

The progression of COVID disease and what to expect if you go to the hospital

January 9, 2022

- Since original video (available here in the ReOpen Bucks FB group) was made on January 9th, 2022 at 8:02 pm:
 - Cases are way down
 - Hospitalizations did indeed peak just as I predicted in the original video
 - Hospital ERs are now emptying out, wait times are much less
- 4 Primary Phases:
 - Pre-infection – prevention
 - Infection phase – symptoms begin
 - Transition phase – pneumonia begins
 - Pulmonary phase – focus on longs
- Pre-infection Phase
 - Focus is on preventing the disease to come
 - An ounce of prevention is worth a pound of cure
 - BY HEALTHY
 - Vaccination
 - Breathing Exercises
 - Prophylaxis
 - Basic supplements: Vit D, Vit C, Zinc, etc.
 - Anti-virals: Ivermectin, Hydroxychloroquine, etc.
 - Monoclonal antibodies
- Infection Phase
 - Cold & Flu symptoms
 - Infectiousness from 1-2 days prior to symptom onset, to 2-3 days after symptom onset
 - MONOCOLONAL ANTIBODIES
 - Ivermectin, Hydroxychloroquine, Vit D, Vit C, Zinc, etc.
 - Get up and move around; don't lay in bed on your back all day long
 - Tools needed:
 - Thermometer
 - Pulse oximeter
 - Specifically measures SpO₂, “oxygen saturation” of hemoglobin
 - “Normal” is 95% or higher
 - 94% and below is indication for hospitalization
 - Separate from PaO₂, “partial pressure of oxygen” in blood plasma
 - Measured in mm Hg; 80-100 is normal, disassociation curve exists
 - This becomes very important later when we talk about mechanical ventilation, so more to come.

- Transition Phase (transition to pneumonia)
 - Symptoms transition from Cold & Flu to more of a cough, loss of energy, drops in SpO2 %
 - Happening because infection phase has now done its damage to your lungs (specifically the lower and back region)
 - Inflammatory response is desperately trying to clean up the mess
 - Current hospital admission criteria = 94% SpO2...WAY too easy to meet this threshold
 - You feel like it's time, you need to go to the hospital
 - Which hospital to go to?
 - Considerations might include access to additional medical services, visitation policy, etc.
 - We're not observing a major difference in Bucks County in terms of vaccinated vs. unvaccinated people being treated differently (sole exception may be Holy Redeemer)
 - So let's say you've gone to the hospital...
 - Falling SpO2 will indicate supplemental oxygen
 - Much more on this to come, in terms of how much oxygen you will get, how it will be delivered, and how it may change
 - THIS HAS IMPACT ON MONOCLONAL ANTIBODY CANDIDACY!
 - Supplemental oxygen should trigger anti-inflammatory treatment
 - Dexamethasone vs. methylprednisone
 - Expect an IV!
 - Also may expect an antibiotic if COVID pneumonia is confirmed
 - Chest X-ray or chest CT scan
 - Looking for the classic "ground glass opacities"
 - Azithromycin, doxycycline, amoxicillin
 - A little controversial (treats potential bacterial infection, not viral infection)
 - Other things you may encounter:
 - Anticoagulants (heparin, aspirin, etc.)
 - May honestly want to push basic supplements
 - Remdesivir – anti-viral that interferes with the RNA replication process
 - Ivermectin – people really like it because it combines anti-viral functions with anti-inflammatory functions
 - Anti-inflammatory treatment is really being handled by the steroids
 - But the BIG DOGS are supplemental oxygen and steroid
 - Why?
 - Supplemental oxygen = obvious
 - Steroid = inflammation if the primary enemy

- Pulmonary Phase
 - Let's say you go to the hospital and go through everything we just talked about
 - You're on supplemental oxygen, you're in an anti-inflammatory steroid
 - You're not improving, now what?
 - So now we're going to get into how your oxygen supplementation can be increased and decreased
 - Understand that the goal is always to get the patient's SpO₂ to the mid-90's in conjunction with decreased labor of breathing, and then slowly wean the support
 - So every step along the way, we're hoping to STOP the deterioration and desaturation, and what we want to see is improvement
 - So what's the order of operations?
 - Low flow oxygen
 - Starts with a nasal cannula (1 to ~6 L/min)
 - Higher flow (5-10 L/min) should get some type of face mask
 - Highest flow (10-15 L/min) should be on something like a non-rebreather mask
 - FiO₂ measurement – “fraction of inspired oxygen”
 - Expressed as a decimal from 0.21 (air) to 1 (pure oxygen)
 - Can also be expressed as a percentage
 - Air is about 21% oxygen
 - LFNC adds 4% oxygen to your inhalations for every 1 L/min
 - So if you're getting 6 L/min LFNC, you add $6 \times 4\% = 24\%$ to the 21% of oxygen that is in the air, for a total of 45% oxygen delivery in your breaths
 - High flow nasal cannula (special type of cannula tube)
 - Can get up to ~80 L/min of oxygen flow
 - Heated and humidified, so that you don't get dried out
 - Awake prone
 - Possible CPAP or BIPAP
 - Invasive mechanical ventilation
 - When is it indicated?
 - A key diagnostic value is PaO₂/FiO₂ – we want this to be higher; lower values are worse
 - A “normal” PaO₂/FiO₂ would be something like high 300's to high 400's
 - Ventilation is technically indicated at PaO₂/FiO₂ < 300 mm Hg (presuming 5 cm H₂O of applied pressure), but this is widely considered to be too high
 - Most hospitals will probably allow “permissive hypoxemia” if the numbers are bad but the patient is breathing okay, but will yield to mechanical ventilation once labored breathing becomes excessive.
 - COVID pneumonia is very different from ARDS, but using the classic ARDS definitions:
 - Mild ARDS = PaO₂/FiO₂ < 300 mm Hg = ~25% mortality
 - Moderate ARDS = PaO₂/FiO₂ < 200 mm Hg = ~35% mortality
 - Sever ARDS = PaO₂/FiO₂ < 100 mm Hg = ~45% mortality

- Two primary settings on ventilator:
 - FiO₂ – fraction of inspired oxygen
 - Range is 0.3 to 1
 - PEEP – positive end-expiratory pressure
 - Range is 5 to ~mid 20's
 - Early in the pandemic, like Spring 2020, we treated COVID using a more PEEP-centric approach that has historically been preferred for ARDS, but this has flipped and now we prefer a more FiO₂-centric approach
 - At the end of the day, the room you have to work with both settings is finite, so both of them will absolutely be used, but we just prefer incremental changes to lead with FiO₂ rather than PEEP.
- Prone ventilation
- ECMO
 - Extra-corporeal membrane oxygenation
 - Blood is oxygenated outside the body, allowing the lungs to rest
 - Reserved for very extraordinary COVID cases, like a very young person

- Hope this information is useful!