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## COVID-19 and PT: Characteristics, Considerations, and Care

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- Presenter Disclosure: Financial disclosures: Presenter received an honorarium for this course. Non-financial disclosures: The presenter is the Vice President of the Cardiovascular and Pulmonary Section of APTA. The section has been sponsoring and creating extensive content related to COVID-19 care. She personally helped create and present 2 webinars/presentations related to COVID-19 care. These are available on APTA's Learning Center, one of which has CEUs for it. Both are free to learners and she did not accept payment for either one.
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## Learning Outcomes

After this course, participants will be able to:

- Describe at least three pathology and common symptoms of the COVID-19 virus.
- Describe at least two challenges to PT interaction and performance of interventions with patients with COVID-19.
- Describe at least two parameters for PT interventions for acute care and post-acute care for patients with COVID-19.
- Identify at least three components of PT interventions for these patients to continue into outpatient care.

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## Pathophysiology of COVID-19

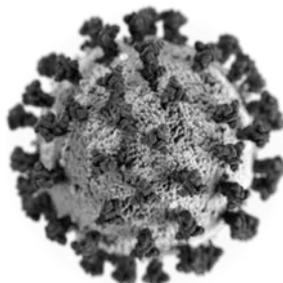
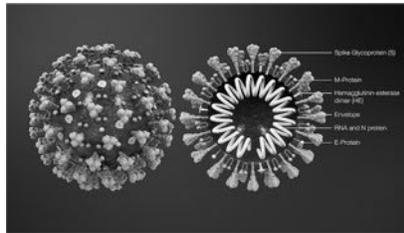


Image: CDC

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## Corona Virus Classification

- Corona viruses (CoVs): a large family of single-stranded RNA viruses
  - MERS (Middle East Respiratory Syndrome - 2012)
  - SARS (Sever Acute Respiratory Syndrome - 2003)
- There's a crown-like appearance due to spikey glycoproteins on the outside (more on this in a minute)



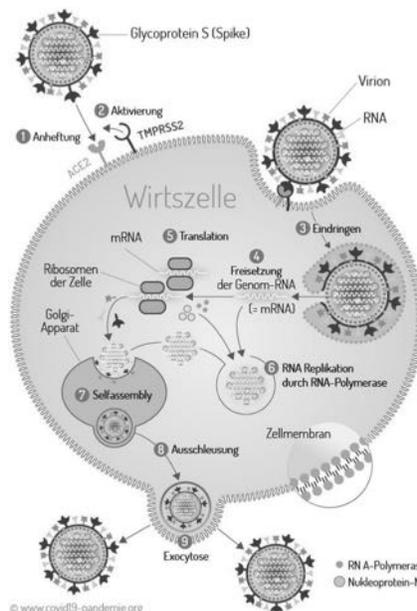
<https://www.scientificanimations.com/> / CC BY-SA  
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## Corona Viruses

- Estimates suggest that 2% of the population are healthy carriers of a CoV
  - Estimated CoVs are responsible for about 5% to 10% of all acute respiratory infections
- CoVs can cause common colds and upper respiratory infections, even in immunocompetent individuals.
- In immunocompromised subjects and the elderly, lower respiratory tract infections can occur too.<sup>5</sup>

## COVID-19 (SARS-CoV-2)

- Most current strain of the virus started in Wuhan, China in December 2019.
- Glycoproteins on outside of virus attach to angiotensin converting enzyme (ACE 2) receptors <sup>5,27</sup>
- The ACE 2 brings coronavirus into pneumocyte cells
- Triggers
  - Synthesis and release of more COVID-19 virus back into blood stream
  - Inflammatory responses to virus: clotting factors, etc.
  - Immune system increase: WBC, prostaglandins, leukotrienes, etc.



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## Impact of COVID-19

- Greatest impact is pulmonary system although will also impact: GI, musculoskeletal, neurological and indirectly the integumentary system.
- Pulmonary Impact: causes fluid to build up between alveoli and capillary in interstitial space.
- Fluid causes problems with gas exchange.
- As virus progresses, get inflammation inside alveoli too – thus fluid is like a pulmonary edema progressing to ARDS

Q1

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## COVID-19

- Jan 30, 2020 WHO declared COVID-19 a Public Health Emergency of International Concern<sup>29</sup>
- Around Feb 22, 2020 first US case transmitted within US (meaning not someone who contracted the virus from being in another country)
- As of May 4<sup>th</sup> – 187 countries have reported cases.

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As of May 4, 2020<sup>14</sup>

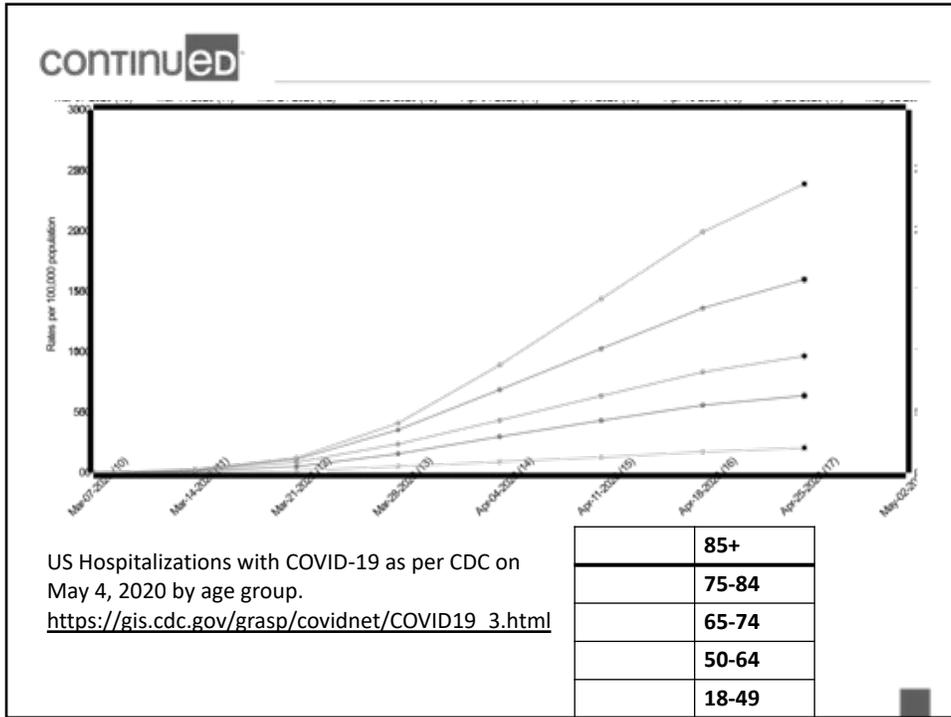
	Global Cases	United States	Spain	Italy	United Kingdom	Germany	China (11 <sup>th</sup> )
<b>Confirmed Cases</b>	<b>3,552,985</b>	<b>1,170,719</b>	217,466	211,938	191,827	165,745	83,965
<b>Deaths</b>	<b>248,025</b>	<b>68,797</b>	25,428	29,079	28,734	6,861	4,637
<b>Recovered</b>	<b>1,133,538</b>	<b>153,198</b>	121,343	82,879	1,918	126,316	81,785
<b>Case-Fatality Rate</b>	<b>6.98%</b>	<b>5.88%</b>	11.69%	13.72%	15.02%	4.14%	5.52%

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## Characteristics of People With COVID-19

- Slightly more men than women: some studies show around 80% men, but most around 60% men.
- Age: around 60-65 mean age among sources
- Race: Not a lot of data yet, really only one study.<sup>9</sup> Rest is anecdotal and estimates range from 12%-50% of patients with COVID-19 being African American.
  - Percent of COVID-19 cases that were African Americans as per CDC as of May 4, 2020: varied between age groups: 21%-31%

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## COVID-19 Transmission

- Bad News
  - Individuals can transmit virus before symptoms appear
- Good News:
  - COVID-19 is sensitive to ultraviolet rays and heat.
  - It can be inactivated by ether (75%), ethanol, chlorine-containing disinfectant, peroxyacetic acid and most forms of chloroform.

## COVID-19 Transmission Cont'd

- Transmission occurs through respiratory droplets from coughing and sneezing. (more later)
- According to CDC:
  - Incubation time generally within 3 to 7 days - up to 2 weeks
  - Longest time from infection to symptoms was 12.5 days
- On average, each patient transmits the infection to an additional 2.2 individuals<sup>5</sup>



James Gathany,  
work of the CDC  
/ Public domain

## Initial Patient Symptom/Presentation

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Image: Christian Dorn  
from Pixabay

## General Initial Symptoms<sup>5,6</sup>

- Fever, malaise, dry cough, headache, dyspnea
- Some with GI issues: abdominal pain, diarrhea, appetite loss, nausea and vomiting
- Vitals: Increased RR, HR, and BP
- CT scan: like pneumonia, but with abnormal findings
  - Inflammatory infiltrations
  - Patchy or segmental GGOs (ground glass opacities)
  - Multiple lobes in bilateral lungs (pneumonia more unilateral)

Q2

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## Categorization of COVID-19 Cases<sup>5,23</sup>

- Mild (80%): no or mild respiratory impairment **OR** moderate respiratory impairment, but still not enough to require hospitalization.
- Severe (15%): dyspnea, hypoxia, >50% lung involvement on imaging within 24-48 hrs, respiratory frequency  $\geq 30/\text{min}$ , blood oxygen saturation (SpO<sub>2</sub>)  $\leq 93\%$ , PaO<sub>2</sub>/FiO<sub>2</sub> ratio <300
- Critical (5%): respiratory failure, shock, or multiorgan dysfunction (MOD) and/or failure (MOF)

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## COVID-19 Progression

- Most cases of COVID-19 may present with mild to moderate illness.
- However, in a small percentage of patients, after about a week there is a sudden worsening of clinical conditions with rapidly worsening respiratory failure and MOD/MOF.
- Still unsure of cause or markers of patients that will decline quickly but have some things to watch.

## Bloodwork with COVID-19

- Blood work shows people with COVID-19 have<sup>17</sup>
  - Elevated: Neutrophil count, C-reactive protein (CRP), Lactate dehydrogenase (LDH), Aspartate aminotransferase (AST), Alanine aminotransferase (ALT), Urea
  - Decreased: white blood cell (WBC) count and serum albumin
- Possible signs of rapid decline
  - D-dimer levels increase dramatically<sup>13</sup>
  - Cytokines and other inflammatory markers increase (CRP, Ferritin, etc.)



Image: Marco Verch  
Professional Flickr

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## Symptoms Based on Severity Mild COVID-19<sup>5,6</sup>

- Mild fever, chills, repeated shaking with chills
- Dry cough and/or sore throat
- Shortness of breath or difficulty breathing
- Malaise
- Headache
- Muscle pain
- Some people experience new loss of taste or smell

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## Moderate COVID-19

- Same as mild presentation plus
- Greater cough
- Shortness of breath, inability to catch breath, with increased RR (>30 breaths/min)
- Hypoxia (SpO<sub>2</sub> <90% on RA)
- Clinical findings of Pneumonia
- Cyanosis can occur in children, not as typical in adults

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## Severe COVID-19

- Severe Pneumonia or Acute Respiratory Distress Syndrome (ARDS) type presentations
- Typically diagnosed using CT scan findings, blood work, analysis of  $\text{PaO}_2/\text{FiO}_2$  ratio

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## Cytokine Storm

- We've now found that patients that can't be stabilized can go into "cytokine storm"
- Cytokine storm:
  - Immune cells rapidly multiply and invade the lungs and heart
  - Blood vessels leak blood cells into interstitial space
  - Blood itself begins to clot
  - BP decreases
  - Organs start to fail due to lack of  $\text{O}_2$  delivered

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## Other issues from COVID-19

- Neurological issues:
  - Confusion, delirium from ICU care and meds
  - Possible viral encephalopathy
  - Possible stroke – typically related to increased BP
- Cytokine storm can lead to platelet aggregation and thrombosis
- Skin integrity – from bedrest – discussed more in PT section
- Pulmonary Fibrotic changes – keep an eye on this in the future. No long-term data yet.

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## Infection Control

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## Review of Types of Isolation Precautions

### Contact Precautions

•Infections, diseases, or germs spread by touching the patient or items in the room

•Examples: MRSA, VRE, diarrheal illnesses, open wounds, RSV

•PPE:

- Gloves
- Maybe gown: if risk of splash/contact

### Droplet Precaution

•Diseases or germs spread in tiny droplets caused by coughing or sneezing

•Examples: pneumonia, influenza, whooping cough, bacterial meningitis

•PPE

- Gloves
- Gown: water-proof
- Surgical mask
- Maybe glasses: if risk of splash to the eyes

### Airborne Precaution

•Diseases or very small germs that are spread through the air from one person to another

•Examples: tuberculosis, measles, chickenpox

•PPE

- Gloves
- Gown
- Fit-tested N95 or higher-level respirator
- Face shield or goggles/glasses

**Q5**

## COVID-19 is Droplet/Airborne

- Being treated as an airborne pathology for the most part.
- It's actually spread by droplet contact.
- However, when patient coughs, sneezes, or exhales droplets they go into the air.
  - COVID-19 particles can stay in the air for a while: studies say it hovers around 1-3 hrs., but that is in closed spaces and the viral count does decrease in concentration.
  - Usually though, the expelled droplet will land on something then a person touches that surface and then they touch their face/eyes/mouth/etc.
- So, it's being treated as airborne with regards to PPE, but the patient may not be in a negative pressure room in acute care and obviously won't at home or sub-acute/SNF/LTAC.

**Q4**

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## Guidelines for social distancing when treating a patient with (+) COVID-19

- Maintain social distancing with all family members/caregivers of patient. (If in home health)
  - Maintain 6' from family members. Preferably they should leave the room.
- Don't be a vector: take appropriate precautions, follow PPE don/doff procedures
- Try not to touch any surface entering/leaving the house or room without gloves or other protective barrier in place. (Includes pushing door open with arm, moving something aside with leg, etc.)

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## Contact with patient with (+) COVID-19 When can they go outside/leave house?<sup>6</sup>

- Contact with pt should be in full droplet/airborne PPE for as long as your agency/facility recommends. This may vary or change as we learn more about how long the patient is contagious. This point, there's just not enough data.
- These are guidelines for pt going out of their house or for us to D/C use of PPE...
- If the pt won't be re-tested, then
  - At a minimum, it should be at least **7 days** after symptoms first appeared (PPE probably for longer still)
  - **AND** at least 72 hours (that is three full days of no fever without the use medicine that reduces fevers)
- If the pt will be re-tested, then
  - Once they no longer have a fever (without the use medicine that reduces fevers)
  - **AND** other symptoms have improved (for example, when their cough or shortness of breath have improved)
  - **AND** they received two negative tests in a row, 24 hours apart.
- **No definite answer on when pt is no longer contagious.**
- Studies show pt can shed virus for up to 30 days.
- Some sources saying patient may be a carrier for up to 6-8 weeks

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## PT Considerations in Acute Care

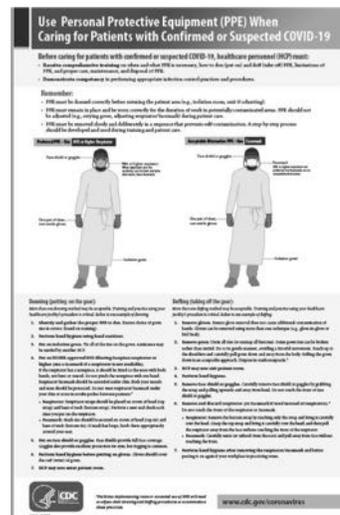
## PPE

- Country is in surge capacity strategy
- Here is a resource for your agency/facility to use in order to see how much PPE they'll need and how long it will last them.
- PPE burn rate calculator:  
<https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/burn-calculator.html>
- General reminder for everyone regarding use of PPE
- RE-ADJUSTMENT of PPE once on = HAND HYGIENE
- ONE OF THE BIGGEST PPE MISTAKES!!!!!!

## Don/Doff PPE

- Don and Doff PPE away from the patient environment.
  - Acute Care or Rehab setting: outside pt's room or designated area
  - HH: outside if possible. Otherwise, just inside pt's door at least 6-10' from pt
- Follow procedures
  - Key points when donning PPE: all skin at wrists is covered, N95 mask seal is intact (take a couple breaths in/out to seal it), ensure gown is tied tight enough
  - Key points when doffing PPE: take gown down from shoulders first, gloves inside out, hand hygiene A LOT t/o, store mask correctly if re-using
  - Mask storage: make sure straps do NOT touch the inside of the mask, store in a clean open container (possibly a paper bag), record length of use and discard after recommended wear time
- Greatest risk of spread of disease is during doffing process

- Use your agency/facility's procedure.
- JCAHO standards mandate that the agencies/facilities have policies and procedures for PPE donning/doffing for droplet and airborne transmission.
- Those have probably been modified for COVID-19.
- Make yourself aware of those and FOLLOW them.
- If you don't have any, use CDC's.



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One caveat:

- If you're re-using your N95 mask...
- Put on gloves to put the mask on, then take those gloves off and throw them out. Put on clean gloves to treat pt.



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## Eyewear



Image: Emilian Robert  
Viral from Pixabay



Image: Vivien Roffe flickr



Image: U.S. Navy photo

- Obtain eyewear (goggles, glasses, face shield) from your agency/facility
  - Single use vs. Re-usable (re-usable recommended due to PPE shortage)
- Ensure appropriate cleaning and disinfection between uses if goggles or reusable face shields are used.
  - Clean inside of lenses first, then outside, then rest of the frame.
  - Make sure to let disinfectant dry completely first.
  - Then run water over lenses and dry with cloth to eliminate streaks
- Throw out any goggles, glasses, or face shield that becomes damaged even if it was re-usable

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## Gowns



Photo Credit: Sgt.  
Domnique Washington)

- Single use gowns preferred as most re-usable ones aren't waterproof. However, if shortage continues, this may have to change.
- May use surgical gowns if they're waterproof. Then wash as per regular recommendations for that gown.
- Make sure gown is tied tight enough it won't slip off while in physical contact with the pt
- During doffing, make sure to start at the shoulders and wrap it into itself as you take it off
  - Do NOT shake the gown out at all during doffing
- Only as a last resort, if your agency/facility runs out of gowns should you consider the use of coveralls or lab coat.

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## Masks



Image Left:  
Khawaja  
Masud from Pi  
ahaw Right:  
(CDC/ Debora  
Cartagena)

- Surgical mask is fine for pts that aren't COVID-19 (+) or to wear over an N95 mask, but they are NOT good enough on their own for a pt with (+) COVID-19.
- **When treating a pt that is COVID-19 (+), you NEED an N95 or higher barrier mask during contagious/viral shedding period.**
- You must be fit tested for N95 mask. Make sure you get a good seal every time.
- Almost all places re-using masks now. Know your agency/facility's protocol.
- Throw out mask once it reaches your agency/facility's protocol or if it gets soiled, damaged, or hard to breathe through.
- Remember do NOT touch the facemask while wearing it. If you do, perform hand hygiene. This goes for surgical and N95 masks.

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## Equipment Management Stethoscopes, BP cuffs, Bags, Weights, Computers, Equipment

- Leave anything outside of room/in your car that you can.
- Bags, equipment: bring something with you to set things down on (really for home health PTs)
  - Piece of tarp, newspaper, plastic.
  - Have a bag to put that tarp in as you leave or dispose of newspaper at pt's house
  - Wrap tarp/plastic with "dirty" side into itself and then place in the bag
  - At home: take it out and clean/disinfect it then leave for several hrs. or days as able
- Sanitize anything else used with agency approved cleaner (bleach/alcohol)
- Pulse ox: mixed info depending on your pulse ox.
- Soft surfaces – virus lives shorter..... Hard surfaces – easier to clean

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## PT Care in Acute Care

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## Main Acute PT goals in ICU

- Positioning
  - Assist with proning.<sup>3</sup>
    - \*\*Has been shown to really improve V/Q matching (gas exchange) in people with COVID-19\*\*
    - May prevent need for vent or stabilize pt on vent
    - Follow facility's protocol for hrs, equipment for skin integrity, etc.
  - Upright position and mobility as able: encourage inspiratory effort in upright. Diaphragm, accessory muscles, posture.
- Prevention
  - Skin breakdown – proning or just prolonged immobility
  - Muscle atrophy weakness – keep as active as able

Q6

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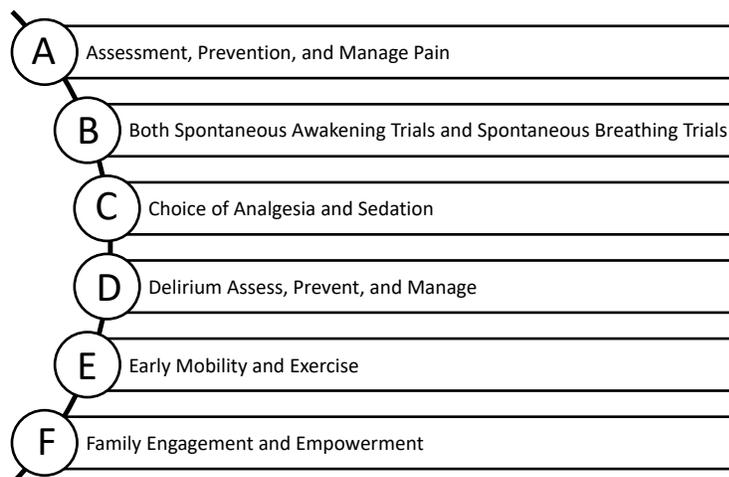
## Main Acute PT goals in ICU Cont'd

- Reduce need for ventilator use – inspiratory effort, IMT as able, deep breathing, breath stacking/hold
- Manage delirium as able<sup>15</sup>
  - Work with pt arousal and stimulus as able
  - Confusion assessment method (CAM-ICU) delirium scale, delirium rating scale (DRS-R-98) and others
- ICU mobility/function measures: Am-PAC, Perme ICU Mobility Scale, Johns Hopkins Highest Level of Mobility Scale, etc.

Q7

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## ICU - ABCDEF Bundle Strategy<sup>26</sup>



## Prevent ICUAW

- ICU Acquired Weakness: muscle weakness in ICU pts with no other cause of weakness (no nerve injury, blood flow issue, TBI, etc.)
- ICUAW shows - muscle atrophy/wasting, myopathy, polyneuropathy or both
- ICUAW showed higher 1-year mortality, impaired physical function, and poor health-related QoL up to 24 months after D/C in general ICU pts.<sup>10</sup>
- COVID-19 pts at high risk of ICUAW due to longer number of days in ICU and hospital in general.

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## PICS – Post Intensive Care Syndrome<sup>2,21,24</sup>

- Impairments in physical, cognitive, or mental health
- Starts in ICU or as a result of ICU and continues after acute care
- Patients can show decreased QoL for up to 12 yrs after ICU stay<sup>21</sup>
- Assess each domain and address impairments as much as able

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## PICS Cont'd

- Physical Impairments
  - Muscle weakness or atrophy
  - Pulmonary complications
  - Balance, coordination, mobility impairments
- Cognitive
  - Executive functioning skills
  - Memory
- Mental Health
  - Anxiety, depression
  - PTSD

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## Acute PT Interventions (not ICU)

- Positioning – upright as much as possible
- General conditioning ex – sitting and standing
- Bed mobility and transfers
- Amb and stairs as able – focus on safety and endurance
- Inspiratory muscle training (IMT) as appropriate

## IMT

- Diaphragmatic breathing ex
- Deep breathing, inspiratory hold, breath stacking
- IMT device: several brands out there
  - Start with pt to ensure they do it correctly
  - Decide what intensity level is appropriate for them
  - Then prescribe it as a HEP
    - Often 8-10 breaths 2-3 x/day

## Acute PT Parameters (not ICU)

- Modes as per last slides
- Duration: goal 12-20 min continuous activity
  - Start with 3-5 min, rest 1-2 min (or more if needed), then 3-5 min again
  - Pts with COVID-19 presenting with much greater rates of dyspnea and fatigue
  - May need longer rests and therefore longer overall duration of PT sessions to achieve at least 15-20 min of activity overall



Image: OpenClipart-Vectors from Pixabay

## Acute PT Parameters Cont'd

- Intensity: want pt around 12 Borg and 2 Modified Borg (see next slide)
  - Realistically – pt's Modified Borg/dyspnea will probably be higher based on what we're seeing so far with COVID-19
  - Ex until dyspnea 3-4...rest...then ex again
  - Adjust intensity and increase as able based on dyspnea and vital signs
- Frequency: preferably 5-7 days/wk in acute care
  - If you can't see pt every day – give some ex to do on own
  - Include IMT and other inspiratory ex

## RPE and Dyspnea

### Borg RPE Scale

6	
7	Very, very light
8	
9	Very light
10	
11	Light
12	
13	Somewhat hard
14	
15	Hard
16	
17	Very hard
18	
19	Very, very hard
20	

### Dyspnea Scale

- 0 No dyspnea
- 1 Mild, noticeable
- 2 Mild, some difficulty
- 3 Moderate difficulty, but can continue
- 4 Severe difficulty, cannot continue

### Borg Modified Dyspnea Scale

0	Nothing at all
0.5	Extremely Slight (just noticeable)
1	Very Slight
2	Slight
3	Moderate
4	Somewhat Severe
5	Severe
6	
7	Very Severe
8	
9	Extremely Severe (almost maximal)
10	Maximal

## Energy Conservation



- Typically with restrictive lung disorders (like ARDS) you want pt to be as active as possible
- With COVID-19 we want activity, however, we're seeing pt's dyspnea and fatigue are continuing for weeks after initial symptoms and hospitalization
- So, need to teach pt energy conservation techniques to go with HEP too.
  - Home set up, spacing out activities, equipment or O2 as needed, minimize stairs/reaching/bending, breaks as needed



Image:  
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## Previous Were Ideals

- What we're seeing with COVID-19 pts...
- Sometimes PT is not involved in the ICU care
  - Facility doesn't want PPE used, PT not on typical ICU team
- Plan is to get pt out of hospital ASAP, much faster than typical – therefore, they may not hit full independence
- Many pts can't go to sub-acute/LTAC or refuse to
  - Make sure to get appropriate equipment
  - Get home PT
  - Call family for education if possible and give pt handouts

## Patient Symptoms/Presentation Post-Acute

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## No Real Data Yet

- Some studies in the works to classify pt presentation upon D/C from hospital, but nothing published yet.
- From little sharing out there:
  - May have fever still if quick D/C from hospital
- Otherwise, most common are:
  - Persistent dry cough
  - Moderate to severe decrease in endurance
  - Fatigue
  - Muscle weakness
  - Dyspnea with even easy activity

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## PT Considerations Post-Acute

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## Patient Presentation

- So far – pts appear with greater impairments than pts that have had similar ICU stays, ARDS, or other pneumonia
- Moderate to severe decrease in endurance and dyspnea seem to be problems that patients are still struggling with weeks after D/C from hospital
- COVID-19 patients are showing greater muscle weakness than other pulmonary pts and similar ICU pts

Q8

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## PPE

- Recommendations are still PPE including N95 mask for up to 14 days after initial symptoms. CDC did decrease that to 7 days. CDC/WHO/etc. don't want to put in writing that you have to have an N95 mask.
- No references to state 14 days and need for N95 with PT, but Thomas et al. reference has statements in sections 5.1, 6.1, 7.5 about PT being close contact and thus requiring same equipment as aerosol generating procedures.

- Thomas P, Baldwin C, Bissett B, Boden I, Gosselink R, Granger CL, Hodgson C, Jones AYM, Kho ME, Moses R, Ntoumenopoulos G, Parry SM, Patman S, van der Lee L (2020): Physiotherapy management for COVID-19 in the acute hospital setting. Recommendations to guide clinical practice. Version 1.0, published 23 March 2020.

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OpenClipart-Vectors from Pixabay

## General Note about O2

- Many, if not most, pts with COVID-19 will require supplemental O2 for post-acute rehab.
- Goal is to wean them down and off O2 as able.
- Will need to watch O2 saturations closely
  - Preliminary observations showing saturations may under-represent PaO2 levels (see 2 slides from now)
- Although not specific to COVID-19, the Practice Guidelines on Supplemental O2 will be a great resource for you.11

## General Considerations

- Supplemental O2
  - Did pt use O2 prior to COVID-19?
    - Will use equal to, if not more now. May desaturate more now.
  - What have they used since hospital?
    - Try to wean pt off O2 over a few days/weeks. You want an O2 titration order.
  - Example:

### Supplemental Oxygen

#### Oxygen Use:

- Continuous for all activity and at rest
- During activity only
- While sleeping
- As needed

#### Oxygen Prescription

- Pt is prescribed \_\_\_\_\_ L O2 delivery via \_\_\_\_\_.
- PT may titrate supplemental O2 between \_\_\_\_\_ L O2 and \_\_\_\_\_ L O2 to maintain oxygen saturations above 90%.

## SpO2 Monitoring-Pulse Oximeter

- Pt may have their own. In home health they may have telehealth equipment
- Anecdotal evidence showing pulse ox may under-represent PaO2 levels. We just don't know yet.
- It's still the best thing we have to monitor oxygen levels in post-acute care though.
- Cleaning pulse oximeter: follow manufacturers instructions (some allow alcohol, some don't)



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**Q9**

## PT Care Post-Acute

## Primary Goals: Post-Acute Care

- Endurance – pts have had prolonged hospital stays, signs of ICUAW (ICU acquired weakness), PICS (post intensive care syndrome), dyspnea and O2 desaturation
- Strength – pts presenting with loss of muscle mass
- Independence – early D/C to free up hospital space may mean pts aren't fully independent at home. Or they came to your sub-acute/LTAC to get independent.
- Safety – weakness, decreased endurance, and decreased independence put them at greater risk for falls, etc.



## Endurance

- Prolonged hospital stay - average 28 days in a study in Wuhan.<sup>28</sup> We don't have any US data yet.
- Many showing ICUAW or PICS: affect endurance a lot
- Moderate to severe decrease in endurance
  - Is correlated to severity of disease progression, but all pts report some sort of decreased endurance
- Dyspnea and high respiratory rate shown to be predictors of severe disease or death, so important to continue to monitor these closely during post-acute phase.<sup>28</sup>

## Endurance

- Focus much of our pulmonary rehab care on endurance.
- We need quantifiable assessments of endurance level.
- Interventions should take into account the need for frequent rests and working towards longer duration.
- Write goals to achieve the endurance demands of functional life.

## Aerobic Ex

- Mode: amb, stairs, pedaling if available. In home, can use pt ex equipment if they have it (TM, bike, etc.)
- Duration: Intervals – but HIIT most likely not used due to increase likelihood of droplet expulsion thus possibly increasing spread of virus.
- Intensity: Recommendation is low-intensity ex first 6-8 weeks out of hospital with  $\leq 3$  dyspnea on modified 0-10 Borg scale.<sup>25</sup>
- Frequency: will vary based on PT setting, pt presentation, pt abilities, agency policy for PT exposure.

CONTINUED

## Intervals

- Early rehab:
  - Activity XX min, rest about  $\frac{1}{2}$  ex time if able, then XX min again – example: amb 2 min, rest 1 min, amb 2 min again....
  - May need longer rest period early on
  - Accumulate as many min as you can – goal >15-20 min
- Progression
  - Increase activity time one session
  - Decrease rest time next session
  - Con't to increase duration before intensity

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## Breathing

- Early rehab:
  - May still want to use IMT and prescribe as HEP
  - Teach controlled or deep or pursed lip breathing for amb
  - Use breath timing with conditioning ex: exhale on the exertion range
- Progression:
  - Progress IMT resistance

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## Aerobic Ex Cont'd

- I know you'd like clear cut guidelines with vitals, duration, intensity, etc.
- Sadly, at this point, no true guidelines. There is expected to be a lot of variability based on pt's level of endurance.
- Prescribe and adjust ex based on vital sign response, pt symptoms, etc.
- Ideal frequency is 4-6 days/week.
  - Sub-acute/LTAC easier
  - Home health – get pt “buy in” – what can they do w/o assist, what will they be willing to do, etc.

## Functional Exercise

- Important PT and pt understand functional endurance will be decreased
- Activities that were easy before COVID-19 diagnosis, now may be difficult and actually be exercise for the pt
  - Amb within house from bedroom to living room
  - Getting the mail
  - Walking through the grocery store
  - Housekeeping, yard work



OpenClipart-Vectors from Pixabay

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## Strength

- Prolonged bed rest and immobility part of causes of the loss of strength.
- With COVID-19, most clinicians are seeing greater muscle mass loss compared to pathologies with similar ICU and bed rest time, so it may be related more to:
  - Specific COVID-19 viral load
  - Impact of prolonged lack of oxygenation to the muscle tissue
  - Physiologic reaction to longer periods of increased respiratory rate and HR along with decreased PaO<sub>2</sub>

CONTINUED

## Strength

- Assess strength values using traditional grading as able and appropriate.
- Use standardized tests to measure functional strength
- International committee on COVID-19 rehab recommendation “Loss of weight and muscle mass must be assessed and subsequently treated during comprehensive rehabilitation in COVID-19 survivors”<sup>25</sup>

CONTINUED

## Strength

- Mode: Functional movements or Weights
- Functional movement strengthening
  - Stairs/step ups, sit to stand, pulling/pushing with UEs, lunges, squats, triceps dips, bridges, core ex positions as able (quadruped, modified planks prone and sidelying, etc.)
  - Anecdotally hearing pts with more core and small muscle weakness than large muscle or LEs. Treat accordingly.
- Add weights as able (lower weight/higher reps)
  - In home: use pt's weights, cans, weighted bags, etc.
    - If bringing in your weights, make sure they can be fully sanitized
  - Sub-Acute/LTAC: kettle bells or dumbbells. Ankle/wrist weights and machines only if they can be completely sterilized.

CONTINUED

## Strength

- Think about what muscle groups are weakest, needed most for function, creating safety issues, etc.?
- Use functional ex as training too: i.e. transfers sit to stand

CONTINUED

## Strength

- Duration: to pt tolerance. Initial goal is at least 15-20 reps of each ex. Can be broken into sets.
- Intensity: low weight/high rep to start with
  - Progress to heavier weights
  - Possibly initiate HIIT as pt progresses
- Frequency: will depend on setting
  - Sub-acute/LTAC: 3-4 days/wk
  - Home health: at least 2 days/wk, up to 4 if they can



## Independence

- No data on how many pts are not independent upon D/C from hospital in US. May be higher than usual due to rush to get people out of hospital to free up space.
  - Several APTA Sections working on gathering that data.
- Recommendations are to treat people at home when possible and D/C from hospital as quickly as able.
  - So we can surmise that there are probably many pts that aren't independent.
- Many sub-acute and LTAC facilities around the country are opening COVID-19 specific locations, so the need is obviously there.

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## Independence

- Functional mobility testing: our usual CG assist for transfers, amb x 60' independently, etc.
- Standardized tests as able
- Try to minimize family member support needed at home

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## Safety



- Goes along with independence
- Assess safety concerns: mobility, endurance, balance, cognition, strength, etc. Address specific pt concerns.
- Teach pt self-monitoring of vital signs and other symptoms
- Used standardized tests as able
- Interprofessional collaboration as able

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## Functional Capacity Testing

Tests easily performed in pt's home or  
sub-acute or LTAC room

## Essential Functional Tests

- Tests to look at function
- SPPB (Short Physical Performance Battery) – looks at standing balance, gait speed, and sit to stand functions
- Sit to Stand tests – 30 sec sit to stand test, 5x sit to stand, etc.
- Mobility assessment for function: amb distance, transfer status, etc.

## Outcome Measures Endurance Tests

## Outcome Measures

- Decide what is most appropriate for that pt and their status at the time.
  - Also, what equipment/facility you have.
  - Keep in mind pt may need to be treated in room with the door closed in sub-acute/LTAC facility.
  - Best measures after acute resp failure.<sup>20</sup>
- 2 MWT, 6 MWT
- Step Tests – Variety out there, but studies have shown Astrand and Ryhming Step Test best one for patients with pulmonary conditions.<sup>18</sup> (research was w/COPD pts)

CONTINUED

## Outcome Measures

- TUG – not a true endurance test, but it will give a good measure of functional endurance for a pt this limited.
- Modified shuttle run tests
- Recumbent stepper test – if in sub-acute/LTAC facility that is still allowing use of gym.
  - Completely disinfect equipment prior to and after test.
- Others
- See PhysicalTherapy.com course “Endurance Assessment and Intervention” presented in 2019.

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## Clinical Methods to Evaluate Endurance

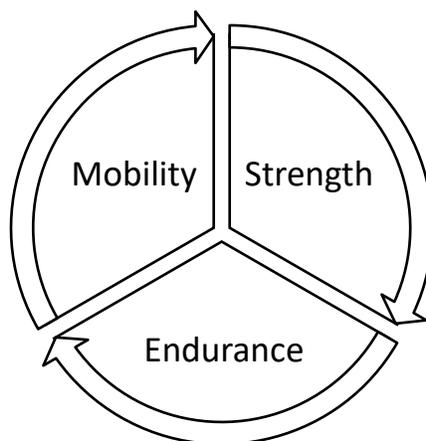
- General Observation: level of SOB, signs of pallor
  - COVID (+) pts showing baseline dyspnea that progresses quickly with mobility. Can become severe.
- Positioning / Postural Control
  - Is it requiring a lot of energy just to hold their head or trunk up?
- Tolerant to Therapy
  - How many rest breaks do they require?
- Can't make all these objective, so when you can't quantify, use these as qualifiers to your objective measures.

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## Clinical Endurance Cont'd

- Breathing Pattern – bonus if you remember the names
  - High effort?
  - Could it be easier?
- Functional mobility skills
  - Bed Mobility, Transfers, Ambulation, Stairs, W/C Propulsion, ADL's. \*Can make these measurable.\*
- Adaptive devices & equipment utilization
  - Looking at the quality & efficiency of their movement
- Environmental accessibility
  - Is their current way the most energy efficient?

## Endurance and Mobility



## PT Going Forward

## General Considerations

- We don't know when outpatient pulmonary rehab programs will be able to re-open.
  - May get some telehealth ones up in the next few weeks.
  - Reimbursement isn't there yet for telehealth for pulm rehab.
- Considerations:
  - How long since pt was diagnosed with COVID-19?
  - How long since symptom resolution or D/C from hospital?
  - Do you mix COVID (+) and non-COVID pts in rehab if COVID pts aren't symptomatic anymore?
- More education to come as that all starts to happen.

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## Basic Considerations When Outpatient Opens Again

- Will need to maintain social distancing guidelines
- Equipment, railings, door handles, etc. will all need to be disinfected regularly and equipment – before AND after each patient use
- Regardless of whether pts with and without COVID-19 are mixed, ANY pt with COVID-19 must be asymptomatic to ex. (time frame since symptoms TBD)
- Patients and staff will most likely have to wear masks

Q10

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## Aerobic

- Goals will be to follow traditional Pulmonary Rehab model with intensity and duration modifications as needed.
- Most likely will have higher amount of supplemental O2 need

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## Strength/Resistance

- Will focus more on adding in weights.
- Really progressing strength to re-build muscle mass.
- May start HIIT strategies by that point, but not sure yet.
- Will depend a lot on pt age, length of hospital stay, ICU stay, vent, etc.
  - Is it generalized weakness or PICS/ICUAW

## Resources (besides references)

- Academy of Acute Care – COVID-19 resources at <https://www.acutept.org/page/COVID19>
- APTA COVID-19 Resources: <http://www.apta.org/Coronavirus/>
- Cardiovascular and Pulmonary Section of APTA – COVID-19 resources at <http://cardiopt.org/resources-covid-19.php>.
- CDC COVID-19 website: <https://www.cdc.gov/coronavirus/2019-nCoV/index.html>
- COVID-19 Resources: Public Google doc curated by Kyle Ridgeway  
<https://docs.google.com/document/d/16UrBoE0YLikWaXgdUpmO01oO2NTo5fr-qkN3EyDvr0/edit?ts=5e751903#heading=h.phszscnq02r7>.

CONTINUED

## Resources Cont'd

- Geriatric Academy - COVID-19 resources at <https://geriatricspt.org/practice/covid-19.cfm>
  - Includes a delirium fact sheet
- Home Health Section of APTA – COVID-19 resources at <https://aptahhs.memberclicks.net/coronavirus--information-for-providers>
- PACER Project lectures (Post-Acute COVID-19 EXercise & REhabilitation)  
<https://www.youtube.com/channel/UCJR0p2186h3OYPfnavqjfHQ/videos> Not all there yet. Will be 15-17 in total.

CONTINUED

## Questions

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