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Practice abgs questions

Analyze the following ABG Review levels and submit your analysis This section tests your ABG interpretation skills, with questions related to acid-base balance and oxygenation.There are 44 questions available in this quiz.Answer 10 questionsAnswer 20 questionsAnswer 30 questionsAnswer 40 questionsAnswer 44 questionsStartRead our ABG interpretation guide An arterial blood gas sample is an important investgiation in the acutely unwell patient, particularly those with respiratory distress. Venous blood gas samples are increasingly used to assess the acutely unwell patient where oxygenation status and carbon dioxide retention are not a concern. has to be analysed within minutes of the blood being taken. In the Emergency Department and Intensive Care, this often happens within the department in an arterial blood gas machine, but on the wards you may have to take the sample directly in person to the lab, and hand it over to a technician in person. You should send it with regular blood samples, or put it in a pod without at least calling the lab to let them know you have sent an ABG (or VBG) sample. Best practice is also to send the sample 'on ice'.Thus, before you begin, make sure you have ice ready, tell someone on the ward what you are doing, and make sure somebody is ready to take the sample in person to the lab. You have approximately 15 minutes to get the sample to the lab. Samples are usually taken from the radial artery, but you can also use the femoral and brachial arteries When sending off the sample you must record what % of O2 the patient is on (if any).Interpreting the arterial blood gas results is considered separately.IntroductionIntroduce / check right patient / explain procedure / check anticoagulation therapy / gain consent. The procedure is used to check levels of oxygen and carbon dioxide in the blood. It is also used to check acid/base balance. Explain to the patient that knowing these levels helps asses what treatment is best. If the patient is on anti-coagulant therapy you won't change the way you do the procedure, but note that it will probably take a lot longer for them to stop bleeding afterwards! Wash your handsEquipmentGo and get your equipment. You will need – an ABG pack – this has the syringe, needle, a bung, and the syringe cap – ice, swabs, cotton wool bud, bag to put sample in, forms to go with sample, plaster. Don't forget to clean out your tray before you put all this stuff in it! Ice is used because it slows down the metabolism of red cells. If the sample is left for a long time (e.g. transferred to another hospital) then the use of oxygen by cells can lead to a falsely low O2 level in the sample. PreparationOpen out the ABG pack – you should find a syringe already with heparin in it. You need to put the needle on the syringe (put it on, do a ¼ turn, then pull off the cap and you should be ok). Once you have done this, you can squirt all of the heparin out of the syringe (just do this with the cap half on, it doesn't really matter where the heparin goes)– this leaves a very small amount in the needle which will help prevent clots. Wash/alco gel, then put gloves onAllen's TestYou need to check the collateral circulation to the hand – a rare complication of blood sampling is that you may end up occluding the radial artery (e.g. as a result of a clot), and thus you should test collateral circulation to the hand to prevent ischaemia of the hand if this event were to occur. Get the patient to make a fist. Find both the radial and ulnar arteries, then press down on them to occlude them for a few seconds. Ask the patient to relax their hand and show their palm. It will appear blanched. Let go of the ulnar artery but keep holding down the radial. The hand should turn red again as it is perfused. As long as this perfusion takes no longer than 10-15 seconds, then there is adequate perfusion of the hand via the ulnar artery, and you are able to continue. If there is not adequate perfusion, you are unable to use the radial artery for this procedure. Feel the radial artery – you are going to use the radial artery. Have a really good feel of it – you are going to go in where the pulse is strongest – this is a different place on different people! Once you are happy you have got a good place, then swab the area (leave it 30 seconds to dry). Be careful when taking your sample – try not to touch the sterile area (you will still need to palpate the artery as you take the sample)Collect SampleGo in! – hold the syringe a bit like a pen. You want it into the skin at 45'. You should go 'up' the artery, i.e. towards the elbow. You want to go in at the point where the pulse feels strongest. Usually you would put a finger on the pulse to help orientate yourself, but be careful not to contaminate the exact spot where you will insert the needle. Insert the needle slowly. The syringe should now rise by itself. You only need 1-2 ml. Once you are happy you have got this amount, take the needle out, and apply pressure and a sterile dressing immediately. This will need to be held on (either by the patient or by you, or if you really have to you can tape it down firmly) for at least 2-3 minutes, possibly 10 (or longer if on warfarin). If you don't get into the artery, you can try again – as long as you don't withdraw the needle fully from the skin, you can poke around – but remember this is very painful! Bung it! – stick the needle into the bung, whilst you deal with the cotton wool. Once you are happy with the cotton wool situation, you can put the needle (and bung) in the sharps bin. The cap – the ABG kit comes with a cap that allows air but not blood through it. Put the cap on the syringe once you have taken the needle off. Flick the syringe to get all the air to the top, and then you can squeeze the air out. As soon as you get a drop of blood in the cap, stop squeezing! The cap is to allow you to squeeze air out without spilling blood. Once all the air is out, you should mix the sample to make sure the anti-coagulant is thoroughly mixed with the sample. You should label up the sample and use the ice, and make sure it gets delivered in person and all that. Taking an arterial blood gas sample. Image by iem-student.org is licensed with CC BY-NC-SA 2.0.Finishing offFinish off – check the site isn't still bleeding, and check the patient is comfortable. Once you are happy it's no longer bleeding, you can stick a plaster on (helps prevent infection).Related Articles The most typical vision problems are refractive mistakes, more frequently known as nearsightedness, farsightedness, astigmatism, and presbyopia. Refractive errors take place when the shape of the eye prevents light from focusing straight on the retina. The length of the eyeball (either longer or shorter), changes in the shape of the cornea, or aging of the lens can trigger refractive errors. The majority of people have one or more of these conditions. Skin Skin is the biggest organ of your body. It is, in regards to both weight – between 6 and 9 pounds – and area – about 2 square yards. Your skin separates the within your body from the outside world. It secures you from germs and viruses and manages your body temperature. Conditions that aggravate, obstruct, or irritate your skin can cause symptoms such as soreness, swelling, burning, and itching. Allergies, irritants, your genetic makeup, and specific diseases and body immune system issues can cause dermatitis, hives, and other skin problem. Lots of skin issues, such as acne, likewise affect your appearance. Your skin can likewise establish many types of cancers. Abdominal pain, likewise called a stomach ache, is a sign related to both non-serious and significant medical issues. Common causes of pain in the abdomen consist of gastroenteritis and irritable bowel syndrome. About 10% of people have a more severe underlying condition such as appendicitis, dripping or ruptured stomach aortic aneurysm, diverticulitis, or ectopic pregnancy. In a third of cases, the precise cause is unclear. Considered that a range of diseases can cause some abdominal pain, a systematic method to an assessment of a person and the solution of a differential diagnosis stays essential. Pregnancy The state of brings a developing embryo or fetus within the female body. This condition can be suggested by positive results on a non-prescription urine test and verified through a blood test, ultrasound, detection of a fetal heartbeat, or an X-ray. Pregnancy lasts for about nine months, measured from the date of the woman's last menstrual period (LMP). It is traditionally divided into three trimesters, each approximately three months long. The most crucial jobs of fundamental fetal cell distinction take place during the first trimester, so any harm done to the fetus throughout this duration is most likely to lead to miscarriage or serious special needs. There is little to no chance that a first-trimester fetus can survive outside the womb, even with the very best hospital care. Its systems are just too undeveloped. This stage ends with the phenomenon of quickening: the mom's first perception of fetal movement. It remains in the first trimester that some women experience early morning illness, a type of queasiness on waking up that typically passes within an hour. The breasts also start to get ready for nursing, and severe discomfort from solidifying milk glands may result. As the pregnancy advances, the mom may experience numerous physical and emotional changes, ranging from increased moodiness to darkening of the skin in different areas. Throughout the second trimester, the fetus goes through an impressive series of advancements. Its physical parts become unique and a minimum of somewhat functional. With the best treatment, a second-trimester fetus born prematurely has at least some possibility of survival, although developmental delays and other handicaps might emerge later. As the fetus grows in size, the mother's pregnant state will start to be apparent. In the 3rd trimester, the fetus enters the final stage of preparation for birth. It increases quickly in weight, as does the mom. As completion of the pregnancy nears, there might be discomfort as the fetus moves into position in the woman's lower abdominal areas. Edema (swelling of the ankles), back pain, and balance problems are in some cases experienced throughout this period. Most women can set about their usual activities until the very last days or weeks of pregnancy, consisting of non-impact workout and work. During the last days, some feel too much discomfort to continue at a full rate, although others report considerably increased energy right before the birth. Pregnancy ends when the birth procedure begins. Below are some brief clinical scenarios with ABG results. Try to interpret each ABG and formulate a differential diagnosis before looking at the answer. Question 1. You are called to see a 54 year old lady on the ward. She is three days post-cholecystectomy and has been complaining of shortness of breath. Her ABG is as follows: pH: 7.49 (7.35-7.45) pO2: 7.5 (10–14) pCO2: 3.9 (4.5–6.0) HCO3: 22 (22-26) BE: -1 (-2 to +2) Other values within normal range What does the ABG show? This is type 1 respiratory failure. The PO2 is low with a low CO2. The accompanying alkalosis is a response, due to the patient blowing off CO2 due to her likely high respiratory rate. What would you do? Look at the patient! Acutely unwell: ABCDE and call for help Check the observations All of these conditions can may you tachypnoeic and tachycardic. Wheeze will predominate in asthma. Pyrexia points more towards pneumonia (but PE can give a mild pyrexia). Pulmonary embolus will be the only condition that will likely be normal on auscultation. Take a full history and examination Sudden onset: more likely PE Purulent cough: more likely pneumonia Raised JVP, ankle swelling, fine basal creps: more likely oedema Investigations CXR Bloods Cultures if pyrexial Management (depends on cause) PE: Heparinisation or thrombolysis if unstable. Remember this patient is post-op so it is a complex decision. Pneumonia: Antibiotics for hospital acquired pneumonia Asthma: Salbutamol, ipatropium and steroid in the first instance Pulmonary oedema: Sit patient up, furosemide, consider catheter See relevant pages in the respiratory section for further information. Question 2. A 75 year old gentleman living in the community is being assessed for home oxygen. His ABG is as follows: pH: 7.36 (7.35-7.45) pO2: 8.0 (10–14) pCO2: 7.6 (4.5–6.0) HCO3: 31 (22-26) BE: +5 (-2 to +2) Other values within normal range What does the ABG demonstrate? This is a compensated respiratory acidosis. This does not represent acute pathology. Rather it reflects a compensation for a chronic respiratory acidosis secondary to chronic pulmonary disease. Note this is an acidosis, not an acidaemia (pH normal, but only due to compensatory mechanisms: the high bicarbonate). What would you do? Nothing acutely as this man does not meet the criteria for long-term oxygen therapy (LTOT). Lifestyle advice and smoking cessation of necessary. LTOT criteria are: PaO2 less than 7.3 kPa when stable. OR… PaO2 greater than 7.3 and less than 8.0 kPa when stable AND with any of: Secondary polycythaemia Peripheral oedema Nocturnal hypoxaemia Pulmonary hypertension Question 3. A 64 year old gentleman with a history of COPD presents with worsening shortness of breath and increased sputum production. pH: 7.21 (7.35-7.45) pO2: 7.2 (10–14) pCO2: 8.5 (4.5–6.0) HCO3: 29 (22-26) BE: +4 (-2 to +2) Other values within normal range What does the ABG show? This is Type 2 respiratory failure. See ABG interpretation for more details. Note that the HCO3 is raised in this patient despite the abnormal pH. With the above history this is likely to represent an acute on chronic respiratory acidosis. This would indicate that the patient normally retains CO2 and has a chronically raised HCO3. The drop in pH represents the normal mechanisms of compensation being over whelmed. This is one of the cases where having an old ABG from a previous admission can be useful. How much oxygen would you give this man? Question 4. A 21 year-old woman presents feeling acutely lightheaded and short of breath. She has her final university exams next week. pH: 7.48 (7.35-7.45) pO2: 13.9 (10–14) pCO2: 3.5 (4.5–6.0) HCO3: 22 (22-26) BE: +2 (-2 to +2) Other values within normal range What does this ABG show and what is the differential diagnosis? This is a respiratory alkalaemia Differential diagnosis: Pulmonary disease Hypermetabolic states (e.g. infection or fever) Pain Anxiety hyperventilation What's the most likely diagnosis? Based on the history, anxiety hyperventilation is the most likely cause here. However, it is very important to have considered the other options, in particular and to have ruled out a primary respiratory pathology or infection. In the anxious patient who is short of breath and persistently tachycardic have you thought of PE? Question 5. A 32 year-old man presents to the emergency department having been found collapsed by his girlfriend. pH: 7.25 (7.35-7.45) pO2: 11.1 (10–14) pCO2: 3.2 (4.5–6.0) HCO3: 11 (22-26) BE: -15 (-2 to +2) Potassium: 4.5 Sodium: 135 Chloride: 100 Other values within normal range The anion gap is the difference between primary measured cations (sodium and potassium) and the primary measured anions(chloride and bicarbonate). It is calculated by subtracting the concentrations of chloride and bicarbonate (anions) from the concentrations of sodium and potassium (cations): Anion gap = ([Na+] + [K+]) − ([Cl−] + [HCO3−]) Reference range usually 7–16 mEq/L (but varies between hospitals, some using 3-11) Potassium is commonly left out of the equation as potassium concentrations, being very low, usually have little effect on the gap. This leaves the following equation: Anion gap = [Na+] − ([Cl–] + [HCO3−]) What is the anion gap in this case? Anion gap = ([Na+] + [K+]) − ([Cl−] + [HCO3−]) = 28.5 Normal range is 7 – 16. N.B. Some analysers won't include potassium in their calculations therefore for them >15 constitutes a raised anion gap. Either way, this is a raised anion gap metabolic acidosis. What is the differential diagnosis for a metabolic acidosis with raised anion gap? The traditional mnemonic for the causes of a metabolic acidosis with raised anion gap is 'MUDPILES': Methanol Uraemia Diabetic ketoacidosis (and alcoholic/starvation ketoacidosis) Propylene glycol Isoniazid Lactate Ethylene glycol Salicylates However, another way is to think about the mechanism of acidosis: Excess production of acids DKA, lactic acidosis (produced by poorly perfused tissues) Ingestion of acids Methanol, ethanol, ethylene glycol Inability to clear acids [/toggle title="What is the differential diagnosis for a metabolic acidosis with normal or decreased anion gap?" active="false"] Loss of bicarbonate: Question 6. A 67 year-old man with a history of peptic ulcer disease presents with persistent vomiting. pH: 7.56 (7.35-7.45) pO2: 10.7 (10–14) pCO2: 5.0 (4.5–6.0) HCO3: 31 (22-26) BE: +5 (-2 to +2) Other values within normal range What does the ABG demonstrate? This is metabolic alkalaemia [/toggle title="What' s the differential diagnosis of this ABG picture?" active="false"] Differential diagnosis of a metabolic alkalosis or alkalaemia: Persistent vomiting E.g. gastric outlet obstruction (the classic example is pyloric stenosis in a baby) Hyperaldosteronaemia Diuretic use Milk alkali syndrome Massive transfusion Question 7. A seventeen year-old girl presents to the emergency department after an argument with her boyfriend. He says that she took lots of tablets. She denies this. You persuade her to let you do an ABG: pH: 7.46 (7.35-7.45) pO2: 12.5 (10–14) pCO2: 3.5 (4.5–6.0) HCO3: 22 (22-26) BE: +1 (-2 to +2) Other values within normal range A few hours later she says she feels increasingly unwell and is complaining of ringing in her ears. A repeat gas shows: pH: 7.15 (7.35-7.45) pO2: 11.0 (10–14) pCO2: 3.2 (4.5–6.0) HCO3: 9 (22-26) BE: -18 (-2 to +2) Other values within normal range What's the diagnosis? This is the classic picture of aspirin overdose. There is an initial respiratory alkalosis due to central respiratory centre stimulation causing increased respiratory drive. In the later stages a metabolic acidosis develops along side the respiratory alkalosis as a result of direct effect of the metabolite salicylic acid and more complex disruption of normal cellular metabolism. How would you manage this patient? How do you manage an aspirin overdose? Presentation of aspirin overdose Hyperventilation Sweating Nausea & vomiting Epigastric pain Tinnitus Deafness ARDS (rare) Hypoglycaemia (children in particular) Investigations in aspirin overdose Plasma salicylate concentration (initial and repeats) Paracetamol levels (always check in any case of poisoning by anything) ABG Urea and electrolytes Renal failure (rare) sometimes other electrolyte imbalances Chest x-ray If dropping sats or any suspicion of ARDS (non-cardiogenic pulmonary oedema) Management of aspirin overdose ABCDE and supportive care Gastric lavage within 1h of ingestion (although no evidence for mortality reduction) Activated charcoal Correct electrolyte abnormalities In mild/moderate cases (plasma concentration 500-700mg/l) Alkalinise urine Give 225ml of 8.4% bicarbonate solution over 1hr Ensure urine pH over 7.5 (use indicator paper) Bicarbonate will increase any pre-existing hypokalaemia – so don't let it happen Additional boluses of bicarbonate to maintain alkalinisation N.B. Acidosis increases salicylate transfer across the blood brain barrier Monitor U+Es regularly In severe cases (plasma concentrations >700mg/l) Prognosis in aspirin overdose Generally good with treatment. Question 8. A normally fit and well 11 year-old boy presents with diarrhoea and vomiting. He is complaining of non-specific abdominal pain. A venous blood gas shows: pH: 7.12 (7.35-7.45) pO2: 11.5 (10–14) pCO2: 3.2 (4.5–6.0) HCO3: 9 (22-26) BE: -17 (-2 to +2) Lactate: 4.0 Potassium: 5.5 Glucose: 22 mmol/L (395 mg/dL) Other values within normal range What's the most likely diagnosis? This is diabetic ketoacidosis (DKA). What are you going to do? Priorities for management include fluid resuscitation, insulin administration and careful management of potassium levels. Click here for a page detailing this, and click here for DKA questions Question 9. A 22 year-old lady with a known history of asthma presents to the emergency department with difficulty in breathing. Her initial ABG on 15 litres of oxygen shows: pH: 7.54 (7.35-7.45) pO2: 10.0 (10–14) pCO2: 3.2 (4.5–6.0) HCO3: 24 (22-26) BE: +0 (-2 to +2) Other values within normal range After initial treatment the nurse in resus calls you to review the patient. The nurse says that although the patient's respiratory rate has come down slightly she is looking more unwell. Her repeat gas shows: pH: 7.36 (7.35-7.45) pO2: 9.8 (10–14) pCO2: 5.0 (4.5–6.0) HCO3: 22 (22-26) BE: -2 (-2 to +2) What is your next management step? This patient has asthma, ongoing difficulty in breathing and a rising CO2 (the fact that it is in the normal range is irrelevant) . This is an extremely worrying sign as it shows that the patient is tiring. This patient should be managed in a high dependency area and closely monitored for further deterioration. The management of acute asthma will be found on the respiratory sections of this website. Question 10. A 62 year-old woman with a history of diabetes and a long smoking history presents to the emergency department with worsening shortness of breath. On auscultation of the chest there are widespread crackles and you notice moderate ankle oedema. ABG shows: pH: 7.20 (7.35-7.45) pO2: 8.9 (10–14) pCO2: 6.3 (4.5–6.0) HCO3: 17 (22-26) BE: -8 (-2 to +2) Other values within normal range What's the diagnosis? Note that despite the low pH the pCO2 is also high. This is a picture of a mixed respiratory and metabolic acidosis. Given the history of diabetes and ankle swelling, renal failure is a unifying diagnosis with pulmonary oedema contributing to a respiratory acidosis whilst the failure to clear acids causes a metabolic acidosis. Click here for further questions on ABGs Perfect revision for MRCP PACES, OSCES and medical student finals Understanding arterial blood gas (ABG) interpretation is crucial for nursing students and healthcare professionals. It helps assess a patient's respiratory and metabolic status. This guide provides an overview of ABG analysis, including examples, tables, and 50 practice questions to reinforce learning. ABG analysis is a diagnostic test that measures the levels of oxygen (O_2), carbon dioxide (CO_2), and the pH in arterial blood. It provides valuable information about a patient's acid-base balance and respiratory function. Key components measured in an ABG test include: pH: Indicates the blood's acidity or alkalinity (normal range: 7.35-7.45). $PaCO_2$: Partial pressure of carbon dioxide, reflecting respiratory function (normal range: 35-45 mmHg). HCO_3^-: Bicarbonate level, representing metabolic function (normal range: 22-26 mEq/L). PaO_2: Partial pressure of oxygen, showing oxygenation status (normal range: 80-100 mmHg). SaO_2: Oxygen saturation, indicating the percentage of hemoglobin saturated with oxygen (normal range: 95-100%). ABG interpretation involves a systematic approach: Examine the pH: 45 mmHg): Respiratory acidosis Low $PaCO_2$ (45: Respiratory acidosis,