

**20th** Memorial Education Forum

## COVID-19 Pandemic in the Clinical Environment

Implications for Long-term and Short-term Oxygen Therapy



#### **Objectives**



- Pathophysiology of COVID-19
  - Early Presentation
  - Phases of COVID-19 Disease: the 4-phase perspective
  - Current Environment in deciding an end to the infection
- Patient Discharge Planning: Key Contacts for Planning
  - What is Recovery?
  - What does Recovery look like, perspective of the long haulers?
  - How is oxygen delivery, pulse vs. continuous, affected by the Recovery Stage
- Impact on Chronic Illnesses
  - COPD
  - CHF
  - Cancer

#### **SARS-COV-2 Infection: Four Phases of Illness**

## Illness is More than Being Exposed to SARS-COV-2



#### **Falling viral load**

In an analysis of 708 nasal swabs from hospitalized patients with covid-19, researchers found that there was a progressive decline from March to June in the percentage with a high viral load.



#### **CATCHING COVID-19**

Different types of COVID-19 test can detect the presence of the SARS-CoV-2 virus or the body's response to infection. The probability of a positive result varies with each test before and after symptoms appear.

- PCR-based tests can detect small amounts of viral genetic material, so a test can be positive long after a person stops being infectious.
- Rapid antigen tests detect the presence of viral proteins and can return positive results when a person is most infectious.
- **Antibody tests** detect the body's immune response to the virus and are not effective at the earliest phase of infection.



#### The Immune Response Battle





#### Phase 1: Viral Injury









#### Phase 2: Sequelae of Acute Infection





- V/Q Mismatch (low)
- Shunt Physiology (right to left)
- Diffusion Abnormality (edema)
- Hypoperfusion

#### The Result of COVID-19 Viral Illness





- Endothelitis
- Pulmonary Embolism
- Acute Respiratory
  Distress Syndrome
- Ventilator Dependent Respiratory Failure

#### Phase 3: Prolonged Hospitalization





#### Risk for Prolonged Hospitalization/ Mortality



![](_page_11_Figure_2.jpeg)

![](_page_11_Figure_3.jpeg)

#### Phase 4: Recovery

![](_page_12_Picture_1.jpeg)

- 33 million have been infected Globally
- 25 million are somewhere on the continuum of recovery from the infection
- Limited recovery information due to variable definitions of what recovery means
  - US (NYC) 45% of severely ill patients recovered to discharge home (from acute care)
  - UK 49% of hospitalized patients recovered to discharge home (from acute care)
- The CDC considers a patients recovered 3 days after fevers and other symptoms end and a negative repeat test for the virus (how many negative tests are also controversial)
- Recovery endpoints shines a light on the need to develop care plans for survivors outside the hospital

Where are the rest of the patients?

![](_page_13_Picture_1.jpeg)

![](_page_13_Picture_2.jpeg)

# Coronavirus Cases: **7,408,066**

4,860,662

Cases which had an outcome:

**4,649,827** (96%)

210,835 (4%)

Recovered / Discharged

Deaths

#### Post COVID-19 Recovery

![](_page_14_Picture_1.jpeg)

![](_page_14_Picture_2.jpeg)

- Patients who survive intubation often find themselves profoundly debilitated, experiencing weakness, memory loss, anxiety, depression, and hallucinations
- Many will suffer through months of rehabilitation in unfamiliar facilities, cared for by masked strangers, unable to receive friends or loved ones

What does the discharge patient look like at recovery?

Oxygen Prescription during a Pandemic

![](_page_16_Figure_0.jpeg)

### US Case Rates are Increasing

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![](_page_17_Figure_2.jpeg)

#### Hypoxia is the Main Cause of Morbidity and Mortality in COVID-19

![](_page_18_Picture_1.jpeg)

- There is a disparity in oxygen provision, for COVID-19 patients, between the countries in the World indicating variability, in access to supplemental oxygen, represents a modifiable factor associated with mortality during the pandemic.
- There are no prospective clinical trials relating to COVID-19 and supplemental oxygen, nor any published studies examining access to supplemental oxygen and mortality in COVID-19.
- Countries that provide better access to supplemental oxygen have a statistically significant lower mortality rates.
- The international consensus view, that improving access to supplemental oxygen, in COVID-19 pneumonia, is likely to reduce mortality
  - Only 26 countries have accessible clinical guidelines referring to target oxygen levels for the commencement of supplemental oxygen in COVID-19
    - Below 95%: Singapore, Peru, Switzerland, Ireland, Qatar and Pakistan
    - Below 94%: Saudi Arabia, Chile, Brazil, India and Russia
    - Below 93%: Portugal, Iran, Turkey, Bangladesh and Italy
    - Below 92%: Canada, Belgium, France, UK, USA and China
    - Below 91%: Germany, Mexico, Spain and Sweden

## Target Oxygen Saturation in COVID-19 Patients

- The use of supplemental oxygen in adults with COVID- 19 has not been studied
  - COVID-19 binds ACE receptors and hypoxia increases the density of ACE receptors on respiratory epithelium
  - But, supplying oxygen staves off hypoxic vasoconstriction (precapillary PulmHTN)
- Current target oxygen saturation range for patients with COVID-19 recommended by the National Institutes of Health (NIH) is **92–96%**
- Will HOT during the Pandemic worsen viral infection? Timing is of the essence.

![](_page_19_Picture_6.jpeg)

![](_page_19_Figure_7.jpeg)

#### Silent Hypoxia is Prominent at Discharge

![](_page_20_Picture_1.jpeg)

![](_page_20_Picture_2.jpeg)

![](_page_20_Figure_3.jpeg)

Half of hospitalized COVID-19 patients without lung disease developed exercise- induced hypoxia without subjective dyspnea at the time of discharge. One third of patients who terminated the 6MWT early had PE

### JPS Health Experience:

#### Texas

![](_page_21_Picture_2.jpeg)

![](_page_21_Picture_3.jpeg)

- JPS Health Network has save 1200 patient days by initiating the JPS COVID-19 Home Monitoring Program– only 3 weeks old
- The program increased the available inpatient beds for sicker patients by 30%
- The problem was a patient's blood oxygen had to be 88 percent or lower to get their oxygen paid for by insurance- standard of care currently
- JPS finance team worked with oxygen vendors and insurers to come up with a plan helping all the contributors more efficiently and effectively help patients
  - The plan allowed saturations to 94%

#### LACK OF OXYGEN CONCENTRATORS DELAYS DISCHARGE

Hospitals are having difficulty discharging COVID-19 patients due to a shortage in oxygen concentrators, preventing hospitals from freeing up beds for incoming patients.

Doctors Hospital at Renaissance is a Hospital in Edinburg, TX. A 77 bed facility near McAllen, Tx.

## Without direction, where do we go from here?

![](_page_23_Picture_1.jpeg)

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![](_page_23_Picture_3.jpeg)

- Without adequate discharge criteria, there is no standardized prescription recommendations for home oxygen therapy.
- Without adequate patient information, there is no population to approach, to ensure safe discharge environment.
- Without adequate definition of recovery, there is no time course to assist prediction on home oxygen therapy needs.

#### **Determine Eligibility**

![](_page_24_Picture_1.jpeg)

and reassessment

The following SpO2 < 93% flowchart is applicable to people with At rest: or . asymptomatic or . Ambulatory for at least 1 min mildly symptomatic COVID-19 diagnosis. SpO<sub>2</sub> unstable/ SpO<sub>2</sub> stable With oxygen fluctuating (LFNC) Monitor SpO<sub>2</sub> trend. Titration of O<sub>2</sub> **Eligible for** Monitor ABG/CBG trend in STOT Ideally monitor ABG after each patients with previous change history of, or potential for Alternatively monitor SpO<sub>2</sub> ± CBG type 2 respiratory failure Titration in 1 L/min increments (e.g. COPD, OSA) **Clinically Stable for continuous 48 Clinically Unstable** hours\* Any one of  $SpO_2 \ge 93\%$  with oxygen (LFNC) . ٠ SpO<sub>2</sub> < 93% with oxygen Desaturation on trialling down-Respiratory acidosis . titration. Worsening hypercapnia (PaCO<sub>2</sub> rise of >1 kPa) Consider eligibility for STOT if clinically stable for 6-12 hours in Emergency Department or clinical decision unit. **Ineligible for** \* = admitted patients ready STOT for discharge or longer period to achieve stability. -Medical Optimization

Sardesai, et al.: Short Term Home Oxygen Therapy for COVID-19

#### Tele Health Follow up Flow Sheet: COVID- Hot

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![](_page_25_Figure_3.jpeg)

Clinical Parameter	Values requiring clinical risk stratification	Equipment required	Disadvantages
SpO <sub>2</sub>	< 93%	Portable (battery operated) pulse oximeter	Incorrect use; Equipment malfunction
Heart rate	< 45 beats/min > 120 beats/min	As above	As above + Rate-limiting medications explaining bradycardia; Anxiety exaggerating tachycardia
Temperature	< 35°C > 38.5°C	Thermometer	Variance; Incorrect use; Equipment malfunction
Respiratory rate	< 12 breaths/min > 20 breaths/min	Video feature	Connection issues Difficult visualization

#### COVID-HOT protocol should only be used with utmost caution ensuring patient safety at home

### CMS Guidelines During Pandemic

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- Centers for Medicare and Medicaid Services (CMS) has waived all requirements for in-person testing and signature at delivery for supplemental oxygen during the COVID-19 pandemic
- It should be noted that Public Health Emergency (PHE) does not confer changes to the clinical indications of coverage for any LCD or NCD, unless specifically indicated
- CMS will not enforce the clinical indications for coverage across respiratory NCDs and LCDs (including articles) allowing for maximum flexibility for practitioners to care for their patients
  - The new indications include items such as:
    - NCD 240.2 Home Oxygen/ LCD L338000 respiratory assist devices,
    - NCD 240.5 Intrapulmonary Percussive Ventilator/ LCD L33797 Oxygen and Oxygen equipment.

Collaboration is the Key

![](_page_27_Picture_1.jpeg)

From Case Management, to the medical staff, to third-party vendors, this is something that required a real team effort. Collaboration and coming together for a good cause, it's what we do best.

#### Chronic Illness Management

The Foundations are speaking

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#### COPD Foundation: COVID-19 perspective

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- The Foundation Asked Clinicians: "Assuming clinical stability and limited available hospital beds, which of the following would you consider the strongest criterion for planning a COVID-19 patient's hospital discharge?"
  - Fifty percent of respondents relied on a resting room air oxygen saturation of at least 92% to support hospital discharge
  - Given the lack of evidence, most participants erred on the side of following existing treatment recommendations
- SARS-CoV-2 pneumonia, lung function in COPD patients can deteriorate rapidly leading to respiratory failure and hospitalization
  - After 6 to 7 days of infection, rapid deterioration of lung function may occur.

#### Pulmonary Fibrosis Foundation

![](_page_30_Picture_1.jpeg)

- People who have chronic medical issues may be at higher risk for serious illness from COVID-19 and it remains unclear how fibrosis will be affected
- Based on the limited information of how COVID will affect chronic fibrosis lung diseases, the foundation has leaned on their prior home oxygen use recommendations

#### Pulmonary Hypertension Association

![](_page_31_Picture_1.jpeg)

- The PHA has supported patient self management as their recommendations
- The association stresses patients should:
  - Know their oxygen saturation ranges
  - If saturations fall to below these normal ranges, patients should evaluate their symptoms
    - Dizziness
    - Light Headedness
    - Headache
    - Cyanosis
    - Exuberant shortness of breath
  - If there are any symptoms at the lower oxygen saturation ranges, this indicates an emergency situation

#### Conclusion

![](_page_32_Picture_1.jpeg)

- The disparity in oxygen provision for COVID-19 patients indicates such access to supplemental oxygen may represent a modifiable factor for discharging patients
- There is a lingering diffusion defect in patients recovering from COVID-19 and this remains present for weeks after discharge
- As with all home oxygen patients, measurement with activity is crucial to the full prescription completeness
- Any saturation that falls below 90%, should prompt titration of therapy to maintain peripheral saturations above this threshold
- Consider strong collaboration with local insurers, hospital case managers, and DME suppliers following best practices during this Pandemic