCO₂ is decreasing after intervention

The patient's PO₂ is less than 90 mmHg after intervention

The patient's heart rate increases to over 120 beats per minute after intervention

Correct answer: The patient's PCO₂ is increasing after maximum therapy

In rare cases, advanced airway procedures will be required for an asthma patient in a severe attack. Absolute indications for immediate intubation of an asthma patient is coma and apnea. In addition, the paramedic should consider intubating any asthma patient who has the following: PO₂ less than 50 mmHg with oxygen therapy, PCO₂ greater than 50 mmHg with acute acidosis, PCO₂ increases despite maximal therapy, or if the patient becomes fatigued with decreased mental status.

It would not be appropriate to consider intubating a patient whose PCO₂ is decreasing after therapy. This is a finding that would indicate the patient may be getting better, not worse.

The normal PO₂ range is 80–100. It would not be appropriate to intubate a patient with a PO₂ of 90.

An asthma patient's heart rate may increase immediately following intervention as a reaction to the beta-agonists given to relieve the bronchospasm. It is not an indicator that intubation would be warranted.

79.

What is the drug of choice for providing sedation prior to performing rapid sequence intubation in patients with hypotension?

Ketamine

Succinylcholine

Lorazepam

Promethazine

Correct answer: Ketamine

The first step in rapid sequence intubation is to provide heavy sedation with medications like ketamine and etomidate. Ketamine is a powerful sedative with amnesic effects and is the drug of choice for providing heavy sedation to patients prior to rapid sequence intubation. Ketamine also has an amnesic effect that helps the patient not remember the event. In addition, this drug typically increases the heart rate and blood pressure and can safely be given to a patient with hypotension.

Succinylcholine is a paralytic administered after the sedative ketamine. It provides the airway paralysis required to intubate the breathing patient.

Lorazepam is a benzodiazepine often given in the pre-hospital setting for seizure disorders and may be used for sedation after intubation. It is not an approved sedative for rapid sequence intubation.

Promethazine is an antiemetic that has a sedative quality. It is not an appropriate medication to provide sedation before rapid sequence intubation.

80.

What is the best airway adjunct to quickly establish a clear means of air entry for a spontaneously breathing patient who has an intact gag reflex?

A nasopharyngeal airway (NPA)

An oropharyngeal airway (OPA)

A laryngeal mask airway (LMA)

An esophageal-tracheal Combitube

Correct answer: A nasopharyngeal airway (NPA)

A NasoPharyngeal Airway (NPA) is the least invasive airway adjunct. It does not truly help maintain or establish an open airway, but it does keep a clear passage for air to the hypopharynx. It is useful in conscious or unconscious patients with an intact gag reflex. It is also useful if the patient will possibly require a nasogastric tube inserted. An NPA is the only airway adjunct that does not irritate a patient's gag reflex if it is still intact regardless of whether the patient is conscious.

OroPharyngeal Airways (OPA) are useful in unconscious patients or patients in cardiac arrest to help keep the patient's tongue out of the hypopharynx. However, they are not indicated for conscious patients because most conscious patients will have an active gag reflex.

For an Laryngeal Mask Airway (LMA) to be indicated, the patient must be unresponsive without an active gag reflex. It is often indicated when intubation is needed, but access to the patient or a possible spinal cord injury prevents successful intubation. LMAs are considered supra-glottic airways.

A Combitube is often used for patients who require ventilatory assistance and airway control. It has two tubes that enter both the esophagus and trachea. Combitube is indicated when intubation is needed but difficult or impossible. However, like most advanced airway control devices, the patient must be unconscious/unresponsive with an absent gag reflex.

81.

Gas exchange in the lungs and tissues is known as respiration. Which of the following are considered external factors that may affect this?

Select the two answer options which are correct.

High altitude

Carbon monoxide inhalation

Pulmonary edema

COPD

Low atmospheric pressure conditions such as those found at high altitudes and carbon monoxide inhalation are considered external factors that will affect respiration.

Chronic Obstructive Pulmonary Disease (COPD) and pulmonary edema would be considered internal factors that may affect respiration.

82.

Which of the following conditions is most likely to cause a decrease in spontaneous respiration?

Metabolic alkalosis

Metabolic acidosis

Aspirin poisoning

Hypoxemia

Correct answer: Metabolic alkalosis

Metabolic alkalosis results in a decrease in the rate and depth of a patient's spontaneous respiration. The body decreases respiration in an attempt to correct the carbon dioxide levels and pH of the patient's blood.

Metabolic acidosis causes an increase in spontaneous respiration in an attempt to correct the oxygen level and pH.

The rate and depth of respirations increase when a patient experiences aspirin overdose in an attempt to correct the acidosis caused by aspirin.

The rate and depth of spontaneous respiration increases, not decreases, when the body detects hypoxemia (low blood oxygen level).

83.

You are called to assist an adult female at a local restaurant who was found in the bathroom and unable to speak, and is barely conscious. Her husband states she was eating dinner when she simply got up from her chair and went to the bathroom. Which of the following signs would lead you to believe a foreign-body airway obstruction is present?

Her skin is cyanotic, and she has stridor respirations on inhalation

She is diaphoretic with hot, dry skin and an ineffective cough

She has hypotension, urticaria, and inadequate air exchange

She is unresponsive and has fixed pupils

Correct answer: Her skin is cyanotic, and she has stridor respirations on inhalation

The best indicator of an obstructed airway in an adult who cannot speak is the presence of cyanosis with stridor respirations.

Hot skin with diaphoresis is more likely found in a patient with pulmonary embolus than an obstructed airway.

Hypotension with urticaria and inadequate air exchange is more likely to be experiencing an allergy/anaphylaxis than an obstructed airway.

Unresponsive patients with fixed pupils are more likely experiencing a brain injury rather than a blocked airway.

84.

Which of the following airway devices are indicated for patients who depend on hypoxic drive to breathe?

Venturi mask

Non-rebreather mask

Nasal cannula

Simple face mask

Correct answer: Venturi mask

The Venturi mask is a high-flow oxygen entrainment delivery device. It delivers a precise fraction of inspired oxygen at typically low concentrations. It can deliver a precise FiO_2 between 25–50 percent. It is used for patients who require specific concentrations, such as COPD patients.

A non-rebreather mask is a high-flow oxygen delivery system. It is designed to deliver 10–15 liters of oxygen per minute at concentrations approaching 100 percent. These masks are not intended for the long-term treatment of hypoxic drive patients.

A nasal cannula delivers low-concentration oxygen between 20–44 percent and is designed to deliver up to 6 liters per minute. Nasal cannulas are often used but cannot deliver specific concentrations as a Venturi mask can.

Simple face masks are seldom used today but are capable of delivering 6–10 liters of oxygen per minute. They are not indicated for the long-term treatment of patients who breathe on hypoxic drive.

85.

Which of the following steps are correct for suctioning a stoma?

Select the 2 answer options which are correct.

Apply suction while withdrawing the catheter

Use an appropriately sized soft suction catheter

Inject 10 mL of sterile saline through the stoma and into the trachea

Use a rigid suction catheter such as the Yankauer

To suction a stoma, inject a small amount (no more than 3 mL) of sterile saline through the stoma and into the trachea. Next, insert an appropriately sized soft suction catheter without applying suction until resistance is met. Then, apply suction while withdrawing the catheter.

Do not use a rigid suction catheter to suction a stoma. These are for suctioning the mouth and nose only. 10 mL of saline is too much for suctioning and may cause aspiration.

86.

You are evaluating a 20-year-old male patient experiencing respiratory problems. You apply an End-Line CO₂-equipped nasal cannula to the patient and attach it to your monitor. You notice a shark-fin-shaped graph on the capnography and the patient's EtCO₂ at 45 mmHg.

What is this most likely indicative of?

The patient is experiencing asthma exacerbation and needs to be treated accordingly

The patient is hyperventilating due to the distress and should be coached to breathe slower

The patient is experiencing a foreign body airway obstruction in the upper airway and cannot breathe adequately

The patient is experiencing diabetic ketoacidosis (DKA) and needs to be treated accordingly

Correct answer: The patient is experiencing asthma exacerbation and needs to be treated accordingly

A capnography wave that shows a consistent shark-fin appearance is indicative that the patient is having constriction in the lower airways, as air is not passing through them consistently. While the CO₂ measurement of 45 mmHg is on the high side of normal (normal is 35–45 mmHg), this shows that the patient is unable to expel CO₂ as effectively, which helps hold up the hypothesis of asthma (other possibilities include COPD and possibly pneumonia, depending on the patient).

If the patient is hyperventilating, this would most likely cause low CO₂ measurement, as the patient is breathing too fast to properly retain CO₂. Also, generally with just hyperventilation, the graph will have a normal box-like appearance.

While an airway obstruction may cause a higher CO₂ reading that is normal due to inadequate ventilation, it would still likely retain a box-like appearance because the air in the patient's respiratory system would all be moving at the same time, just slower than normal. This is opposed to asthma, wherein the bronchioles are having a harder time moving air, and the upper airway is unobstructed.

Diabetic KetoAcidosis (DKA) results in the patient experiencing Kussmaul respirations, which are faster than normal in an attempt to blow off the excess acid in

the patient's body. This could result in a possibly lower CO₂ measurement, but at the very least, the capnography would not show shark fins.

87.

Which of the following are indications for CPAP administration?

Select the three correct answer options.

Pulmonary edema

COPD exacerbation

Pneumonia

Apnea

Pneumothorax

Continuous positive airway pressure (CPAP) is indicated for patients experiencing respiratory distress in conditions such as chronic obstructive pulmonary disease (COPD), asthma, or pneumonia. Pulmonary edema is the most common reason for CPAP administration.

Apnea is a contraindication for CPAP administration, as the patient must be breathing and able to support their own airway for it to be effective. Pneumothorax is a contraindication of CPAP administration, as the condition will worsen with the increased pressure.

88.

Which of the following are correct steps in placing an orogastric tube in an unresponsive patient that has been intubated?

Select the 3 answer options which are correct.

Position the head in a slightly flexed position

Lubricate the tube with water-soluble gel

Measure from mouth to ear to xiphoid process

Position the head in a chin down position

The steps for placing an orogastric tube in an unresponsive patient are as follows:

- 1. Position the head in a slightly flexed position*
- 2. Measure from mouth to ear to xiphoid process*
- 3. Lubricate the tube with water-soluble gel and introduce the tube at the midline; advance it gently into the oropharynx, continuing into the stomach*
- 4. Confirm placement*
- 5. Apply suction to the tube*
- 6. Secure the tube in place*

The chin down position may be helpful in placing the nasogastric tube, not an orogastric tube, in a conscious patient.

89.

Which of the following respiratory patterns is most likely to be present with an adult patient suffering the adverse effects of diabetic ketoacidosis?

Kussmaul respirations

Cheyne-Stokes respirations

Central neurogenic hyperventilation

Bradypnea

Correct answer: Kussmaul respirations

Kussmaul respiratory pattern is characterized by an abnormally deep, very rapid sighing respiratory pattern. It is most often seen in patients with diabetic ketoacidosis and other forms of metabolic acidosis.

Cheyne-Stokes respirations are characterized by a periodic pattern of breathing with equal periods of apnea followed by a period of crescendo-decrescendo sequence of respirations. It is not associated with acidosis.

Central neurogenic hyperventilation is a rapid pattern of breathing that is most often regular and at a rate of 25 breaths per minute. Increasing rates indicate an injury at the cortical level of the brain. It is not associated with diabetes or any type of acidosis.

Bradypnea is a persistent respiratory rate of less than 12 per minute. It is often seen in patients with chest wall injury and narcotic overdose patients. Painful respiration is a common voluntary cause of bradypnea. It is not often seen with any type of acidosis (including ketoacidosis). Patients with most forms of metabolic acidosis, including ketoacidosis, will present with increased respirations, not decreased respirations.

90.

Your adult patient is found unconscious with decreased respirations. Which of the following medical conditions is most likely to cause a direct decrease in a patient's respiratory effort and/or breathing rate?

Metabolic alkalosis

Metabolic acidosis

Aspirin poisoning

Central nervous system lesion involving the pons

Correct answer: Metabolic alkalosis

Metabolic alkalosis is a disorder that results from a significant loss of body acid or a condition that causes an increase in base bicarbonate characterized by a direct decrease in respiratory effort and rate.

Metabolic acidosis is a disorder that results from an excess of acid within the body. It can also occur when something causes an increased loss of base bicarbonate.

Aspirin poisoning is most likely to cause metabolic acidosis due to the high acidity of aspirin. Therefore, respiration can be expected to increase as the body attempts to blow off the acid.

Central nervous system lesions that affect the pons are likely to cause an increase in respiration due to the stimulation of the respiratory centers in the pons.

91.

You are preparing for medication-assisted intubation of a 29-year-old patient. Which of the following medications and doses are appropriate for paralysis?

Select the three correct answer options.

Rocuronium (Zemuron) 1 mg/kg

Vecuronium (Norcuron) 0.1 mg/kg

Succinylcholine (Anectine) 1 mg/kg

Pancuronium (Pavulon) 1 mg/kg

Standard adult drug dosages for medication-assisted intubation paralytics are succinylcholine (Anectine) 1–2 mg/kg, vecuronium (Norcuron) 0.1–0.2 mg/kg, rocuronium (Zemuron) 0.6–1.2 mg/kg, and pancuronium (Pavulon) 0.06–0.1 mg/kg.

1 mg/kg of pancuronium bromide would be ten times the standard adult dose.

92.

Your adult patient is hypoxic and struggling to breathe. What can be said about the patient's partial pressure of oxygen?

The PaO₂ is likely below 80 mmHg

The PaO₂ is likely over 90 mmHg

The PaO₂ is slightly below 100 mmHg

The PaO₂ is likely over 100 mmHg

Correct answer: The PaO₂ is likely below 80 mmHg

In a normally breathing adult, the PaO₂ should be from 80-110 mmHg. Any value below 80 mmHg is considered abnormal and is a common finding with hypoxia.

A PaO₂ of over 80 mmHg is considered normal and would most likely be present in normally breathing patients.

93.

What is the normal respiration rate for a newborn (0–1 month)?

40–60 breaths per minute

100–180 breaths per minute

10–20 breaths per minute

15–30 breaths per minute

Correct answer: 40–60 breaths per minute

When babies are born, their vital signs can be vastly different from adults due to their size and organ development. It is important to recognize how their vital signs are different, as 40 breaths per minute would be an emergency for an adult but perfectly normal for a two-week-old. Likewise, a normal rate of 12 breaths per minute for an adult is a respiratory emergency for a two-week-old.

Respirations less than 40 per minute would not be adequate for a newborn.

94.

You have copious amounts of secretions noted in the lower airway of your intubated patient, making ventilation ineffective. Which would be the most appropriate action to clear the secretions?

Using a sterile technique, insert the suction catheter and apply suction while withdrawing the catheter with a rotating or twisting motion

Administer 3-5 mLs of atropine down the endotracheal tube, and ventilate to ensure delivery of the medication into the lower airways to dry up secretions

Increase the rate and depth of your ventilations with the bag valve mask to force the secretions from the lower airways up the tube where it can be easily suctioned

Raise the head of the stretcher thirty degrees to facilitate drainage of the secretions and continue ventilations

Correct answer: Using a sterile technique, insert the suction catheter and apply suction while withdrawing the catheter with a rotating or twisting motion

If a paramedic is unable to clear the copious secretions from a patient's lower airways, the ventilations will not be effective because the patient will not get an adequate amount of oxygen delivered to the alveoli. The paramedic must insert a flexible suction catheter and suction while withdrawing the catheter, moving the catheter in a twisting or rotational motion.

Atropine is a medication administered via IV in the prehospital setting. It is not appropriate to administer the medication down the ET tube in hopes it will clear the thick secretions.

When thick, heavy amounts of mucus and saliva are filling the lower airways and making ventilation ineffective, it is not acceptable to increase the rate and depth of your ventilations to clear the secretions. It not likely to help at all and could even cause a pneumothorax to occur.

Raising the head of the stretcher may help the oxygen reach the lower airways a little better and help relieve some feelings of shortness of breath for the patient, but it does not clear the thick secretions from the lower airways, and oxygenation is still compromised. The secretions must be brought up either by the patient or mechanical suction if the patient is intubated.

95.

Which abnormal respiratory pattern is associated with brainstem herniation characterized by irregular, cluster-type respirations?

Ataxic respiratory pattern

Kussmaul's respiratory pattern

Bradypnea respiratory pattern.

Tachypnea respiratory pattern

Correct answer: Ataxic respiratory pattern

An ataxic respiratory pattern is a name for cluster type, which are irregular respirations commonly seen in patients with brainstem herniation.

Kussmaul's respirations are regular, rapid, and deep. This pattern is associated with metabolic acidosis conditions such as diabetic ketoacidosis. Bradypnea is slow, regular respirations, with a regular pattern; it is associated with opioid intoxication or similarly depressed mental status circumstances. Tachypnea is fast, regular respirations and is associated with hypoxia, shock, and anxiety,

96.

You have an adult patient with respiratory insufficiency whose respirations are shallow and irregular at six times per minute. Their SpO₂ is 76%, and you anticipate carbon dioxide retention due to the decreased respiratory effort. Which of the following should you suspect?

Respiratory acidosis

Respiratory alkalosis

Metabolic alkalosis

Metabolic acidosis

Correct answer: Respiratory acidosis

Respiratory acidosis is caused by the direct retention of carbon dioxide and the subsequent increase in partial pressure of carbon dioxide. Ineffective respirations are the most common cause of respiratory acidosis.

Respiratory alkalosis is caused by an increased respiratory or ventilatory rate. This causes a direct decrease in the available CO₂. Hyperventilation syndrome and overaggressive BVM ventilation are the most common causes of respiratory alkalosis in the prehospital setting.

Metabolic alkalosis is a rare condition that results from a direct loss of hydrogen ions. This is most often caused by excessive nausea/vomiting and diarrhea and is not associated with ineffective respiration.

Metabolic acidosis is caused by an increase in acids or a decrease in base and is not caused by ineffective respiratory effort.
