

Chapter Eight Respiratory Aid

1- What drug triggers bronchospasm in asthma?

- A-Salicylamide
- B-Propoxyphene
- C-Mefenamic acid
- D-Choline salicylate

2-A 30 year old woman suffers a sudden attack of dyspnea and chest pain. What can R/O the PE better?

- A- Ventilation scan
- B- Echocardiography
- C- CT scan
- D- D-dimer and duplex sonography of the lower limb

3- Which drug is safe in asthma?

- A-Timolol for glaucoma
- B-Atenolol beta-1 receptor blocker
- C- Propoxyphene
- D-Tartrazine

4-What asthma drug can be used during pregnancy?

- A-Salbutamol and Beclomethasone
- B-Salbutamol
- C-Beclomethasone
- D- Neither can be used

5- An obese woman suffers dyspnea after child delivery.

BP=115/75 mmHg/ PR=110 bpm .RR=22/min.

Lung auscultation is normal. Her perfusion scan is normal. Which statement about her is correct?

- A- PE can be R/O by a negative perfusion scan
- B- Perfusion scan should be repeated
- C-Ventilation scan should be done
- D- LMWH should be prescribed

6-A 35 year old woman has an acute asthma attack. What is the most effective treatment?

- A- Glucocorticoids IV
- B- Aminophylline IV
- C- Adrenaline SC
- D- Beta agonist aerosol

7-Which mechanical ventilation is better for a post thoracic surgery patient?

- A- Assist Control Mode
- B- Positive End Expiratory Pressure Ventilation +Intermittent Mandatory Ventilation
- C- Pressure Control Ventilation
- D- Intermittent Mandatory Ventilation

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8-An asthmatic patient uses beclomethasone aerosol 8 puff every 6 hours and salbutamol 2 puff PRN. He states he uses salbutamol 4 times a day. He has two dyspnea attack at night each week. What should be done for him?

- A- Adding Salmeterol 2 puffs /12 hours
- B- Adding Beclomethasone 12 puffs /6 hours
- C- Prednisolone PO 10 mg /day
- D- Leukotriene antagonists 2 tablets/day

9-A near drowning rescued man is in ED. CPR is done. He is ventilated by mask and Ambu bag. He is alert.

BP=90/60 mmHg /T=36c / PR=120 bpm /RR=30 /min.

His cardiac rhythm is sinus tachycardia. Pulse oximetry shows SaO₂=83%. Which is the best way to restore his respiratory function?

- A-Bicarbonate
- B- Acetazolamide
- C- Oxygen
- D- CPAP +oxygen
- E- Suction of aspirated material and Oxygen

10-A 21 year old laboratory technician develops dypnea, cough, fever, chills, and weakness. He is examined in his recovery days. His CXR shows patchy infiltrates. ESR is raised. He says his condition has started since his work on some mice.

What is the best management for this case?

- A-Cromolyn aerosol
- B- Prednisolone
- C- Beclomethasone aerosol
- D- Stop working with mice
- E- No treatment is necessary

11-A patient with ARDS is treated by PEEP of 10 cmH₂O. Now he develops pneumothorax. What is his best treatment at this stage?

- A- Assist Control Mode
- B- Positive End Expiratory Pressure Ventilation +Intermittent Mandatory Ventilation
- C- Pressure Control Ventilation
- D- Intermittent Mandatory Ventilation

12- Which of the following cases would warrant immediate intubation and mechanical ventilation?

A- A 50-year-old man who is comatose from drug overdose.

PaCO₂ is 51 mm Hg/ PaO₂ is 76 mm Hg/ pH is 7.31 while breathing room air.

B- A 29-year-old man who is alert but in respiratory distress

RR= 42 per min/ PaCO₂ is 38 mm Hg/ PH is 7.42/ PaO₂ is 47 mm Hg while breathing 60% oxygen through a face mask.

C- A 61-year-old alert woman who has severe emphysema in moderate respiratory distress; her respiratory rate is 24/min. PaO₂ is 75 mm Hg while breathing nasal oxygen at 2 L/min, PaCO₂ is 59 mm Hg, and the PH is 7.37. Her chest x-ray is clear.

D- A 29-year-old woman who is suffering diabetic ketoacidosis. Her pH is 7.10/ PaCO₂ is 26 mm Hg / PaO₂ is 110 mm Hg while breathing room air.

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E- A 31-year-old drug abuser who responds briefly to the administration of Narcan (a narcotic antagonist) by opening her eyes and crying out and then lapses back into a state of semi-stupor. PaCO₂ is 31 mm Hg/ PH is 7.38/ PaO₂ is 89 mm Hg while breathing nasal oxygen at 3 L/min.

13-A decision is made to wean a 67 year old man from the ventilator. Before weaning is begun, the machine is in the assist-control mode. The patient is initiating 16 breaths per min and is receiving 700 cc per breath. He is switched to IMV at a rate of 12/min and within a half hour is noted to be in respiratory distress with a total respiratory rate (machine initiated plus spontaneous) of 20/min. Blood gas measurements obtained before and after the change to IMV are shown below. How would you explain the changes?

Mode	(and tidal volume)	breaths	pH	PaCO ₂	PaO ₂	FIO ₂
Assist-control	16 (700 cc)	0	7.45	38	78	0.40
IMV	12 (700 cc)	8	7.39	47	65	0.40

14-A 60 year old patient is in the hospital for myocardial infarction. During the night she suffers acute pulmonary edema and requires cardiopulmonary resuscitation. Before the patient is intubated and mechanical ventilation is begun, her blood gas measurements show pH of 7.06 / PaCO₂ of 61 mm Hg/ and PaO₂ of 50 mm Hg while breathing 100% oxygen delivered by manual ventilation with an Ambu bag. The patient's estimated body weight is 50 kg (110 Lbs). What initial ventilator settings would you choose for the following :

- FIO₂
 - Tidal volume
 - Inspiratory pressure limit
 - Respiratory rate
 - Peak inspiratory flow rate
 - Inspiratory sensitivity
- Would you provide PEEP?

15-A 72 year old man with severe chronic obstructive pulmonary disease is in Intensive Care Unit. His blood PH is 7.24/ PaCO₂ is 84 mm Hg/ PaO₂ is 58 mm Hg while breathing 28% oxygen through a Venturi mask. His chest x-ray suggests severe emphysema. Despite optimal drug therapy, his blood gas measurements cannot be improved, and he is almost unarousable. To prevent respiratory arrest, he is intubated and given mechanical ventilation. His estimated body weight is 70 kg (150 lbs). What initial ventilator settings would you choose for the following :

- FIO₂
 - Tidal volume
 - Inspiratory pressure limit
 - Respiratory rate
 - Peak inspiratory flow rate
 - Inspiratory sensitivity
- Would you provide PEEP?

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16-A comatose 20 year old patient is brought to the emergency room following an overdose of sleeping pills. Because of very shallow respirations and cyanosis, the patient is intubated before his blood gas results are known. Initial ventilator settings include a tidal volume (VT) of 700 cc, a respiratory rate (RR) of 12/min, and an FIO₂ of 0.50. The patient has no spontaneous breathing. Blood gas results obtained (1) before intubation and (2) 20 minutes later show the following:

	pH	PaCO ₂	PaO ₂	FIO ₂	VT	RR
(1)	7.10	79	38	Room air	0	0
(2)	7.25	56	117	50% oxygen	700	12

Following the second blood gas analysis, would you change the FIO₂, the tidal volume, or the respiratory rate? If so, what settings would you choose?

State whether each of the following is true or false .

17. Mechanical ventilation is indicated for any patient with a PaCO₂ above 50 mm Hg and a pH less than 7.30.
18. During controlled positive pressure ventilation, each breath is initiated by the patient.
19. During ventilation with positive end expiratory pressure (PEEP), the pressure in the upper airways is always above atmospheric pressure.
20. A patient receiving intermittent mandatory ventilation (IMV) is able to alternate spontaneous breathing with machine breaths.
21. Continuous positive airway pressure (CPAP) is defined as a PEEP pressure maintained above 10 cm H₂O.
22. The appropriate FIO₂ during the initial stages of mechanical ventilation is always 1.00 (100%).
23. Successful ventilatory weaning requires the patient to have a VD/VT of less than 0.45.

24- Mrs. Puffer is a 35-year-old single mother, just getting off the night shift. She reports to the ED in the early morning with shortness of breath. She has cyanosis of the lips. She has had a productive cough for 2 weeks. Her temperature is 102.2, blood pressure 110/76, heart rate 108, respirations 32, rapid and shallow. Breath sounds are diminished in both bases, with coarse rhonchi in the upper lobes. Chest X-ray indicates bilateral pneumonia. Define the problem and suggest a solution. ABG results are: pH= 7.44 /PaCO₂= 28 /HCO₃= 24 /PaO₂= 54

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25-Mr. Worried is a 52-year-old widow. He is retired and living alone. He enters the ED complaining of shortness of breath and tingling in fingers. His breathing is shallow and rapid. He denies diabetes; blood sugar is normal. There are no EKG changes. He has no significant respiratory or cardiac history. He takes several anti-anxiety medications. He says he has had anxiety attacks before. While being worked up for chest pain an ABG is done:

- ABG results are:
 - pH= 7.48
 - PaCO₂= 28
 - HCO₃= 22
 - PaO₂= 85

Define the problem and suggest a solution.

26- Mr. Sweet, a 24-year-old DKA (diabetic ketoacidosis) patient comes to the ED. The medical diagnosis tells you to expect acidosis. In report you learn that his blood glucose on arrival was 780. He has been started on an insulin drip and has received one amp of bicarb. You will be doing finger stick blood sugars every hour.

- ABG results are:
 - pH= 7.33
 - PaCO₂= 25
 - HCO₃=12
 - PaO₂= 89

Define the problem and suggest a solution.

27- A 26 year-old PT student returns from a humanitarian project in Guatamala. He complains of severe vomiting for five days. He appears extremely fatigued, and has sunken eyes, dry mucous membranes, a heart rate of 110 and a blood pressure of 90/50. When he stands, his blood pressure falls, and his heart rate increases.

ABG is: PH= 7.50 /PaCO₂= 47 /PaO₂= 80 / HCO₃=38

Identify this condition in regard to the ABG Data

28-A 71 year old male, retired machinist, is admitted to the ICU with a history of increasing dyspnea, cough, and sputum production. He has a 120 pack-year smoking history, and quit 5 years previously. On exam he is moving minimal air despite using his accessory muscles of respiration. He has acral cyanosis.

His ABG is:

PH=7.21 / PaO₂=75 / PaCO₂=41/ HCO₃=30.

A-Identify this condition in regard to the ABG data.

B-What is the likely etiology of this man's hypoxia?

29- A 35 year old man is under mechanical ventilation for severe pulmonary infection. His RR increases and right sided pneumothorax develops. What should be done?

A- Needle drainage

B- Observation

C- Small bore catheter

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D- Chest tube

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<p>Protocol 1: ROUTINE MEDICAL CARE (RMC)</p>	<p>1. Assess ABC's; Protect C-Spine as necessary. 2. Oxygen therapy 3. Place patient in Semi-Fowler's position or position of comfort. 4. EKG Monitor and evaluate cardiac rhythm. 5. Initiate IV access with catheter size and Normal Saline appropriate to protocol, or Saline Lock. 6. Obtain and record frequent vital signs (every five (5) minutes, as possible). 7. Contact medical control as indicated by specific protocol.</p> <p>In an uncooperative patient, the requirement to initiate full ALS assessment and care may be waived in favor of assuring the patient is transported to an appropriate facility.</p>
<p>PROTOCOL 2: RESPIRATORY ARREST/IMMINENT RESPIRATORY ARREST/INTUBATION</p>	<p>1. Airway control with intubation, 100% O2 with BVM. 2. EKG Monitoring. 3. IV of Normal Saline at KVO. 4. Refer to appropriate protocol for further assessment and treatment. MEDICAL CONTROL OPTIONS * DIAZEPAM 5-10mg IVP * MORPHINE SULFATE 2-10mg IVP * MIDAZOLAM 0.5-2.0mg Slow IVP * LIDOCAINE 1.0-1.5mg/kg IVP</p>
<p>PEDIATRIC PROTOCOL 2a: RESPIRATORY ARREST/IMMINENT RESPIRATORY ARREST</p>	<p>1. Airway control with intubation, 100% O2 with BVM. 2. EKG Monitoring. 3. IV of Normal Saline at KVO, or IO if peripheral IV access not available. 4. Consider nasogastric tube placement for patient with gastric distention after intubation. 5. Refer to appropriate protocol for further assessment and treatment.</p>
<p>PROTOCOL 3: OBSTRUCTED AIRWAY, UNCONSCIOUS</p>	<p>1. BLS procedure. 2. Direct laryngoscopy and remove foreign body using Magill forceps. 3. If unable to ventilate, intubate. 4. If unable to intubate because of obstruction, cricothyrotomy with large bore over-the-needle catheter. 5. Refer to appropriate protocol, or contact medical control.</p>
<p>PROTOCOL 4: RESPIRATORY DISTRESS ASTHMA /BRONCHOSPASM/ COPD</p>	<p>1. Airway control and O2. 2. EKG Monitor. 3. IV of Normal Saline at KVO if clinically indicated. 4. If asthma is working diagnosis, ALBUTEROL 2.5mg/3cc normal saline via nebulizer, may repeat once in 15 minutes. IN THE EVENT OF COMMUNICATION FAILURE, may repeat ALBUTEROL, in 15 minutes. * ALBUTEROL 2.5mg/3cc normal saline via nebulizer, repeat as directed. * METAPROTERENOL 0.1-0.3cc/3cc normal saline via nebulizer, repeat as directed. * TERBUTALINE 0.25mg subcutaneous, repeat as directed. * EPINEPHRINE 1:1,000 0.3mg subcutaneous, repeat as directed. * MAGNESIUM SULFATE 1-2gm IV over 5 minutes. * METHYLPREDNISOLONE 125mg/50cc normal saline over 3-5 minutes. CAUTION: Use Epinephrine with caution in patients with history of or presence of hypertension, heart disease, current pregnancy, beta blockers. Avoid Methylprednisolone if suspect varicella.</p>
<p>PEDIATRIC PROTOCOL 4a: RESPIRATORY DISTRESS ASTHMA/BRONCHOSPASM/CROUP/EPIGLOTTITIS</p>	<p>If patient has stridor or drooling, do not initiate IV access without medical control. 1. Airway control and O2. 2. EKG Monitor. 3. IV of Normal Saline at KVO if clinically indicated. 4. If asthma is working diagnosis, ALBUTEROL 0.15mg/kg/3cc normal saline via nebulizer; maximum dose 2.5 mg, may repeat once in 15 m IN THE EVENT OF COMMUNICATION FAILURE, may repeat ALBUTEROL, in 15 minutes. * ALBUTEROL 0.15mg/kg/3cc normal saline via nebulizer; maximum dose 2.5 mg; repeat as directed. * EPINEPHRINE 1:1,000 0.01mg/kg subcutaneous; maximum dose 0.3 mg; repeat as directed. * MAGNESIUM SULFATE 200mg-1gm IV over 5 minutes. * METHYLPREDNISOLONE 2mg/kg IV. CAUTION: Avoid Methylprednisolone if suspect varicella.</p>

Table8-1: Protocol of Respiratory Management

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<p>STATUS EPILEPTICUS (Two or more seizures without a lucid interval or a continuous seizure lasting more than 5 minutes).</p>	<p>1. Routine Medical Care . 2. O2, IV of Normal Saline, EKG Monitor, Blood Sample if possible (glucose level). 3. If the patient is having sustained seizures, DIAZEPAM is administered 5-10mg IV over 1-2 minutes. If IV route not available, give rectally, via syringe w/out needle up to 10mg; may be repeated once after 10 minutes. 4. For suspected hypoglycemia, DEXTROSE 50% 50cc IVP or GLUCAGON 1mg IM; THIAMINE 100mg slow IVP or IM. 5. If above actions do not terminate seizure, or respirations are depressed, attempt intubation.</p> <p>* DIAZEPAM 5-10mg IV injection, may be repeated up to 20mg or rectally via syringe w/out needle, up to 20mg. * NALOXONE 2.0mg IV injection, may be repeated up to 8mg. * INTUBATION. CAUTION The paramedic will discontinue the administration of DIAZEPAM as soon as the seizure stops, whether or not the entire ordered dosage has been administered.</p>
<p>PEDIATRIC PROTOCOL OF STATUS EPILEPTICUS</p>	<p>* DIAZEPAM 0.1-0.2mg/kg slow IV; may be repeated. May give rectally via syringe w/out needle at 0.5mg/kg, up to 10mg; may be repeated. * NALOXONE 0.1mg/kg IV or IM; may be repeated 3 times. * INTUBATION. CAUTION The paramedic will discontinue the administration of DIAZEPAM as soon as the seizure stops, whether or not the entire ordered dosage has been administered.</p>
<p>SYSTEMIC ALLERGIC REACTIONS, ANAPHYLAXIS</p>	<p>1. Routine Medical Care . 2. O2, EKG Monitor. 3. If signs of shock or imminent airway obstruction, EPINEPHRINE 1:1,000 0.3cc SQ; may be repeated once after five (5) minutes. 4. If generalized urticaria or anaphylaxis DIPHENHYDRAMINE 25-50mg IM or IV. 5. IV of Normal Saline at KVO if no signs of shock, wide open if signs of shock</p> <p>* EPINEPHRINE 1:10,000 0.1-1.0mg is given slow IVP or via ET. May be repeated every 5 minutes per Medical Control. * EPINEPHRINE 1:1,000 0.1-0.5mg is given subcutaneously. May be repeated every 5 minutes per Medical Control. * DIPHENHYDRAMINE 25-50mg IM or IV. * ALBUTEROL 2.5mg via nebulizer. * DOPAMINE INFUSION 400mg/250cc Normal Saline and started at 5-10mcg/kg/min. then titrated to desired BP (maximum of 25mcg/kg/min.). * PASG. * GLUCAGON 1mg IV or IM.</p>
<p>PEDIATRIC PROTOCOL OF SYSTEMIC ALLERGIC REACTIONS, ANAPHYLAXIS</p>	<p>1. Routine Medical Care per Protocol 1. 2. O2, EKG Monitor. 3. If signs of shock or imminent airway obstruction, EPINEPHRINE 1:1,000 0.01mg/kg SQ to a maximum dose of 0.3mg. 4. IV of Normal Saline at KVO if no signs of shock; 20cc/kg IV or IO if signs of shock.</p> <p>* EPINEPHRINE 1:10,000 0.01mg/kg ET, IVP or IO, may be repeated every 5 minutes. * EPINEPHRINE 1:1,000 0.01mg/kg SQ up to maximum dose of 0.3mg. * DIPHENHYDRAMINE 1mg/kg slow IVP or IM. * ALBUTEROL 0.15mg/kg in 3cc normal saline via nebulizer, to maximum of 2.5mg. * FLUID CHALLENGE of 10-20cc/kg Normal Saline.</p>
<p>TOXEMIA OF PREGNANCY</p>	<p>1. Routine Medical Care per Protocol 1. 2. IV of Normal Saline at KVO, O2, EKG Monitor. 3. Position patient in left lateral decubitus if tolerated.</p> <p>* DIAZEPAM 5-10mg IV over 1-2 minutes; may be repeated once. Paramedic to withhold further DIAZEPAM once seizure controlled. * MAGNESIUM SULFATE 4gm/250cc Normal Saline and run at 500cc/hr. (if patient becomes lethargic or hypotonic, discontinue MAGNESIUM infusion. * ADJUST IV RATE. * CALCIUM CHLORIDE 250-1000mg IV.</p>

Table8-1: Protocol of Respiratory Management (Cont)

The Asthma Management Protocol currently in use in the Wellington Hospital Emergency Department

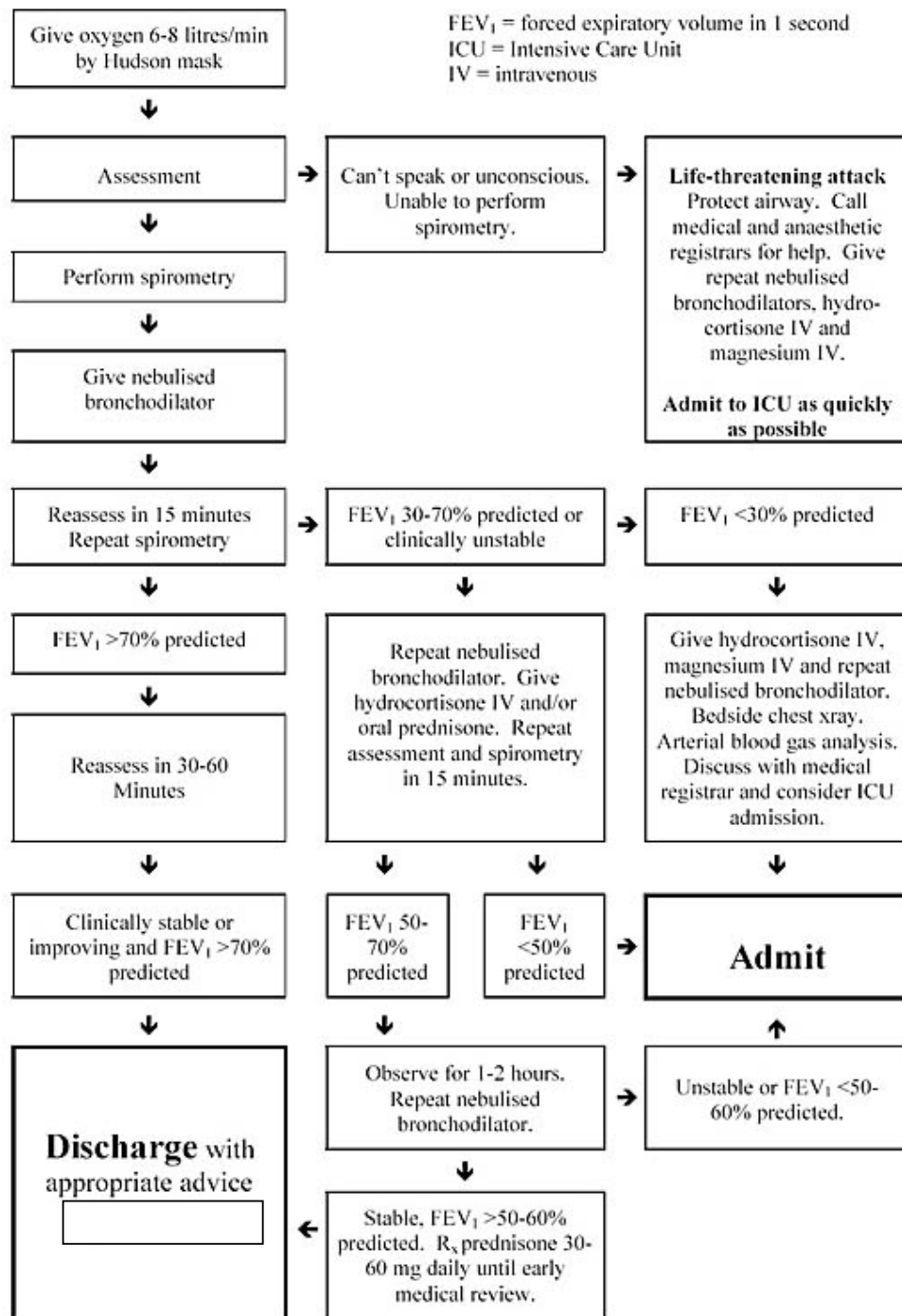


Figure 8-1: Asthma Management

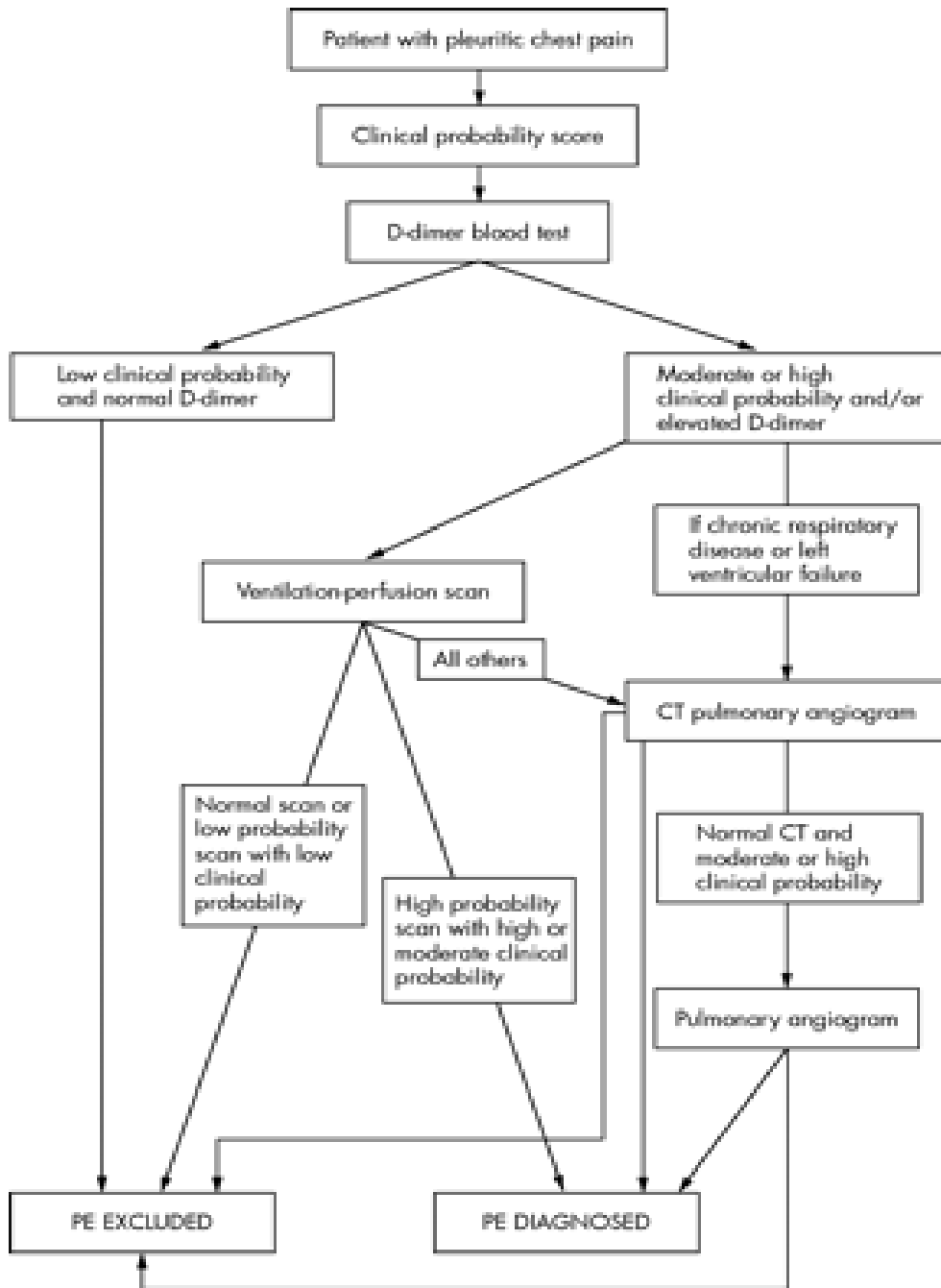


Figure 8-2: The Diagnostic Protocol of Chest Pain (CT= computed tomography; PE= pulmonary embolism)

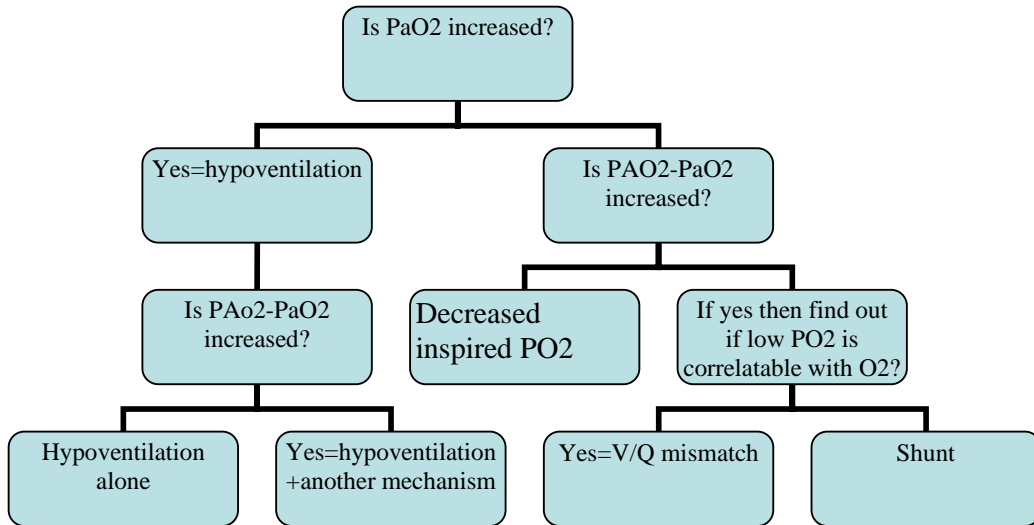


Figure 8-3: Algorithm of Hypoxemia

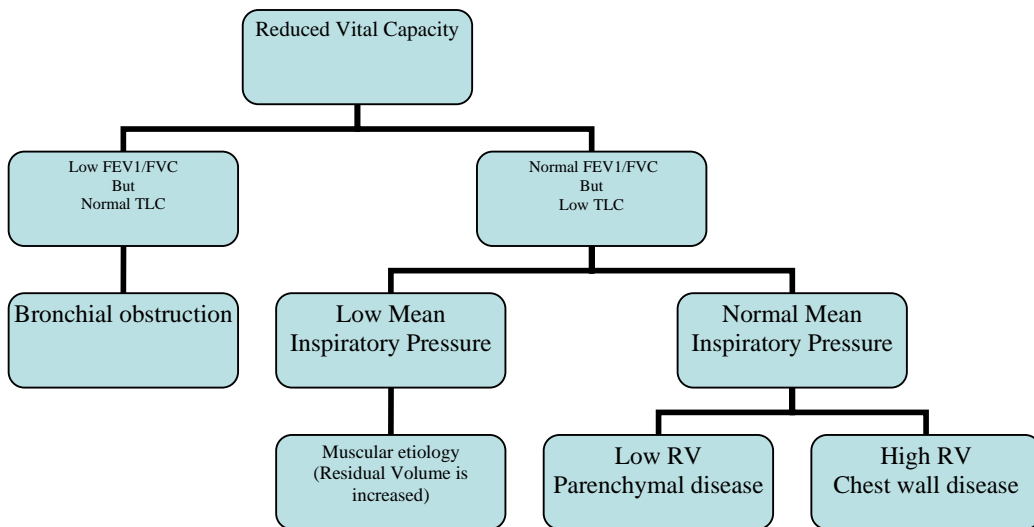


Figure 8-4: Etiology of Low Vital Capacity

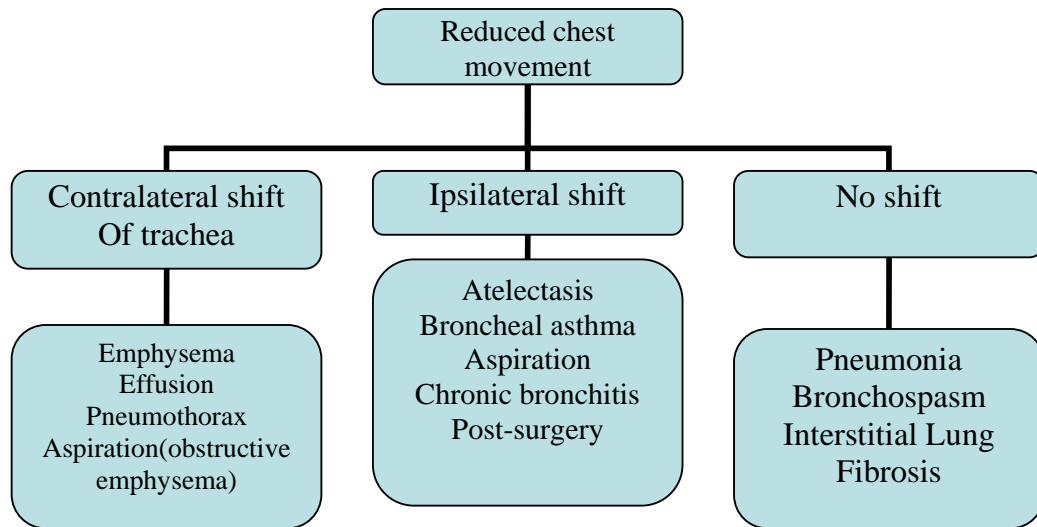


Figure8-5: Etiology of Reduced Chest Movement

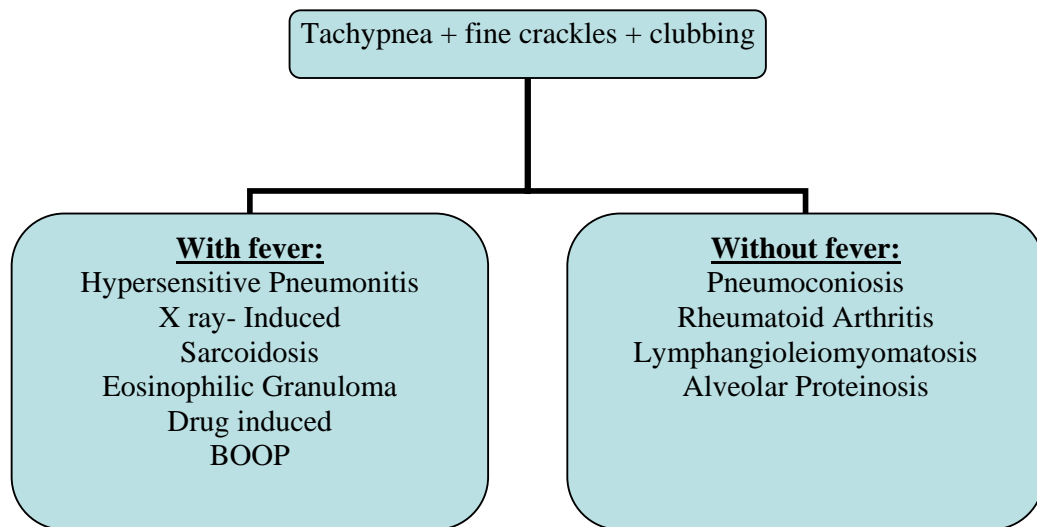


Figure 8-6: Etiology of Hypoxemia without Hypercarbia
(BOOP= Bronchiolitis Obliterans with Organizing Pneumonia)

variables	Normal	Adjustment criteria
1-Inspiratory pressure limit	50 cm H2O	Blood PH
2-Tidal Volume	10-20 cc/kg	Body weight
3-RR in a minute	8-30	Blood PH
4-PEEP	----	When the patient is hypoxic despite anFIO2 over 0.6
5-FIO2	0.21-1	For resuscitation=1 For hypercapnea <0.4
6-Inspiratory Flow rate	40-100 l/min	Patient's own inspiratory effort
7-Sensitivity		<i>*Controlled mode=automatic *Assistcontrol=patient can initiate breathing *Intermittent= patient-machine interaction</i>
-Mechanical ventilation options:	What we should adjust	Application
a-PCV(pressure control ventilation)	Inspiratory pressure	Barotrauma- Post thoracic surgery- Severe pneumonia- Low compliance states
b-ACMV(Assist Control mechanical ventilation)	Respiratory Rate+ tidal volume	Initiation of ventilation
c-SIMV(synchronous intermittent ventilation)	Respiratory Rate+ tidal volume	Weaning
d-CPAP(continuous positive airway pressure)	Pressure	Weaning Or when the patient is intubated
e-Prone Position	Least invasive	ARDS

Table 8-2: Mechanical Ventilation Variables that Need Adjustment

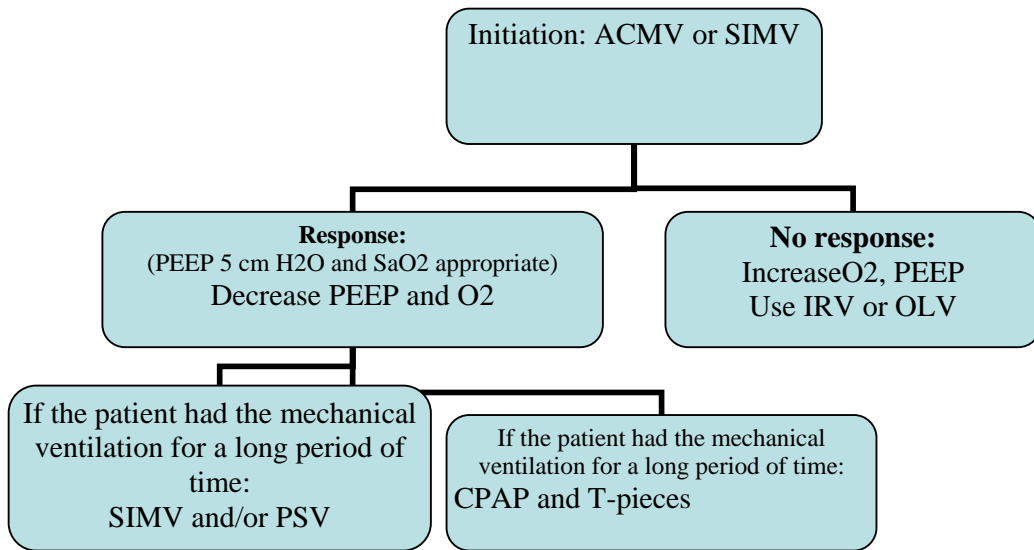


Figure8-7: Algorithm of Weaning from Mechanical Ventilator

Table8-3: CRITERIA FOR INTUBATION &/or MECHANICAL VENTILATION

<p>Intubation only</p>	<p>(Oxygenation and ventilation are adequate but the patient needs a secure airway)</p> <ul style="list-style-type: none"> • Threatened airways obstruction;e.g., deep coma • Definite airways obstruction;e.g., laryngeal edema, tracheal tumor <p>Either indication must be based solely on the clinical examination, although arterial blood gas measurement is often helpful to assure that mechanical ventilation is not necessary</p>
<p>Intubation and mechanical ventilation</p>	<p>(oxygenation and/or ventilation are not adequate)</p> <ul style="list-style-type: none"> • Apnea • Impaired alveolar ventilation (as assessed by PaCO₂) when accompanied by <i>one or more</i> of the following: <ol style="list-style-type: none"> a. Depressed mental status b. Increasing fatigue c. Reduced PaO₂ that cannot otherwise be corrected d. Severely deranged pH that cannot otherwise be corrected e. Compromise of upper airways (e.g., by secretions) • Low PaO₂ (e.g., less than 60 mm Hg): a. that cannot be improved with an FIO₂ less than 0.50, and b. that is causing symptoms or seriously impairing bodily function • Patients undergoing cardiopulmonary resuscitation are intubated and mechanically ventilated to reverse the inevitable hypercapnia and hypoxemia. • During general anesthesia patients are routinely ventilated to prevent the hypercapnia and hypoxemia that would otherwise result. • Patients are sometimes intubated even though their PaCO₂ is in the normal range. This may be justified if the work of breathing is at the patient's limit and if decompensation is feared. In such cases the goal of mechanical ventilation is to relieve the patient of some or all of the work of breathing and to maintain PaCO₂ at an acceptable level. • Patients are occasionally intubated to improve oxygenation even though the PaO₂ may be above 50 mm Hg. This is justified if the FIO₂ is dangerously high <i>and</i> if the patient is in respiratory distress and not improving. Again the goal is to maintain an adequate PaO₂. <p>Intubation may be warranted if excessive, uncontrolled hyperventilation results in a dangerously high pH. For example, a patient with central neurogenic hyperventilation (e.g., from a brainstem tumor) may have a PaCO₂ of 6 mm Hg, a pH of 7.67, and a PaO₂ of 120 mm Hg while breathing room air. Mechanical ventilation with the addition of drug-induced muscle paralysis may be the only way to control the severe alkalemia.</p>

Table 8-4 • EXPECTED DEGREES OF COMPENSATION IN ACID-BASE DISORDERS	
DISORDER	EXPECTED COMPENSATION
Metabolic acidosis	Steady state in 12–36 hours Expected $P_{CO_2} = 1.5 (\text{measured } HCO_3^-) + 8 \pm 2$
Metabolic alkalosis	Less predictable Expected P_{CO_2} increases 0.5 mmHg per 1 mEq/L increase in HCO_3^-
Respiratory acidosis	
Acute	Expected 1 mEq/L increase in HCO_3^- per 10 mmHg rise in P_{CO_2}
Chronic, 24–36 hours	Expected 3–5 mEq/L increase in HCO_3^- per 10 mmHg rise in P_{CO_2}
Respiratory alkalosis	
Acute	Expected 1–2 mEq/L fall in HCO_3^- per 10 mmHg fall in P_{CO_2}
Chronic, after 24–36 hours	Expected 5 mEq/L fall in HCO_3^- per 10 mmHg fall in P_{CO_2}

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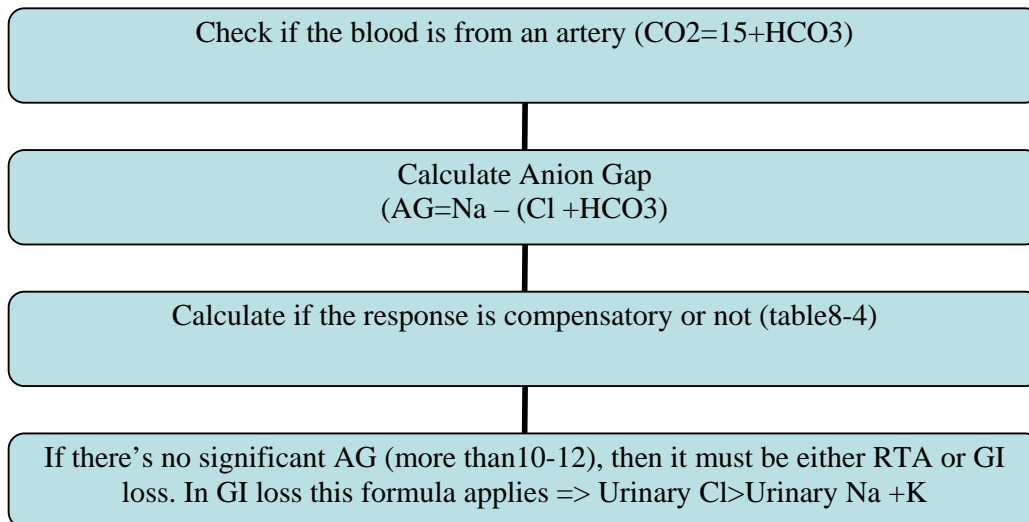


Figure 8-8: Steps to Proceed with an ABG Test.

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Answers:

1- C

2-A

3- C

4-A

5- A

6-D

7-C

8-C

9-D

10-D

11-C

12- Cases **a, b and d** need mechanical ventilation plus intubation.

13-He can not tolerate weaning.

14- a =1 / b=1000 /c=50 /d=18 /e= 60 / f=Assistcontrol/ PEEP needed

15- a = <0.4/ b=700 /c=50 /d=18 / e=40 / f=control/ PEEP is not needed

16=The RR setting should be increased.

17-False

18-F

19-True

20-T

21-F

22-F

23-F

24- Problems:

- PaCO₂ is low.
- PH is on the high side of normal, therefore compensated respiratory alkalosis.
- Also, PaO₂ is low, probably due to mucous displacing air in the alveoli affected by the pneumonia.

Solutions:

- Mrs. Puffer most likely has ARDS along with her pneumonia.
- The alkalosis need not be treated directly. Mrs. Puffer is hyperventilating to increase oxygenation, which is incidentally blowing off CO₂. Improve PaO₂ and a normal respiratory rate should normalize the pH.
- High FiO₂ can help, but if she has interstitial lung fluid, she may need intubation and PEEP, or a BiPAP to raise her PaO₂.
- Expect orders for antibiotics, and possibly steroidal anti-inflammatory agents.
- Chest physiotherapy and vigorous coughing or suctioning will help the patient clear her airways of excess mucous and increase the number of functioning alveoli.

25- Problem:

- pH is high,
- PaCO₂ is low
- respiratory alkalosis.

Solution:

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- If he is hyperventilating from an anxiety attack, the simplest solution is to have him breathe into a paper bag. He will rebreath some exhaled CO₂. This will increase PaCO₂ and trigger his normal respiratory drive to take over breathing control.
- * Please note this will not work on a person with chronic CO₂ retention, such as a COPD patient. These people develop a hypoxic drive, and do not respond to CO₂ changes.

26- Problem:

- The pH is acidotic,
- PaCO₂ is 25 (low) which should create alkalosis.
- This is a respiratory compensation for the metabolic acidosis.
- The underlying problem is, of course, a metabolic acidosis.

Solution:

- Insulin, so the body can use the sugar in the blood and stop making ketones, which are an acidic by-product of protein metabolism.

In the mean time, pH should be maintained near normal so that oxygenation is not compromised .

27-Metabolic Alkalosis not compensated

28-Respiratory Acidosis not compensated / b=COPD

29-d

References:

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