COVID-19 Update for Home and Specialty Infusion Providers

Valerianna Amorosa, MD
Objectives:

1. Understand research and updates on the SARS-CoV-2 virus compared to when first cases were documented in the US
2. Review of guidelines and the most viable treatment options with patients with COVID-19
3. Managing patients in the home during a pandemic
4. Review of vaccines and the horizon for when a vaccine may be available
Research and Updates

- Viral infection and shedding
- Transmission
- Disease
  - Spectrum of disease
  - Risk factors for severity
  - Clinical Characteristics of severe disease
SARS CoV-2 – Cellular infection

• Mainly infecting ciliated cells (ref)
• Surface spike protein (S) to attaches to surface of target cells
  • S1 attaches to angiotensin converting enzyme 2 (ACE2) receptor
    • ACE2 expressed in respiratory epithelial cells, intestine, kidney, blood
  • S is cleaved at S1/S2 site
    • Furin (membrane-bound protease) cleaves
    • Then exposes C-terminal S2
  • A second protein NRP1 may facilitate entry by binding to cleaved C-terminal of spike protein
    • Surface protein abundant in nasal cavity and respiratory epithelium
• Virus uses host lysosomal enzymes to fuse into cell and insert RNA

COVID-19 SPREAD

![Graph showing viral load over days relative to symptom onset with different distributions: Normal, Log-Normal, Gamma, and Weibull. The graph highlights the transmissibility threshold.](https://www.medrxiv.org/content/10.1101/2020.06.11.20129072v2.full.pdf)
Relationship between positive test and infectivity

- Presymptomatic/asymptomatic and symptomatic:
  - There is shedding AND transmission
- Recovered:
  - Virus may still be present with low level shedding as measured with positive molecular PCR-based assay
  - Sometimes with positive tests for PROLONGED periods of time and sometimes INTERMITTENTLY
    - Analogous to other viruses
    - Immunocompromised, elderly, but also others
Relationship between positive test and infectivity

- Virus not cultured and person not infectious once RECOVERED despite positive molecular test
  - Can be CULTURED out to >20 days in severe/critical/persistently symptomatic but typically <10 days among most
- “REPOSITIVES”
  - Molecular test positive than negative than positive
  - No evidence of transmissibility, no evidence of culturable virus present – similar to prolonged shedders
  - Even if symptomatic
    - [https://www.cdc.go.kr/board/board.es?mid=a30402000000&bid=0030&act=view&list_no=367267](https://www.cdc.go.kr/board/board.es?mid=a30402000000&bid=0030&act=view&list_no=367267)
- Long-term shedding not associated with infectivity when recovered
  - Symptom based removal of isolation precautions
  - Rather than have patient’s hostage to the assay
  - Experience suggests not spreading in these cases
Incubation period

https://www.acpjournals.org/doi/10.7326/M20-0504
Transmission

• Highly efficient transmission person to person
  • Inhalation of expelled large and small droplets
  • Prolonged face to face contact increases risk

• Smaller particle aerosol (≤5 microns)
  • Plays a role in certain circumstances – small confined spaces, air conditioned, recirculated air
    • The extent to which airborne transmission by droplets that remain in the air plays a role is unsettled
  • Being present during aerosol generating procedures increases risk
    • Nebs, CPAP, BIPAP, high flow NCO2, intubation

• Fomite transmission is possible but not as big a contributor
Greater than 6 feet
PPE and prevention

- Data supports use of mask or respirator, face shield (eye protection) and maintaining physical distance WHEN possible
  - Chu, DK et al, Lancet 2020
- Metanalysis of studies of COVID-19 AND MERS and SARS

https://www.thelancet.com/action/showPdf?pii=S0140-6736%2820%2931142-9
COVID19 DISEASE

• COVID-19 (COronaVIrus Disease 2019) caused by SARS CoV-2
Disease spectrum

• EXTRAORDINARY RANGE from nothing to death
• Asymptomatic
  • 40-45% of infected individuals asymptomatic
• Mild
  • Require virtually no care
• Moderate
• Severe
• Critical
  • About 2.3% globally with ~1% overall fatality

Disease spectrum used for clinical trials

NIH ORDINAL Scale used in clinical trials:

1) Death
2) Hospitalized, on invasive mechanical ventilation or extracorporeal membrane oxygenation (ECMO)
3) Hospitalized, on non-invasive ventilation or high flow oxygen devices
4) Hospitalized, requiring supplemental oxygen
5) Hospitalized, not requiring supplemental oxygen - requiring ongoing medical care (COVID-19 related or otherwise)
6) Hospitalized, not requiring supplemental oxygen - no longer requires ongoing medical care
7) Not hospitalized, limitation on activities and/or requiring home oxygen
8) Not hospitalized, no limitations on activities.
Symptoms

- Fever or chills
- Cough
- Shortness of breath
- Fatigue
- Myalgia (muscle or body aches)
- Headache
- New loss of smell or taste (anosmia, ageusia)
  - Precedes respiratory infection in some
- Congestion or runny nose
- Nausea or vomiting
- Diarrhea
- * ‘Allergy symptoms’ – sneezing
- * Fatigue
Risk Factors for Severe Disease
Risk Stratification: Clear data re: **populations at risk** for increased severe illness from COVID-19

- Cancer
- Chronic kidney disease
- COPD (chronic obstructive pulmonary disease)
- Solid organ transplant
- Obesity (body mass index [BMI] of **30** or higher)
- Heart failure, coronary artery disease, or cardiomyopathies
- Sickle cell disease
- Type 2 diabetes mellitus

Might be at an increased risk for severe illness from COVID-19 – more limited evidence:

- Asthma (moderate-to-severe)
- Cerebrovascular disease
- Hypertension
- Smoking
- Immunocompromised – Bone marrow Tx, immune deficiencies, HIV, use of corticosteroids, or other immunosuppressants
- Pregnancy
- Cystic fibrosis, pulmonary fibrosis
- Neurologic conditions, such as dementia
- Liver disease
- Thalassemia (a type of blood disorder)
- Type 1 diabetes mellitus

Severe Complications of Disease

• PULMONARY
  • ARDS (acute respiratory distress syndrome)

• NONPULMONARY:
  • Hyperinflammation (‘cytokine storm’)
  • Cardiovascular complications
  • Hypercoagulability
    • Venous (and arterial) thromboembolism
  • Acute renal failure
  • Neurological complications
  • Multisystem inflammatory syndrome in Children (MIS-C)

https://bestpractice.bmj.com/topics/en-gb/3000168/complications
Clinical Manifestations and Course

- Dyspnea often occurs after hypoxia has started, beginning at 4 or more days from onset of symptoms.
- Diseases can involve multiple organs and are primarily inflammatory mediated
- Waxing or waning pattern
- Other symptoms:
  - Extreme fatigue (asthenia), a lack of desire to eat or drink, a sense of early satiety, diarrhea, vomiting, loss of smell/taste, insomnia and confusion
- Patients who develop more prolonged illness can take 6-12 weeks or longer to improve.
- Expectation management
I heard that most people improve within 10 days and that if they get to 14 days they are out of the woods. My patient has been sick for a month and does not seem to be improving.

In a retrospective study of hospitalized patients in China, 50% of patients experienced illness beyond 10 days.

Approx. 10% of hospitalized patients referred to Penn Medicine home health for covid management were ill for at least 30 days.

During this period of prolonged illness patients can experience complications including thromboembolic events, worsening PNA, dehydration.

Patients can get frustrated and depressed when the recuperation period is prolonged.

Setting expectations for and close follow up with patients at risk for prolonged illness can be very helpful.
I have heard about cytokine storm. What should I look out for and when should I expect it to happen?

- Cytokine storm is an acute severe inflammatory response associated with the release of cytokines.
- This usually occurs within 4-14 days after the onset of symptoms.
- Often results in abnormalities of temp, HR and BP
- It is an emergency and requires eval in ED/hospital
There is controversy about whether reactivation or re-infection can occur.

* Some patients can have a period of relative stabilization, resolution of symptoms with a subsequent worsening, or new symptom onset consistent with COVID-19 infection.

* Not clear if it is an active viral infection. The timing is usually later than expected for cytokine storm. Often occurring 21-30 days or longer after the initial onset of symptoms.

* No clear guidance on the relevance of a subsequent expression of COVID-19 symptoms on self-isolation recommendations.
Is it true that like the flu, superimposed bacterial PNA is a complication with COVID-19?

Respiratory complications and clinical change with COVID-19 patients are more frequently from secondary inflammatory-mediated complications or progressive COVID-19 infection or re-activation of COVID-19 infection. ~10-15% may get superimposed bacterial infection but difficult to ascertain.

Patients on antibiotics for presumed secondary bacterial infection may worsen and need readmission for progressive COVID-19 PNA.

- consider getting a chest x-ray
- assessment of vital signs
- consider a higher level of care if multiple vital signs are abnormal.
- Consider in-home clinician assessment if available
Treatment Options
Therapeutic Interventions & Questioned Medications

- Remdesivir
- Convalescent Plasma, hyperimmunoglobulin
- Repurposed drugs
  - Chloroquine/hydroxychloroquine
  - Lopinavir/ritonavir
- Immune-based therapy
  - Corticosteroids
  - Tocilizumab
  - Sarilumab
- Monoclonal antibodies
- ACE-I
- NSAIDS
Therapeutic Interventions & Questioned Medications

- Remdesivir
- Convalescent Plasma, hyperimmunoglobulin
- Repurposed drugs
  - Chloroquine/hydroxychloroquine
  - Lopinavir/ritonavir
- Immune-based therapy
  - Corticosteroids
  - Tocilizumab
  - Sarilumab
- Monoclonal antibodies

- ACE-I
- NSAIDS
Remdesivir

• Accumulating data on efficacy

• NIH ACTT-1 trial vs placebo
  • >1000, randomized control trial
  • Quicker time to clinical improvement (11d vs 15d) and trend towards improvement in mortality

• Randomized Clinical trial of 5 vs. 10 day course
  • Pts who got 10d had similar outcomes to 5d overall (p= 0.14)
  • Post-hoc - Perhaps in mech ventilated or ECMO, benefit to 10 days vs. 5

• GILEAD SIMPLE Severe phase 3 trial
  • 62% mortality reduction vs. standard of care (‘ real world’ not randomized) 7.6% day 14 vs. 12.5% (AIDS 2020)
  • 65% of patients who received a 5d course showed clinical improvement of at least 2 points by D14 vs 54% historic group

Remdesivir

• Intravenous formulation
• Expensive
• Weak inhibitor of mammalian DNA, RNA polymerases, low toxicity
  • Primary adverse event is hepatitis
• Not recommended CrCl <30 as yet
  • Limited water solubility, contains SBECDE - large cyclic oligosaccharide excreted through kidney (same vehicle as IV voriconazole)
  • High levels SBECDE in animal models associated with liver necrosis and renal tubular obstruction
  • Can accumulate
  • It is removed by HD and CVVH
Convalescent Plasma

- Chinese and Korean case series of 15 or fewer patients
- Chinese randomized trial of 100 patients
  - No significant mortality benefit (trend towards benefit)
- Ongoing clinical trials
- No conclusive data yet
- Used in >20,000 patients (Mayo clinic study)
- Very safe
  - Few adverse events, rare transfusion reactions, other adverse events mainly deemed unrelated

https://mayoclinicproceedings.org/pb/assets/raw/Health%20Advance/journals/jmcp/jmcp_ft95_6_8.pdf
10.1001/jama.2020.10044
Corticosteroids

- **RECOVERY trial - UK study**
- Dexamethasone 6mg daily for up to 10 days
- 6K patients – examined 28 day mortality
  - Mortality reduced 28% in ventilated patients
  - Reduced by 20% in others on O2
- Did **NOT** have mortality benefit in patients not receiving ventilatory support

[https://www.medrxiv.org/content/10.1101/2020.06.22.20137273v1](https://www.medrxiv.org/content/10.1101/2020.06.22.20137273v1)
<table>
<thead>
<tr>
<th>Respiratory support at randomization</th>
<th>Dexamethasone</th>
<th>Usual care</th>
<th>RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No oxygen received</td>
<td>85/501 (17.0%)</td>
<td>137/1034 (13.2%)</td>
<td>1.22 (0.93–1.61)</td>
</tr>
<tr>
<td>Oxygen only</td>
<td>275/1279 (21.5%)</td>
<td>650/2604 (25.0%)</td>
<td>0.80 (0.70–0.92)</td>
</tr>
<tr>
<td>Invasive mechanical ventilation</td>
<td>94/324 (29.0%)</td>
<td>278/683 (40.7%)</td>
<td>0.65 (0.51–0.82)</td>
</tr>
<tr>
<td>All participants</td>
<td>454/2104 (21.6%)</td>
<td>1065/4321 (24.6%)</td>
<td>0.83 (0.74–0.92)</td>
</tr>
<tr>
<td>Trend across three categories: $\chi^2=11.49$; p&lt;0.001</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chloroquine/Hydroxychloroquine

- Theoretical and in vitro benefit but no demonstrated treatment or preventative efficacy
- May inhibit remdesivir anti-viral effect so not recommended together
- Treatment:
  - NIH halted ORCHID randomized treatment study in June after DSMB review
  - 480 patients, no benefit vs. placebo
- Post-exposure Prophylaxis:
  - No decreased acquisition as post-exposure prophylaxis in randomized trial in medium/high risk exposures
  - 12% vs. 14% acquisition
ACE-I and ARBs – are they safe in COVID-19?

- ACE-2 is a cofactor for viral entry
- Renin Angiotensin System
  - Angiotensin converting enzymes (ACE) convert angiotensin I to angiotensin II
    - Angiotensin II promotes systemic vasoconstriction, and role in pro- and anti-inflammatory processes
  - ACE2 counterbalances to ACE
    - Catalyzes both angiotensin I and II, ultimately promoting anti-inflammatory processes & systemic vasodilation
  - ACE inhibitors (ACEi) & angiotensin receptor blockers (ARB) traditionally work to prevent initial conversion & block downstream effects
    - Indirectly upregulate ACE2 activity and expression in rat models

http://www.uphs.upenn.edu/antibiotics/COVID19.html
ACE-I and ARBs: Various theories

• Upregulation of ACE2 levels will increase SARS-CoV-2 cell entry and lead to WORSE outcome

OR

• Increases in ACE2 levels will inhibit ACE and angiotensin II and lead to lessened disease

OR

• ACE-I and ARBs are used in those with comorbidities that put them at risk for worse disease: HTN, DM, CVD

http://www.uphs.upenn.edu/antibiotics/COVID19.html
ACE-I and ARBs

• Unclear if ACE-I & ARB either help or harm the pathogenesis of SARS-CoV-2
• Several ongoing clinical trials (of continuing vs. stopping)
• Lack of clinical data
• For now, societies recommend against discontinuing chronic ACEi & ARB regimens or initiating new regimens in therapy-naïve patients with COVID-19
  • NIH, IDSA, AHA, ACC guidelines recommend continue in patients maintained on these agents
  • NIH recommends against addition outside the setting of a clinical trial
• Potential risks starting/discontinuing
  • Loss of long-term disease control, medication errors during transitions of care, and more intensive outpatient follow-up for BP monitoring and medication titration.

http://www.uphs.upenn.edu/antibiotics/COVID19.html
NSAIDS – are they safe in COVID-19?

- NSAIDs may enhance the ACE2 pathway
  - Increase susceptibility to contracting SARS-CoV-2 or severe disease?
- NSAID inhibit prostaglandin synthesis
  - Antiviral and/or anti-inflammatory properties that can be beneficial in COVID-19 disease?
- Several case series
  - No evident impact on acquisition or disease severity
- FDA, WHO do not recommend avoiding NSAIDS
- MULTIPLE clinical trials ongoing using NSAIDS or ASA in treatment of COVID-19
- No data available that beneficial as yet in treatment of COVID-19
- For symptomatic treatment, for now, use individual patient characteristics to decide acetaminophen vs. NSAIDS
Managing Patients in the Home During the Pandemic

• Caring for COVID19 patients in the home
• Caring for non-COVID19 patients

• Protecting staff in the home and patients in the home
• Ongoing pre-visit screening of patients and staff for symptoms and exposure history, ‘hot spot’ travel
• PPE
  • ‘Universal PPE’ for staff
  • PPE for patients? Masks?
  • For COVID-19+ or under investigation, often for quarantined
    • ‘full PPE’ – N95/face shield/gown/gloves or PAPR
Elements of COVID-19 Home Management

● Focus
  ○ Supportive care
  ○ Monitoring
  ○ Prevention of complications

● Key Components
  ○ Close follow up
  ○ Care management
Monitoring

- Ideal monitoring at home includes...
  - pulse ox, HR, BP and temperature
  - Potential for telehealth monitoring and support

- Risk stratification
  - Disease based
  - Support based

- Self assessment tools
  - Dyspnea assessment tool
<table>
<thead>
<tr>
<th>Objective Measures to Prompt Escalation in COVID-19 Home Care</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Symptoms Worsening</strong></td>
</tr>
<tr>
<td>- New dyspnea</td>
</tr>
<tr>
<td>- Worsened dyspnea</td>
</tr>
<tr>
<td>- New myalgia</td>
</tr>
<tr>
<td>- Other new worrisome symptoms (e.g., chest pain)</td>
</tr>
<tr>
<td>- Overall assessment that symptoms worsening</td>
</tr>
<tr>
<td>(new myalgia alone with everything else normal, should just prompt caution)</td>
</tr>
<tr>
<td><strong>Vital Signs Worsening</strong></td>
</tr>
<tr>
<td>- T&gt;100.4 persistently (two visits) after afebrile &gt;24 hours</td>
</tr>
<tr>
<td>- P&gt;120 (if &gt;10 above baseline)</td>
</tr>
<tr>
<td>- BP &lt;100/60 (if &gt;10 less than baseline or significant decrease from previous)</td>
</tr>
<tr>
<td>- RR&gt;25</td>
</tr>
<tr>
<td>- SaO2 &lt;93% (or 2% down from baseline)</td>
</tr>
<tr>
<td><strong>Visual Assessment Worsening</strong></td>
</tr>
<tr>
<td>- Decreased ability to speak in sentences</td>
</tr>
<tr>
<td>- Increase accessory muscle use</td>
</tr>
<tr>
<td>- Increase visible air hunger</td>
</tr>
<tr>
<td>- Other concerning sign</td>
</tr>
<tr>
<td><strong>Increased O2 requirement</strong></td>
</tr>
</tbody>
</table>
Potential Interventions if Assessment Warrants

- O2 therapy
- IVF
- Further lab assessment
- Other symptomatic interventions:
  - Albuterol, mechanical management of hypoxia, management of diarrhea, cough, fever, myalgias

- Further diagnostic workup/referral to ED/antibiotics/etc.
Criteria for ED evaluation

- Lower threshold when patient is high risk for severe disease
- O2 Sat <93%
- or dropping significantly from baseline (e.g. 95-97% X days then 92% without quick recovery)
- Severe dyspnea
- Hypoxia often PRECEDES dyspnea with COVID-19
  - Dyspnea at rest
    - Interfering with the inability to speak in complete sentences
- Concerning alterations in mentation
  - e.g. confusion, change in behavior, difficulty in rousing
- Hypoperfusion/ hypoxia
  - e.g. falls, hypotension, cyanosis, anuria, chest pain suggestive of acute coronary syndrome

*for hypoxic patients, particularly those previously hospitalized, ideally assess all vital signs prior to referral to ED dependent on what care can be delivered in the home. Some may benefit from ordering home O2 without ED eval. (https://doi.org/10.1111/ACEM.14053)*
<table>
<thead>
<tr>
<th>Cause</th>
<th>Tachycardia</th>
<th>Hypotension</th>
<th>Hypoxia</th>
<th>Fever</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dehydration</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td>IV fluids and labs</td>
</tr>
<tr>
<td>Hypoxia</td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
<td>Supplemental Oxygen</td>
</tr>
<tr>
<td></td>
<td>+ Improves</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>with</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>improvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>in O2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MI</td>
<td>+ chest pain</td>
<td></td>
<td></td>
<td></td>
<td>ED eval</td>
</tr>
<tr>
<td>Myocarditis/Pericarditis</td>
<td>+ chest pain</td>
<td>+/-</td>
<td>- (+ may be present secondary to respiratory compromise)</td>
<td>-/+</td>
<td>ED eval</td>
</tr>
<tr>
<td></td>
<td>+/-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart failure</td>
<td>+ shortness of breath</td>
<td>+/-</td>
<td>+/-</td>
<td></td>
<td>Consider outpatient cardiologist involvement, ED eval if severe symptoms</td>
</tr>
<tr>
<td>Pulmonary Embolism</td>
<td></td>
<td></td>
<td>-/+</td>
<td></td>
<td>ED eval</td>
</tr>
<tr>
<td>Sepsis/Cytokine Release Syndrome</td>
<td></td>
<td></td>
<td>+/-</td>
<td></td>
<td>ED eval</td>
</tr>
</tbody>
</table>
Anticoagulation

- Increased risk DVT, PE, CVA with COVID-19
- Autopsies demonstrate widespread thromboses in multiple organs
  - [https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(20)30178-4/fulltext](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(20)30178-4/fulltext)
- Classic risk factors for hypercoagulability are not present in all who end up with DVT/PE
  - No clear predictors for whom will clot
- Currently many recommend ~30 – 90 days of therapeutic anticoagulation in patients who have been hospitalized
- No guidance on patients NOT hospitalized
  - Among those with hospital admission prevented due to aggressive supportive in home care but who have significant illness and/or have underlying risks (e.g., immobility), consider anticoagulation if no contraindication
    - No data convincing data yet, no clear guidance on what are leading predictors
Should patients be anticoagulated if they are not hospitalized?

There is an increased risk of thromboembolic events in patients with COVID-19 infection.

**Recommendations**

- Extended VTE prophylaxis with patients who are low risk of bleeding and have adequate renal function (creatinine clearance ≥ 30 mL/min)

- Extended prophylaxis for 30 days for discharged patients with COVID-19 infection and risk for thromboembolism. with rivaroxaban 10mg daily

- Patients whose COVID-19 infection resulted in ICU should receive empiric therapeutic anticoagulation (90 days)

  extended thromboprophylaxis after discharge using a regulatory-approved regimen (e.g., betrixaban 160 mg on day 1, followed by 80 mg once daily for 35-42 days; or rivaroxaban 10 mg daily for 31-39 days (American Society of Hematology) (4)
The patient doesn’t feel short of breath; do I really need to monitor the p. ox or order oxygen? The nurse called me and said my patient’s p. ox is 88% do I need to send them back to the hospital?

Patients with COVID-19 related hypoxia may not always experience a sense of air hunger, shortness of breath or dyspnea with exertion

- monitor; oxygen needed if p. ox ambulating or at rest drops to 88%.
- ~ 2-6 week weaning period on average and may be months for some
- p. ox to be maintained 93%; if 93% or lower at rest check an ambulating O2 for exertional desaturation

How to avoid readmission

- Obtain home oxygen quickly
- Deep breathing exercises
- Home proning
- Other vitals remain stable

* If acute drop in oxygenation does not improve with deep breathing or proning emergent evaluation is appropriate.
Albuterol can be helpful in improving symptoms and hypoxia.

Nebulizer treatments are an aerosolized procedure and are best avoided to prevent spread of the virus. If nebulizers are used, others should not be present in the room, room ventilated if possible, and surfaces wiped down after use.
Hypoventilation is a significant contributor to hypoxia in COVID infection.

Increasing ventilation can be helpful in improving oxygenation, decreasing mucus plugging and improving outcomes.

https://www.bing.com/videos/search?q=self-proning+youtube&docid=608000736964251334&mid=1EB06A8AAE1FDBFF3A221EB06A8AAE1FDBFF3A22&view=detail&FORM=VIRE (5)
My patient was not on oxygen before COVID-19, what should be expected?

- Slow; The goal is to keep oxygen p.o.x at ≥ 93%. May need higher level of O2 for ambulation/exertion compared to at rest. Titrate to above 93%

- Tachycardia associated with exercise intolerance can improved with oxygen even at mild levels of hypoxia.

- P. ox below 96% and HR over 110, increase the oxygen and assess if tachycardia improves.
  - improves; use HR and p. ox combined to titrate and wean O2.
  - no improvement or p. ox is above 96% with tachycardia; consider other causes of tachycardia

Decreased aeration when sleeping → Continuing O2 while sleeping even after weaning can be beneficial.
What is the role of Intravenous fluid management in the home?

Patients may experience dehydration from decreased oral intake of food and fluids or GI losses

- due to exhaustion
- a feeling of satiety
- vomiting/diarrhea

“the asthenia was a more significant issue than I anticipated, it can contribute to the dehydration and poor PO intake. Encouraging hydration and having a low threshold for pulling the trigger on IVFs would be helpful.” (Dr. Carol Chou, Penn Medicine GIM)

*recommend using NS early on can help with electrolyte imbalances including hyponatremia

- Give 1 L NS IVFs given over 4 hours PRN at home
- Use of weights, p. ox and BP to monitor volume status and ongoing need for IVFs
Both hypotension and hypertension are seen during the COVID-19 recuperation period.

- Hypotension is more common within the first 2 weeks

Causes of Hypotension
- hypovolemia
- poor to minimal PO intake
- severe inflammatory response/sepsis

Causes of Hypertension
- unclear correlation between COVID-19 recuperation and patients with hypertension pre-COVID-19 infection
- possible connection to the R-A-A-S or the compliance of the vascular system associated with damage to the endothelium.
- No pre-COVID hypertension; effect resolves within 4-6 weeks (medicine may be recommended)
I have a lot of patients complaining about insomnia. What is the best management in COVID patients?

Unclear if this is related specifically to the impact of COVID-19 on the neurological system or to stress or already existing sleep disorders.

Melatonin is an accepted management for insomnia.

Avoidance of benzodiazepines is appropriate given respiratory and neurologic risk in patients with COVID-19 particularly in the elderly.
Supportive care: ‘COVID-19 care pack’

Go-to set of COVID-19 care prescriptions many patients will need and considered safe:

- Mucinex 600mg every 12 hours
- Albuterol HFA 2 puffs Q 6 hours PRN
- Ondansetron 4 mg every 8 hours PRN nausea
- Ondansetron 5 mg (very elderly consider 3 mg) daily at bedtime PRN nausea
  Use 5 mg daily to reduce the effects of the inflammatory response
- Tylenol 500mg 2 tablets every 8 hours PRN fever and pain
  after 10 days consider dropping down to 2 grams max for up to 4 weeks
- Imodium: may be helpful for patients with COVID-19-related diarrhea.
- Anticoagulation prophylaxis (individualized based on risk and renal function)

**COVID-19 care pack monitoring equipment:** pulse oximeter, thermometer, BP cuff, and scale if patient has CHF
Vaccine Update

• Several promising vaccine candidates

• Virtually all are focused on the structural S spike protein
### Priority COVID-19 Vaccine Candidates

<table>
<thead>
<tr>
<th>Platform</th>
<th>Developer</th>
<th>Phase 1/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nucleic acid</td>
<td>moderna</td>
<td>Completed</td>
</tr>
<tr>
<td></td>
<td>BIONTECH Pfizer</td>
<td>Completed</td>
</tr>
<tr>
<td>Viral vector</td>
<td>JANSSEN</td>
<td>7/2020 start</td>
</tr>
<tr>
<td></td>
<td>MERCK</td>
<td>TBD</td>
</tr>
<tr>
<td>Protein subunit</td>
<td>NOVAVAX</td>
<td>Ongoing</td>
</tr>
<tr>
<td></td>
<td>GSK SANOFI</td>
<td>TBD</td>
</tr>
</tbody>
</table>
Vaccine Implementation

- WHO framework for appropriate planning of ‘mass vaccination campaign’
- Outlines key issues such as geographic prioritization, need for community engagement
- Ideally distribution modeled on highest risk for severe disease and highest risk for transmitting
  - Analogous to when shortages of flu vaccine
- Those with risk factors for severe disease
- Health aides and other healthcare workers
- Teachers and educators
- Rely on robust safety data
Acknowledgements

• Anna Doubeni, MD
• Penn Home Infusion Therapy team
• Penn Med at Home team
Become a Fellow of NHIA (FNHIA)

**Minimum Eligibility Requirements:**

- Member of NHIA for at least 5 years
- At least 7 years of home and specialty infusion professional experience
- 3 Letter of Recommendation
- Fully completed application with fee
- Questions email fellowprogram@nhia.org

For More Information, visit our website at: [https://www.nhia.org/nhif_fellow-program/](https://www.nhia.org/nhif_fellow-program/)