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Fio2 to lpm formula

www.medicinaintensiva.com.br D.Ferrari C lculo da FiO2 Estimada FiO2 Estimada: FiO2 ATM - 4xO2 ofertado Oxygen, we all need it! We don't need much of it under normal circumstances, with 0.21 being the fraction of oxygen inspired (FiO2) of room air. FiO2 is defined as the concentration of oxygen that a person inhales. The air we inhale on a day-to-day basis is 21% oxygen, 78% nitrogen and 1% trace elements such as argon, carbon dioxide, neon, helium and methane. For the purposes of this article, fractions and percentages will be used interchangeably to facilitate the explanation. Sometimes 21% of the oxygen may not be enough to maintain adequate oxygen saturation. In these situations, additional oxygen can be administered by various oxygen delivery devices ranging from nasal teeth to invasive ventilation. This increases the concentration of oxygen, which could increase FiO2 to 100%. In settings outside intensive care areas, FiO2 has still not received much attention. But things are changing! In standard hospital settings nowadays, there is an increasing use of high-flow humidified oxygen therapy that requires an understanding of the relationship between oxygen flow and FiO2. In most clinical areas that require an FiO2 to document, you will be able to find a table that describes an approximate correlation between oxygen flow and FiO2, similar to the table below: The FiO2 of pure oxygen It is all right and good to remember that for every 1 L/min increase in oxygen flow, FiO2 increases by 4%. But it would be better to understand why FiO2 increases in these specific increments! So let's discuss it... My first question for you is: what is the FiO2 of the air you are breathing right now? If you said 21%, excellent! My second question for you is this: what is the FiO2 of oxygen being delivered through the flow meter as soon as you turn it on? And that's when people start saying, It depends on the oxygen flow. While this is true when we discuss FiO2 as the person inhales, that is not really the question I asked. Therefore, my third question for you is: does the oxygen flow really change the FiO2 of pure oxygen that is delivered by the flow meter? The answer is no! The flow meter is connected either to an oxygen bottle or to a medical wall oxygen supply. This oxygen is PUR, it's 100% oxygen! Therefore, anything that comes out of this flow meter has a 100% FiO2. Consider the following: If I have an oxygen flow set at 1 L/min, will have 1 L/min of 100% oxygen... If I have the oxygen flow set at 5 L/min, I will have 5 L/min of 100% oxygen... If I have the oxygen flow set at 10 L/min, I will have 10 L/min of 100% oxygen... If I have the oxygen flow set at L/min, I'm going to have 15 L/min of................? If you said 100% oxygen, excellent! So my fourth question for you is this: why does the chart above show different FiO2 values corresponding to these oxygen flow rates that we just said is still 100% because it's pure oxygen? This is the point that people start scratching their heads, shrugging their shoulders and slowly recoiling while avoiding eye contact with me. Hold on! The bulb will go out very soon! Advanced Inspiratory Flow and FiO2 The answer to this question comes down to the patient's flow requirements! What do I mean by that? You are currently breathing air in and out of your lungs while you read this blog, hopefully with enough interest to share it with your friends and colleagues after you finish reading it 'wink'. The air you breathe must go from point A (the atmosphere) to point B (your lungs). If a car was trying to get from point A to point B, it can only do so if you press the accelerator to reach a certain speed. The faster the speed, the faster you get from point A to point B. The same principle applies to the way we breathe, but we refer to that speed as our peak-inspired flow. Our normal peak inspiratory flow tends to vary between 20 and 30 L/min. Our breathing muscles are comfortable and do not get tired when we breathe at a normal breathing rate with this peak inspiratory flow. Now consider what your breathing does when you go for a run; or if you're allergic to running like me, imagine what your breathing does! Aside from your increasing respiratory rate, you start sucking in for more air. You are trying to get the air from point A to point B faster, which means that your peak inspiratory flow requirement has increased. The same is true for a person who has difficulty breathing or who has increased breathing work, he has a high peak inspiratory flow. So let's go back to the patient flow requirements and FiO2... If you normally breathe at a peak inspiratory flow of 30 L/min to room air with a 21% FiO2, you can easily calculate the average FiO2 you breathe in an almost redundant formula: 30 x 21 - 630%630 ÷ 30 - 21% Now, consider that you receive 10 L/min of oxygen via a face mask to a 100% FiO2. You always have a normal peak breathing rate of 30 L/min, but 10 L/min if you are blown into your face via the face mask. Therefore, you still need another 20 L/min to meet your inspiratory flow requirements. Where are you going to get this from? You suck it into the surrounding atmosphere with a 21% FiO2. So let's apply the same formula as before: (10 x 100) - (20 x 21) - 1420%1420 ÷ 30 - 47% However, if you had an increased peak breathing rate of 50 L/min, but still receive only 10 L/min of oxygen via a 100% FiO2 face mask: (10 (10 (10) 100) - (40 x 21) - 1840%1840 ÷ 50 - 37% Or a peak inspiratory flow decreased by 20 L/min while receiving 10 L/min of oxygen via a face mask to a Fi O2 100%: (10 x 100) - (10 x 21) - 1210%1210 ÷ 20 - 60% In the examples above, nothing has changed with the oxygen flow being delivered to the patient. The only thing that changed was the patient's breathing flow demand and how much that diluted pure oxygen being delivered with 21% FiO2 found in the room air. If the flow delivered to the patient is greater than its peak inhaler flow, it has no reason to have to suck up atmospheric air and dilute pure oxygen. Remember to stick your head out the window of the car you are driving at the maximum legal speed. All that air that is blown into your face makes it much easier to breathe, it reduces the effort needed to suck air. So if you were breathing with a normal peak inhaler rate of 30 L/min, but you were receiving ≥ 30 L/min of pure oxygen via a high-flow oxygen delivery device, you don't need to suck more air out of the surrounding atmosphere and would receive a 100% FiO2. Unless the rate of flow delivered to the patient is more than their peak inspiratory flow demand, it is impossible to know what the patient's exact FiO2 is because you do not know their exact peak inspiratory flow. The tables used to describe a relationship between oxygen flow and FiO2 are based on simple estimates of normal peak inhaler flow, ranging from 20 to 30 L/min. Does my patient need a flow or oxygen? So let's go further and discuss the practical application of understanding the oxygen flow rate and FiO2. As discussed in the blog post titled Respiratory Insufficiency: Type 1 or Type 2, you may have a patient who has a problem with oxygenation or a patient who has a problem with ventilation. If your patient has a problem with oxygenation, they need a higher FiO2 to help with that. In most contexts, this is achieved by turning up the oxygen flow rate in order to subsequently increase FiO2. If your patient has a problem with ventilation, they need a higher flow to help with that. If we aim to set a higher flow than their charge rate demand, it is not ideal to use only pure oxygen and deliver a 100% FiO2 to someone who may not even have an oxygenation problem. They may only need a 21% FiO2 with a higher throughput, which can be achieved with a high-flow air meter. Or the patient may need something between these two extremes, which can be achieved with a dual-flow adapter that uses to oxygen and an air meter. For example, 15 L/min oxygen at a 100% FiO2 and 15 L/min air at a 21% FiO2 to give a total of 30 L/min flow to a 60% diluted FiO2. Or maybe 15 L/min oxygen to a 100% FiO2 and and L/min of air to a 21% FiO2 to give a total of 45 L/min flow to a diluted FiO2 of 47%. The world is your oyster! Devices such as AIRVO 2, do all the calculations above for you. All you need to do is dial the total flow you want to set for your patient and increase the oxygen meter flow to reach the desired FiO2 to maintain adequate oxygen saturation. So the next time you take care of this asthmatic patient who sucks into the air as their lives depend on it (forgive the nursing humor), consider making their breathing easier by giving them a little extra flow! Imagine how much easier it would be for them to breathe if instead of having to make every effort to suck into the air, they had some of that air blown in their face? And the next time you take care of this patient with suboptimal oxygen saturations, do what we always do and turn up the oxygen! Remember also the following: If your patient has a problem with oxygenation, they need more fio2If your patient has a problem with ventilation, they need more flowIf your patient has a problem with oxygenation and ventilation, they need more fio2 and feedSf Dysart, K., Miller, T. L., Wolfson, M. R., and Shaffer, T. H. (2009). Research in high-flow therapy: mechanisms of action. Respiratory Medicine, 103(10), 1400 - 1405. doi: C., Lobato, S., Pinto, T., and Winck, J.C. (2013). Clinical evidence on high-flow oxygen therapy and active humidification in adults. Revista Protuguesa de Pneumologia, 19(5), 217-227. doi: H., Sztrymf, B., Leroy, C., Brown, P., Dreyfuss, D., and Ricard, J. D. (2012). Humidified high-flow nasal oxygen during respiratory failure in the emergency department: feasibility and efficacy. Respiratory Care, 57(11), 1873-1878. doi: 10.4187/respcare.01575Parke, R. L., McGuinness, S. P., and Eccleston, M. L. (2011). A preliminary randomized controlled trial to assess the effectiveness of high-flow nasal oxygen in intensive care patients. Respiratory Care, 56(3), 265-270. Roca, O., Riera, J., Torres, F., and Masclans, J. R. (2010). High-flow oxygen therapy in acute respiratory failure. Respiratory Care, 55(4), 408-413. Recovered from: Last Update: 20/07/2020