The Evolving Face of COVID 19

COVID-19 Panel

University Hospitals
Cleveland | Ohio

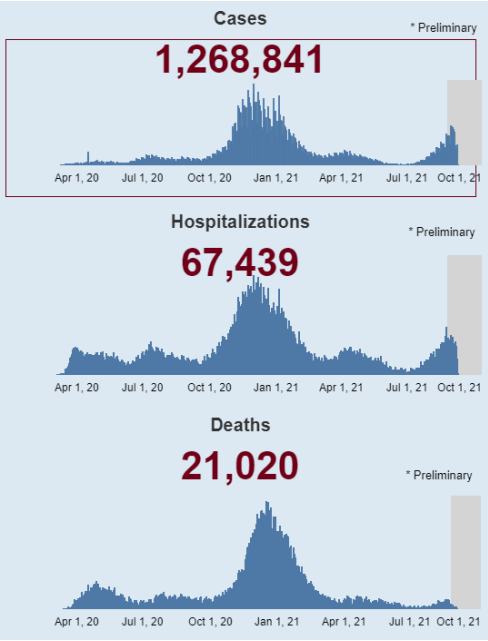
Objectives

- Describe the factors affecting epidemiology of COVID-19 regionally and locally.
- Discuss antiviral treatment approaches to COVID-19 and challenges to reaching the goal of Zero Harm.
- Discuss current trends related to monitoring respiratory failure and the treatment of coagulopathy in COVID-19.
- Discuss the multiple late sequelae and therapeutic interventions of COVID-19.

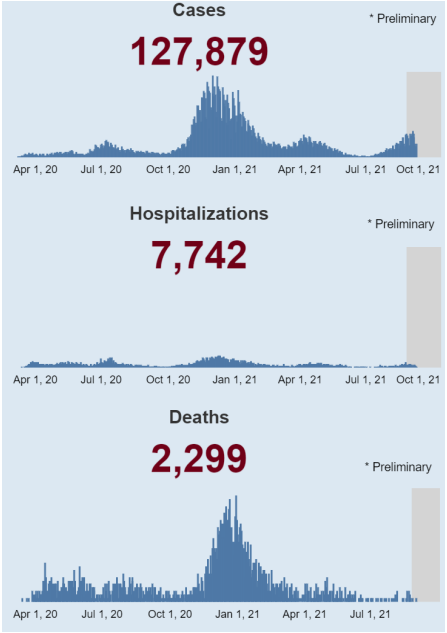
Patient Presentation, Part 1

- 53-year-old female presents to the Emergency Department in spring 2020 with a 2-day history of dry cough
- Additional symptoms include fatigue and loss of appetite
- Past medical history includes hypertension and morbid obesity
- Works full-time at the post office

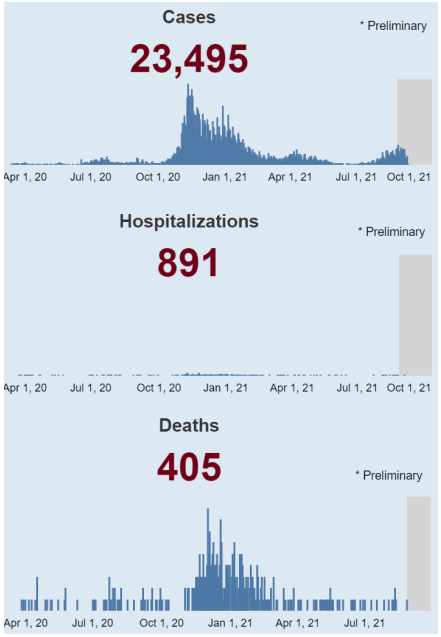
Ohio



Cuyahoga

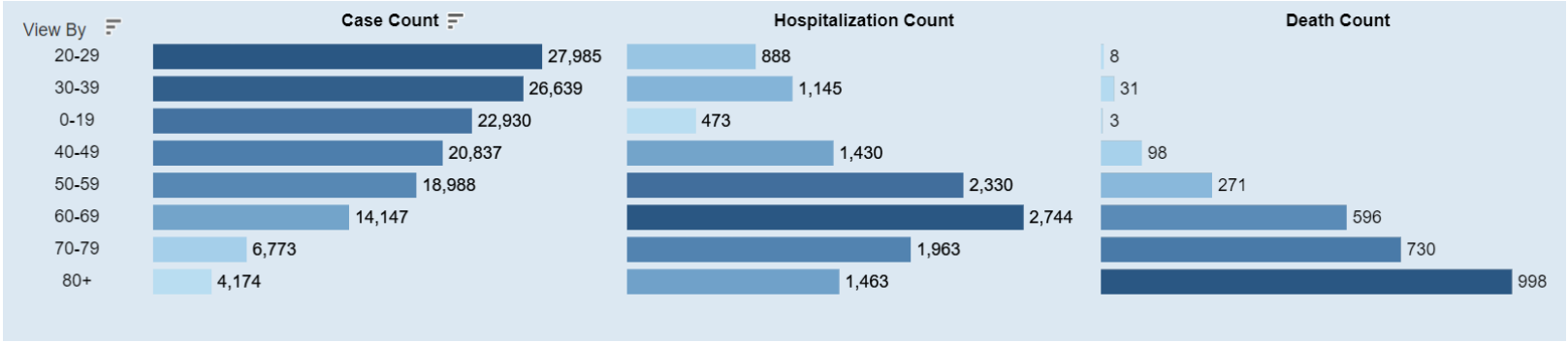


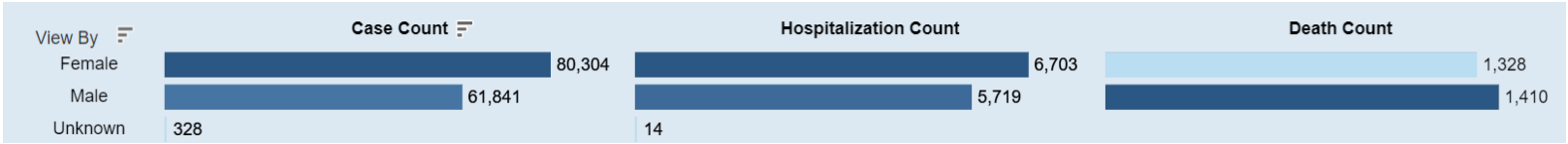
Lake



coronavirus.ohio.gov

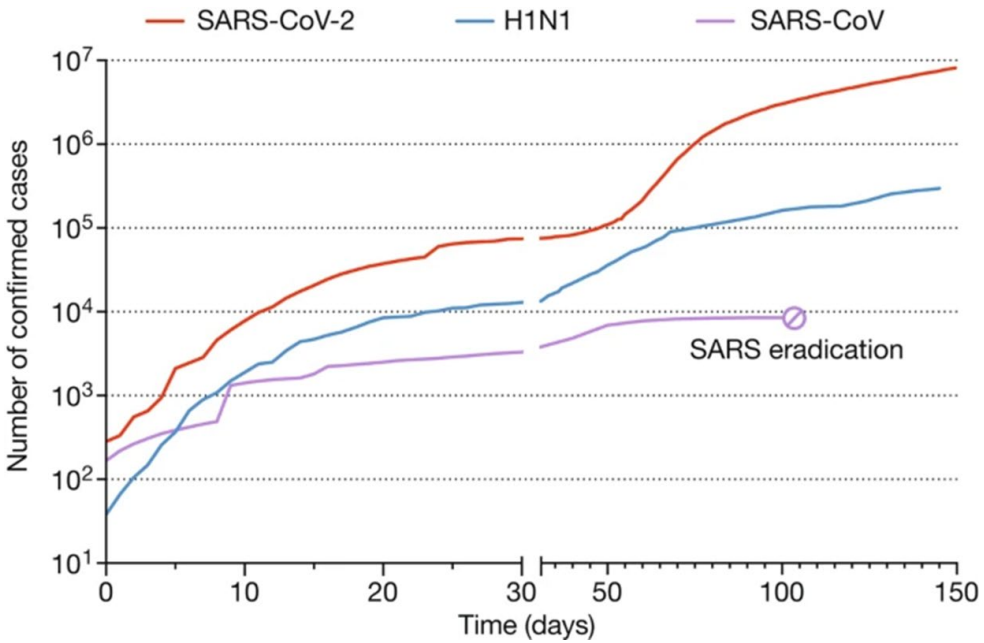
COVID-19 in Ohio





coronavirus.ohio.gov

When will this end?



Telenti A et al. After the pandemic: perspectives on the future trajectory of COVID-19. Nature. 2021

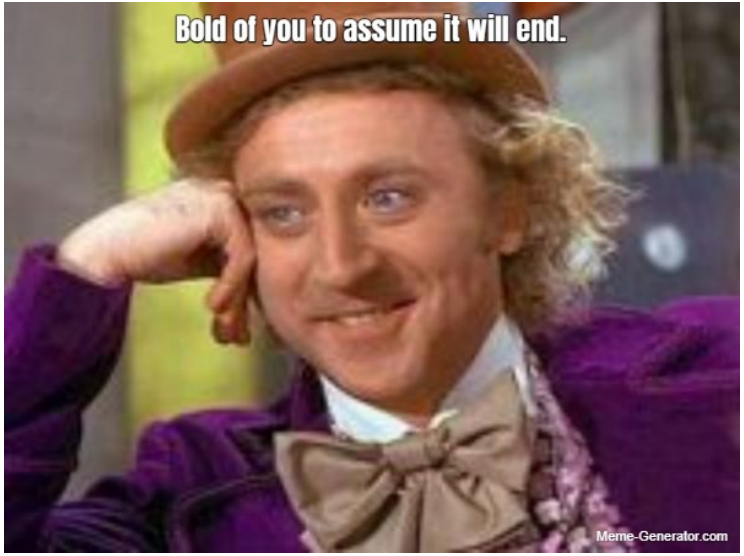
Can SARS-CoV-2 be eradicated?

- Many obstacles:
- Patchy vaccine coverage due to disparities in global access to vaccines and vaccine hesitancy.
- Vaccines may not always block virus transmission (despite reducing the burden of disease).
- Future depends on dynamic interactions between changes in population immunity and ongoing viral evolution and immune escape.

Telenti A et al. After the pandemic: perspectives on the future trajectory of COVID-19. Nature. 2021

When will this end?

- We don’t know whether it will end.
- Better question: what is the future of COVID-19?
- Three possible scenarios.



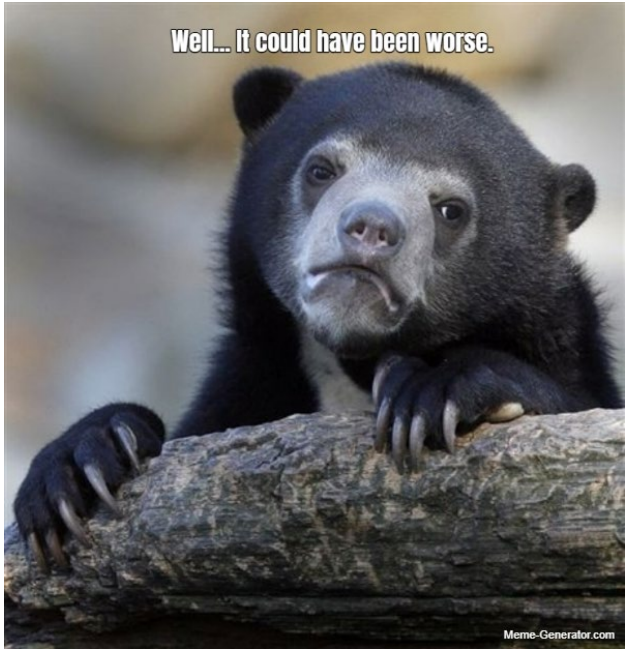
Pandemic forever

- No rapid control of this pandemic.
- Ongoing manifestations of severe disease combined with high levels of infection.
- Evolution of the virus.
- How to avoid that?
  - Long-term herd immunity thru very broad application of vaccines worldwide
  - Comprehensive disease surveillance by accurate and readily available diagnostic assays or devices.

Telenti A et al. After the pandemic: perspectives on the future trajectory of COVID-19. Nature. 2021

Epidemic seasonal disease

- Transition similar to influenza.
- Effective therapies that prevent progression of COVID-19 disease may bring the burden of SARS-CoV-2 infection to levels that are equivalent or even lower than influenza.
- Is that okay?
  - In non-pandemic years, influenza causes 250,000-650,000 deaths globally (two thirds among people who are 65 years and older).
  - Relatively ‘optimistic’ view of the future of the COVID-19 pandemic.



Telenti A et al. After the pandemic: perspectives on the future trajectory of COVID-19. Nature. 2021

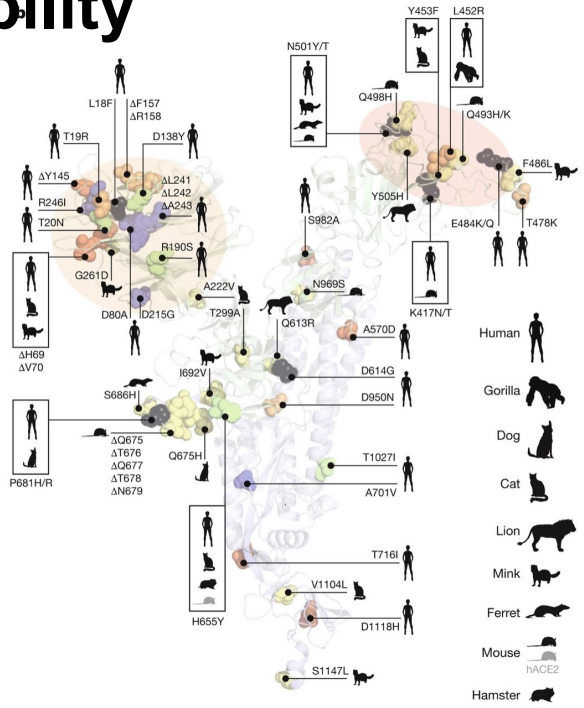
Endemic disease

- Enough people will gain immune protection from vaccination and from natural infection.
- Childhood illness with cold season peaks, less hospitalization and death.
- Similar other human coronavirus infections (example, OC43 that arguably started as a similar pandemic in 1889).
- SARS-CoV2 appears to be more virulent than another human coronaviruses.
- Further adaptations of SARS-CoV-2 to humans may increase or decrease its intrinsic virulence.
- This requires more widespread population immunity, fewer susceptible hosts.

Telenti A et al. After the pandemic: perspectives on the future trajectory of COVID-19. Nature. 2021

Future of SARS-CoV-2 transmissibility

- High rate of viral RNA recombination within SARS-CoV2, and possibly with other human or animal coronaviruses.
- The virus was reasonably expected to develop increased transmissibility, reflecting adaptations to propagation in the new human host.
- SARS-CoV-2 has shown an unprecedented capacity to evolve global variants that outcompete regional variants in extremely short time windows and before considerable selective pressure owing to pre-existing immunity.
- There is a risk of viral diversification in the currently uncontrolled or incompletely controlled pandemic in many regions of the world.



Telenti A et al. After the pandemic: perspectives on the future trajectory of COVID-19. Nature. 2021

Future of SARS-CoV-2 virulence

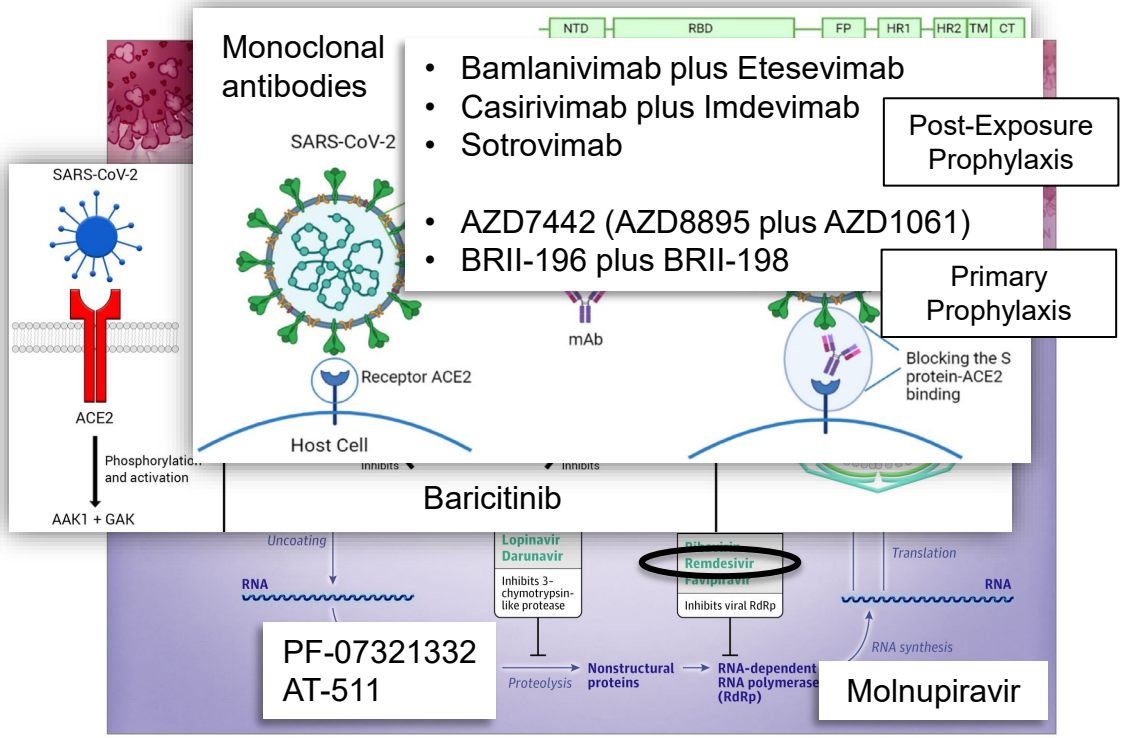
- Virulence is not necessarily a selectable phenotypic trait that increases the fitness of the virus → change in virulence is not predictable.
- The severity of disease caused by SARS-CoV-2 is bound to decrease with increasing population immunity.
- Pre-existing immunity is likely to reduce the severity of symptoms after infection, and to prevent future severe pandemics arising from antigenically related coronaviruses that are circulating in bats and other possible animal reservoirs.
- Nevertheless, the evolution of the virus to the low level of virulence seen in common-cold coronaviruses may not occur or may take several decades to manifest.

Patient Presentation, Part 2

- In the Emergency Department, she was febrile and hypoxic
- Chest x-ray was consistent with multifocal pneumonia
- Hypoxia improved with 4 L of oxygen via nasal cannula
- She was admitted to a general medical floor
- COVID-19 PCR test later returned positive

Antiviral Treatment Approaches for COVID-19

- Viral replication
  - RNA-dependent RNA polymerase
  - Proteolysis
- Cell entry
  - Spike protein
  - ACE2 receptor
  - TMPRSS2
  - Endocytosis
- Neutralization



Sanders JM et al. JAMA 2020, Torrente A et al. Vaccines 2021, Jorgensen et al. Pharmacotherapy 2020

Current COVID-19 Therapeutics Summary

Recommended	Not Recommended
• Remdesivir • Monoclonal antibodies • Baricitinib • Dexamethasone • Tocilizumab	• Convalescent plasma • Hydroxychloroquine/chloroquine • Lopinavir plus ritonavir • Ivermectin • Famotidine • Nitazoxanide • Bamlanivimab monotherapy

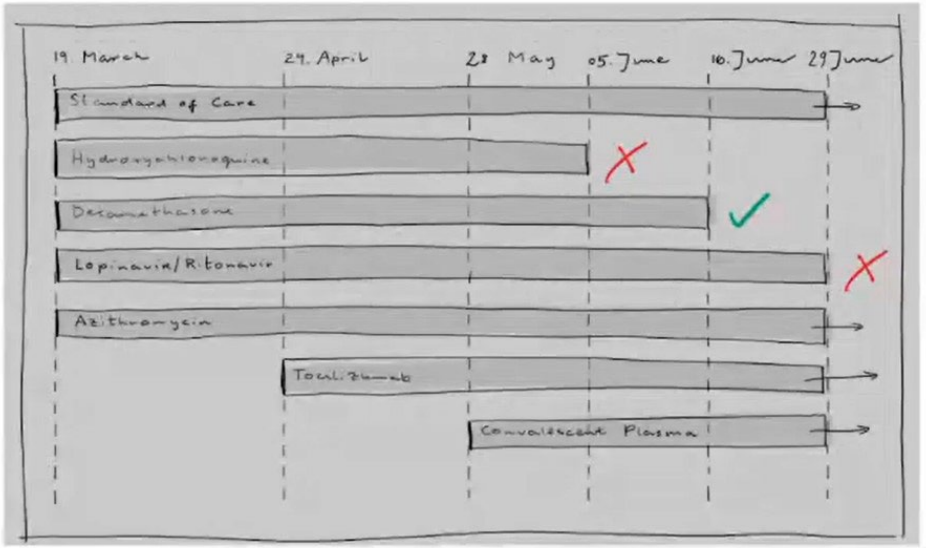
COVID-19 Therapeutics – September 2021

Agent	FDA	NIH	IDSA	WHO
Remdesivir	✓	✓	✓	
Monoclonal antibodies	✓	✓	✓	-
Convalescent plasma	✓			-
Hydroxychloroquine				
Protease inhibitors	-			
Dexamethasone	-	✓	✓	✓
Baricitinib (JAK inhibitor)	✓	✓	✓	-
Tocilizumab (IL-6R inhibitor)	✓	✓	✓	✓
Anakinra (IL-1R1 inhibitor)	-		-	-
Ivermectin				

✓ Recommend under certain conditions Recommend against Insufficient data - No recommendation

The Challenge of COVID-19 Clinical Trials

- Investigators similarly dealt with emerging data
- Adapted traditional approaches
  - Studied agents concurrently
  - Adaptive platforms
  - Merging trial phases
- Data safety monitoring board
- Communication

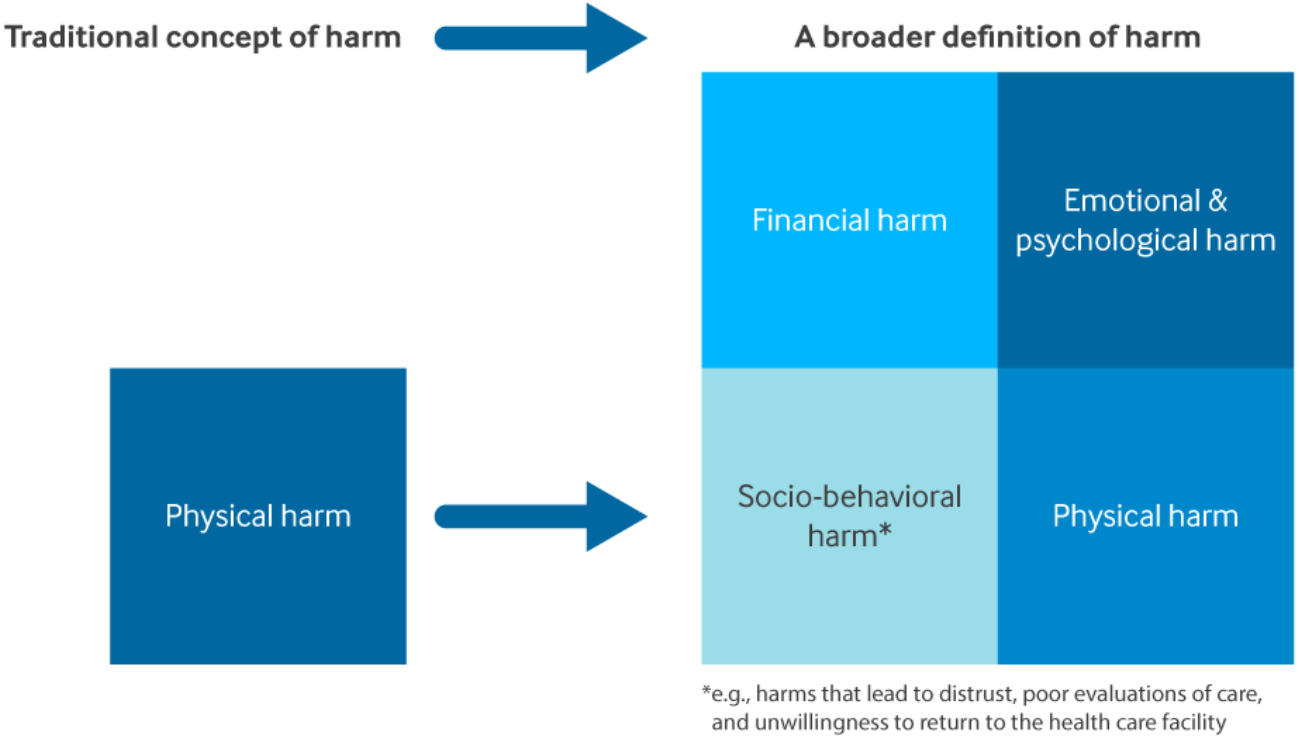


Risks and Benefits of Treatment without Evidence

- Potential devastating consequences of disease
- Pressure to offer help as a provider

- Treatment may lead to worse outcome than no treatment
- Potential of jeopardizing patient trust

First, Do No Harm



Gandhi TK, Feeley D, Schummers D. NEJM Catalyst 2020

Strategies for Attainment of Zero Harm

1. Commit to the goal of zero harm.
2. Become more patient-centric.
3. Recognize the interdependency of safety, quality, and patient-centricity.
4. Adopt good data and analytics.
5. Transform culture and leadership.
6. Focus on accountability and execution.

Clapper C, Merlino J, Stockmeier C. *Zero Harm*. McGraw-Hill, 2018.

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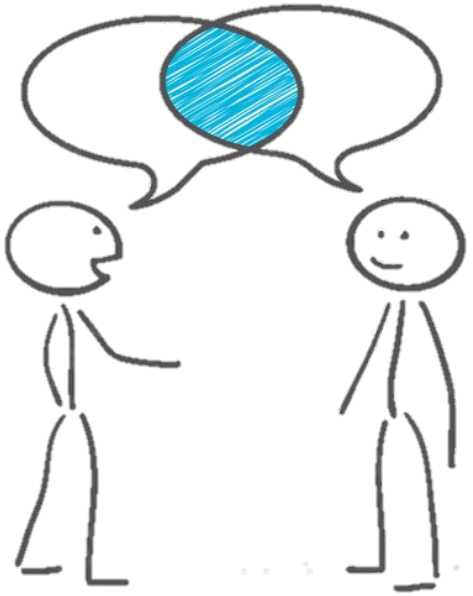
Clapper C, Merlino J, Stockmeier C. *Zero Harm*. McGraw-Hill, 2018.

Provider Responsibilities for Investigational Treatment

- Assess the patient's individual clinical situation
  - Available alternatives
  - Potential risks versus benefits
  - Eligibility for clinical trials
- Appropriately advise the patient
  - Effectiveness not yet demonstrated
  - Potential unknown risks
  - Alternative options, including no treatment

Communication Strategies

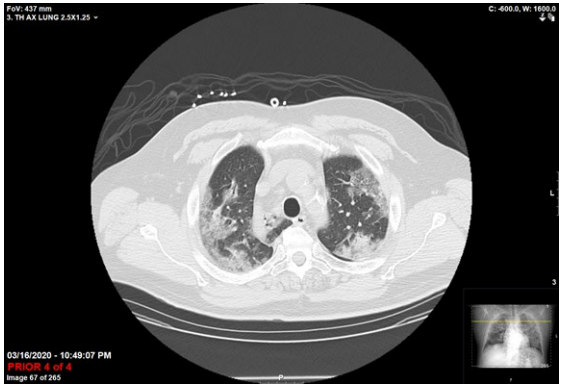
- Be honest, transparent, and clear
- Engage in shared decision-making
- Enable community participation

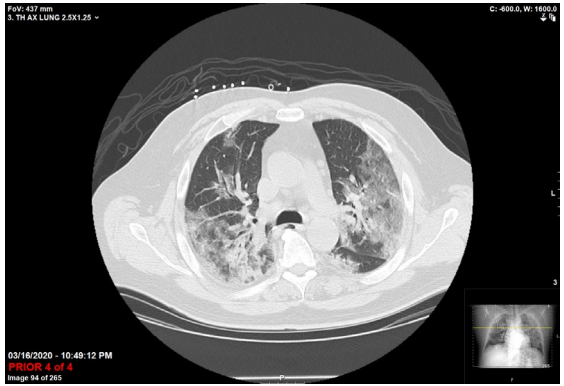


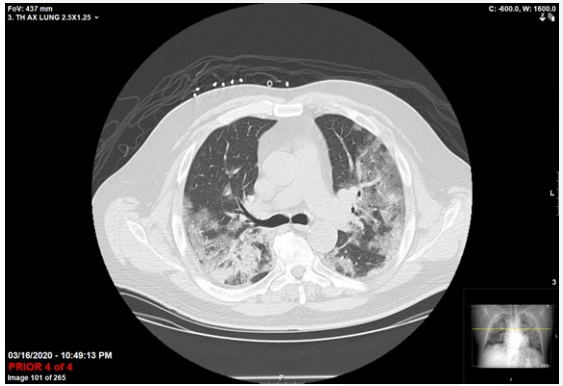
Thomas J. “Communicate with the Public.” Pandemic Ethics Dashboard, UNC School of Public Health.

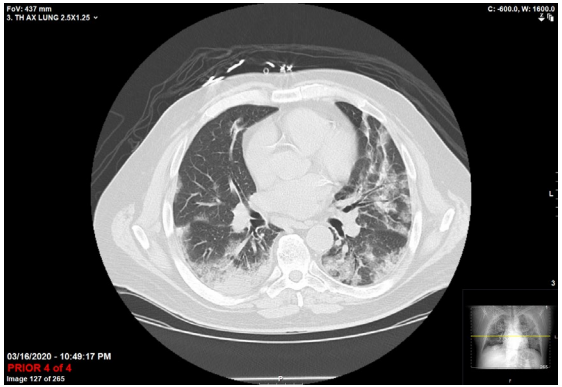
Patient Presentation, Part 3

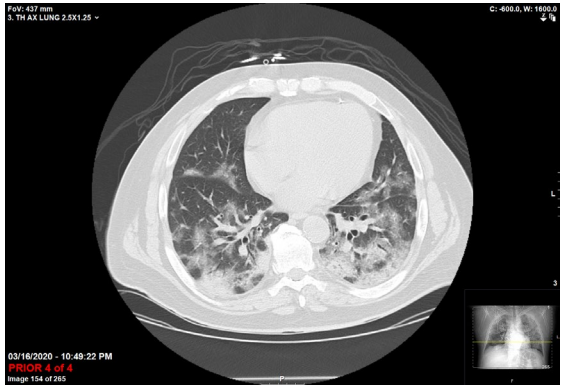
- Hydroxychloroquine and azithromycin were initially started
- Also treated with ceftriaxone for community-acquired bacterial pneumonia
- Patient enrolled in the remdesivir clinical trial and was randomized to receive 10 days of treatment
- Subsequently became more hypoxic and required transfer to the intensive care unit for closer monitoring

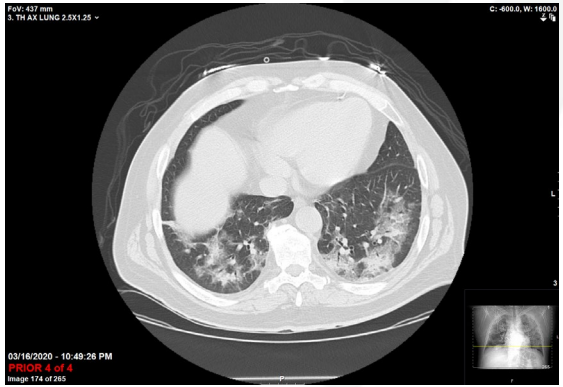












Patchy dense ground glass opacifications in both lung fields

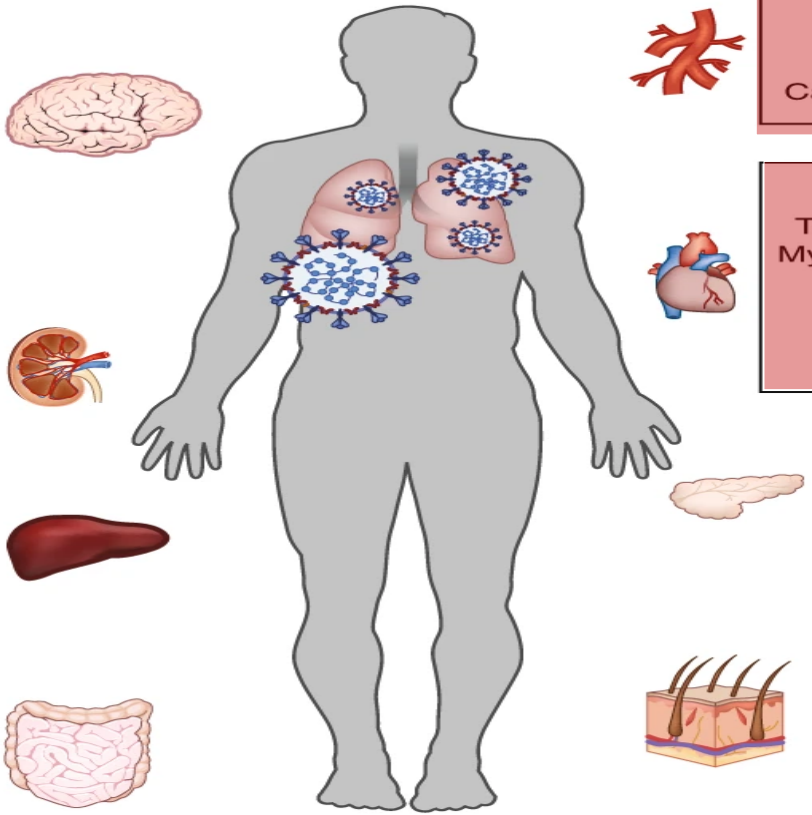
Extrapulmonary Manifestations

Neurologic
Headaches
Dizziness
Encephalopathy
Guillain-Barré
Ageusia
Myalgia
Anosmia
Stroke

Renal
Acute kidney injury
Proteinuria
Hematuria

Hepatic
Elevated aminotransferases
Elevated bilirubin

Gastrointestinal
Diarrhea
Nausea/vomiting
Abdominal pain
Anorexia



Thromboembolism
Deep vein thrombosis
Pulmonary embolism
Catheter-related thrombosis

Cardiac
Takotsubo cardiomyopathy
Myocardial injury/myocarditis
Cardiac arrhythmias
Cardiogenic shock
Myocardial ischemia
Acute cor pulmonale

Endocrine
Hyperglycemia
Diabetic ketoacidosis

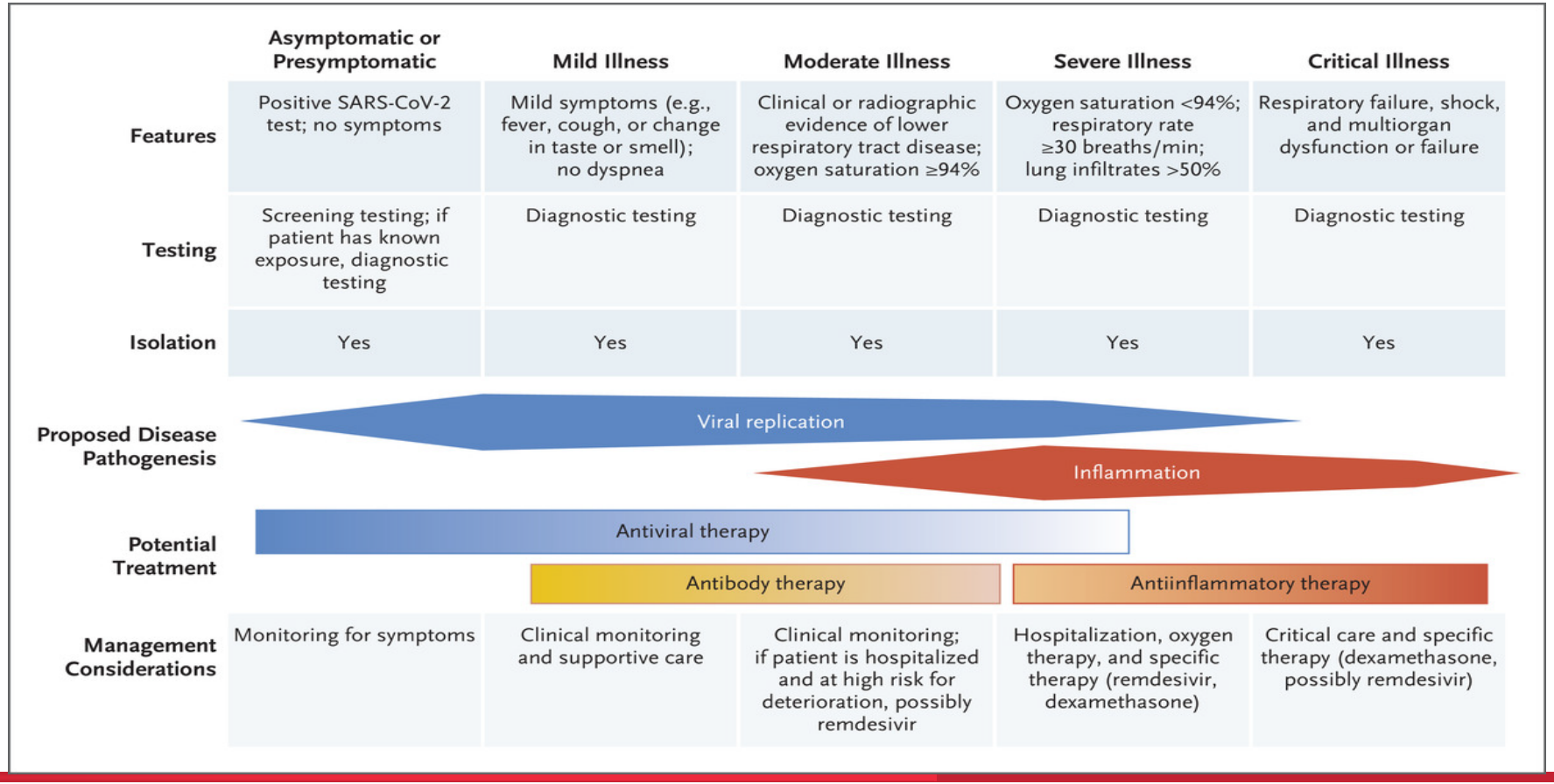
Dermatological
Petechaie
Livedo reticularis
Erythematous rash
Urticaria
Vesicles
Pernio-like lesions

Gupta. Nat Med. 2020;26:1017.

Poor Prognostic Laboratory Data

	Value		Value
WBC	> 10,000 cells/ µL	**ALT**	> 40 U / L
Lymphopenia	< 1000 cells / µL	**LDH**	> 245 U / dL
Thrombocytopenia	< 150,000 / µL	**Ferritin**	> 300 µg / L
Creatinine	> 1.5 mg / dL	**D-Dimer**	> 1000 ng / ml
CK	> 185 U / L	**IL-6**	> 10 pg / mL
Hs Troponin	> 20 ng / L	**Procalcitonin**	> 0.5 ng / mL

Characteristics, Diagnosis, and Management of Covid-19 According to Disease Stage or Severity.



ICU Management

Intensive Support

Oxygen therapy
NIV
MV – lung protection
Sedation
Paralysis
Prone position
Inhaled Epoprostenol
Inhaled NO
ECMO
Attention to other organ dysfunction

Immunomodulators

Corticosteroids (dexamethasone)
~~IL-1 inhibitors (anakinra)~~
IL-6 inhibitors (tocilizumab)
~~Intravenous immunoglobulin~~
JAK inhibitors (baricitinib)

Anticoagulation

Prophylaxis
Therapeutic

Clinical Research

Clinical trials focusing on therapeutics

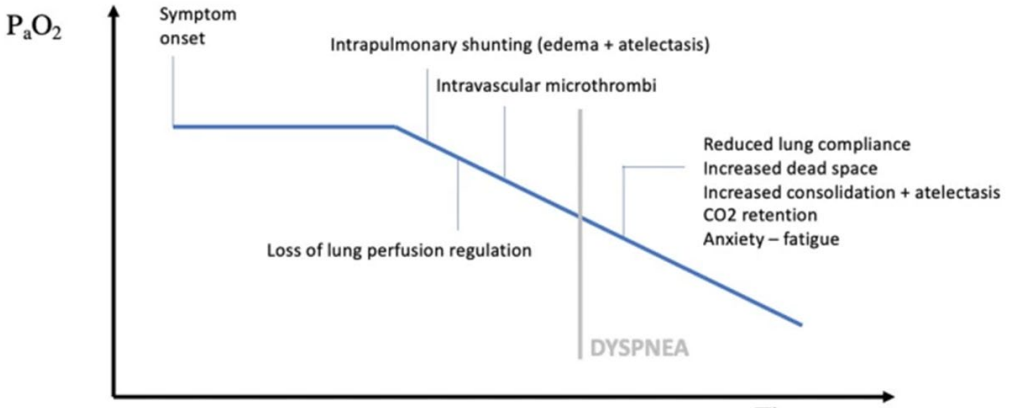
Palliative

Communication
End of Life Care

ICU Management

Intensive Support

- Oxygen therapy
- NIV
- MV – lung protection
- Sedation
- Paralysis
- Prone position
- Inhaled Epoprostenol
- Inhaled NO
- ECMO
- Attention to detail
  - Hemodynamics
  - Renal function
  - Thrombosis



$$\frac{SpO_2 / FiO_2}{\text{Respiratory Rate}} = \text{ROX index}$$

In the example above, the resulting score of 4.48 is greater than the score for predicted failure at 6 hours (3.47 as shown in the ROX Score table right). Therefore, continued NHF treatment should be considered.

ROX score margin for failure over time

Time Point (Hours of NHF use)	ROX Score	Positive Predictive Value %
2 hours	< 2.85	98
6 hours	**< 3.47**	98–99
12 hours	< 3.85	99
> 12 hours	< 4.88	80

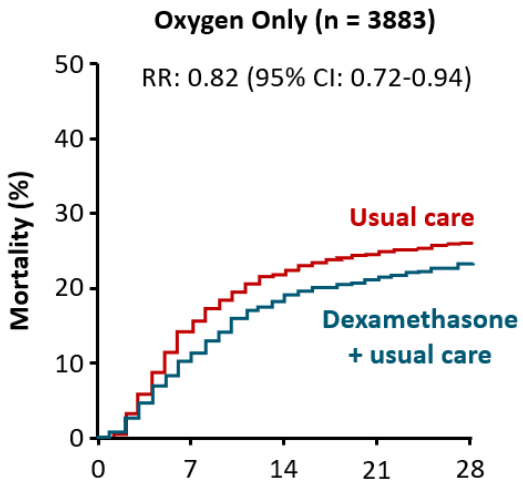
Roca O, Am J Respir Crit Care Med. 2018 Dec 21

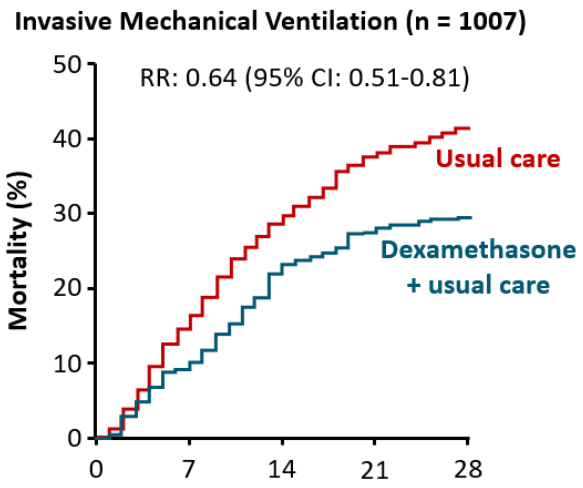
Failure of Noninvasive Ventilation

In patients with moderate-to-severe hypoxemia, the expired tidal volume above 9.5 mL/kg predicted body weight accurately predicts noninvasive ventilation failure

Critical Care Medicine: February 2016 - Volume 44 - Issue 2 - p 282-290

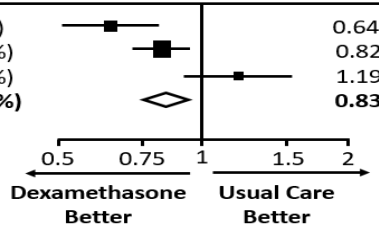
RECOVERY Trial: Mortality in Patients on Oxygen or Mechanical Ventilation ± Dexamethasone





Respiratory Support at Randomization	Dexamethasone + Usual Care	Usual Care Only	28-Day Mortality RR (95% CI)	*P* Value
Invasive mechanical ventilation	95/324 (29.3%)	283/683 (41.4%)	0.64 (0.51-0.81)	
Oxygen only	298/1279 (23.3%)	682/2604 (26.2%)	0.82 (0.72-0.94)	
No oxygen received	89/501 (17.8%)	145/1034 (14.0%)	1.19 (0.91-1.55)	
All patients	**482/2104 (22.9%)**	**1110/4321 (25.7%)**	**0.83 (0.75-0.93)**	**< .001**

Chi-square trend across 3 categories: 11.5

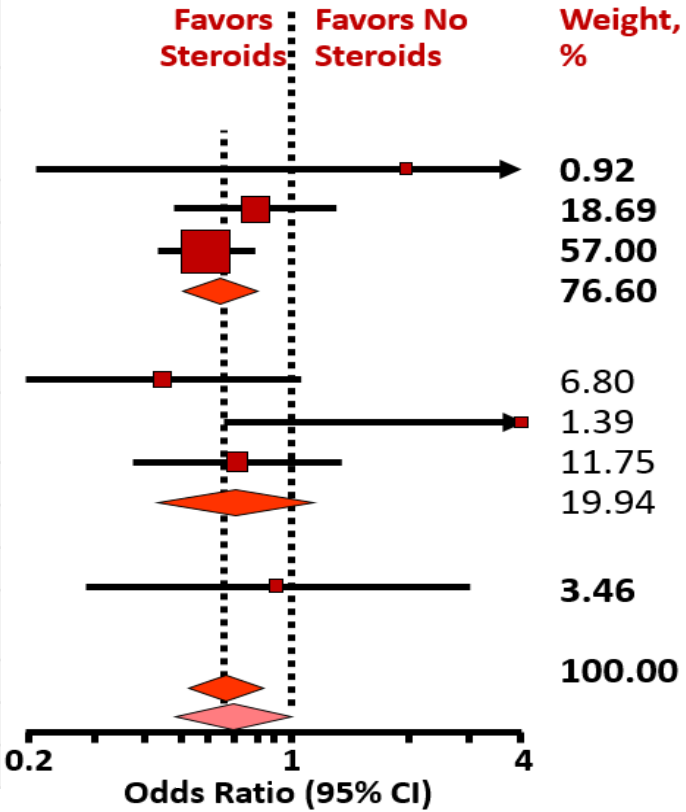


RECOVERY Collaborative Group. NEJM. 2021;384:693.

Systemic Corticosteroids and 28-Day All-Cause Mortality in Critically Ill Patients with COVID-19

Drug/Trial	Initial Dose	Deaths/n		Odds Ratio (95% CI)	*P* Value
		Steroids	No Steroids		
Dexamethasone					
DEXA-COVID 19	High: 20 mg/day IV	2/7	2/12	2.00 (0.21-18.69)	
CoDEX	High: 20 mg/day IV	69/128	76/128	0.80 (0.49-1.31)	
RECOVERY	Low: 6 mg/day PO or IV	95/324	283/683	0.59 (0.44-0.78)	
Subgroup fixed effect		166/459	361/823	0.64 (0.50-0.82)	< .001
Hydrocortisone					
CAPE COVID	Low: 200 mg/day IV	11/75	20/73		
COVID STEROID	Low: 200 mg/day IV	6/15	2/14		
REMAP-COVID	Low: 50 mg every 6 hrs IV	26/105	29/92		
Subgroup fixed effect		43/195	51/179	0.69 (0.43-1.12)	.13
Methylprednisolone					
Steroids-SARI	High: 40 mg every 12 hrs IV	13/24	13/23	0.91 (0.29-2.87)	.87
Overall*					
Overall (fixed effects)		222/678	425/1025	0.66 (0.53-0.82)	< .001
Overall (random effects)		222/678	425/1025	0.70 (0.48-1.01)	.053

**P* = .31 for heterogeneity; I^2 = 15.6%.



WHO REACT Working Group. JAMA. 2020;324:1330.

Tocilizumab

COVACTA	REMCAP	RECOVERY
~400 patients	~800 patients	~4,000 patients
Clinical status: 1 vs 2	<24 hour ICU admission	Median time from hospitalization: 2 days
Mortality: 19.7% vs. 19.4%	Organ support free days: 10 vs 0 days	Mortality: 29% vs 33%
Infection Rate: 38.3% vs 40.6%	Mortality: 28% vs 35.8%	Mortality, MV: 47% vs 48%

Baricitinib

ACTT-2

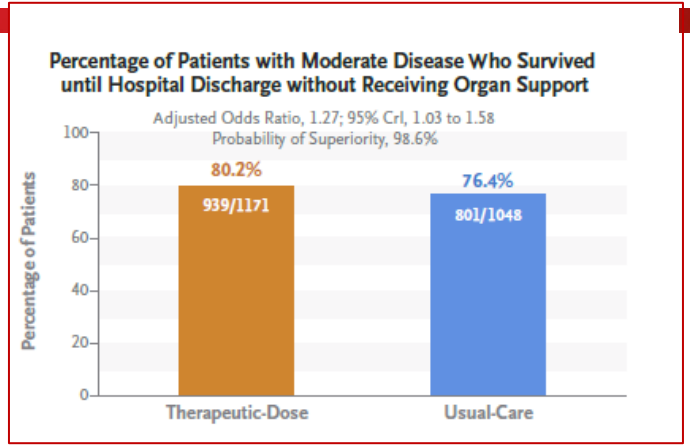
- N = 1033
- Barictinib + RDV vs RDV
- Time to recovery: 7 vs 8 days
- Mortality: 5.1% vs 7.8%
- Mortality, high flow 7.5% vs 12.9%
- Time to recovery, high flow: 10 vs 18 days

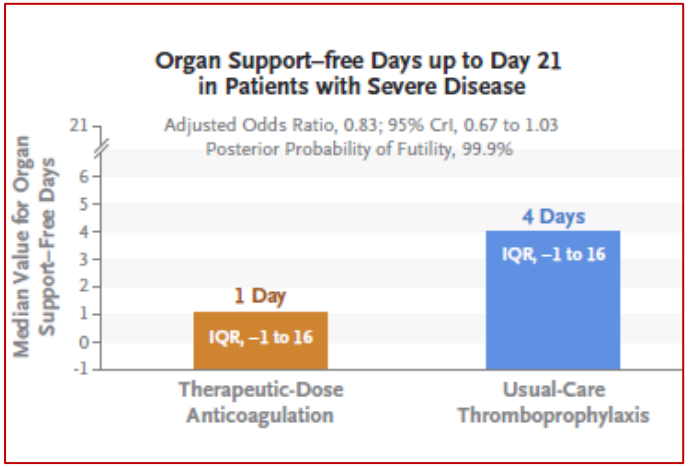
COV-BARRIER

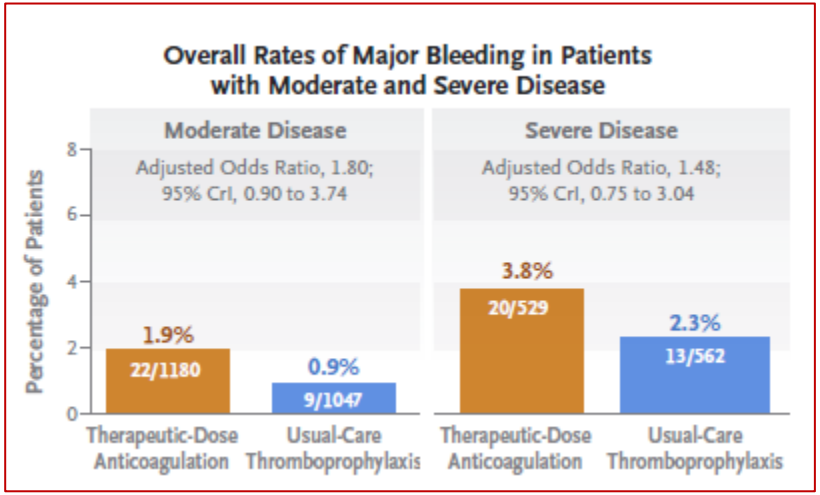
- ~1500 patients
- Baricitinib vs placebo
- 80% on corticosteroids
- Clinical progression: 27.8% vs 30.5%
- Mortality: 8% vs 13%
- Mortality, high flow: 17.5% vs 29.4%

Kalil et al. *N Engl J Med*. Dec 2020
Marconi VC et al. *Lancet Respir Med*. Sept 2021

Therapeutic Anticoagulation with Heparin in Critically Ill and Non-critically Ill Patients with Covid-19







The REMAP-CAP, ACTIV-4a, and ATTACC Investigators*N Engl J Med 2021;385:777-89.

Prophylaxis

D- Dimer ng/ml	Weight (kg)	Drug target Heparin Assay, Lovenox is 0.3 – 0.5 IU/mL
< 1000	< 100	Enoxaparin 40 mg daily
	100-150	Enoxaparin 40 mg bid
	> 150	Enoxaparin 60 mg bid

	▪ Enoxaparin should be timed for 0900 and 2100 if BID
	▪ "Heparin Assay, Lovenox" should be drawn 3.5-4 hours after the second dose, then as needed based on level and renal function
	▪ **Aim: target Lovenox assay 0.3-0.5 IU/mL**
	  ○ Adjust doses in increments of 10-20 mg depending on level and renal function
	▪ If on CRRT or HD,
	  ○ use heparin 5,000 Units Q8H when weight < 150 Kg
	  ○ use heparin 7,500 Units Q8H when weight > 150 Kg	

D- Dimer ng/ml	Weight (kg)	Drug target Lovenox or UFH levels (See Below)
1000 - 3000	< 100	Enoxaparin 40 mg bid
	100-150	Enoxaparin 80 mg bid
	> 150	Enoxaparin 120 mg bid

	For patients requiring doses ≥ 80 mg, recommend using the "Enoxaparin Therapeutic Anticoagulation" UHCare orderset for ease of ordering
	  ○ Enoxaparin should be timed for 0900 and 2100
	  ○ "Heparin Assay, Lovenox" should be drawn 3.5-4 hours after the second dose, then as needed based on level and renal function.
	  ○ **Aim: target Lovenox assayl 0.3-.0.5 IU/mL**
	  ▪ Adjust doses in increments of 10 – 20 mg depending on level and renal function
	▪ If on CRRT or HD, use Low Intensity Heparin drip as per EMR (60 Units/kg IV bolus, followe by 12 Units/kg/hr constant IV infusion). Monitor with "Heparin Assay"
	▪ **Aim: target Heparin level 0.2-0.3 IU/mL**	

D- Dimer ng/ml	Weight (kg)	Note: Lovenox & UFH Assay have different therapeutic level
> 3000	Look for VTE	

Cannot Look
Clinical Judgment
Risk : Benefit

VTE Not Diagnosed

VTE Diagnosed

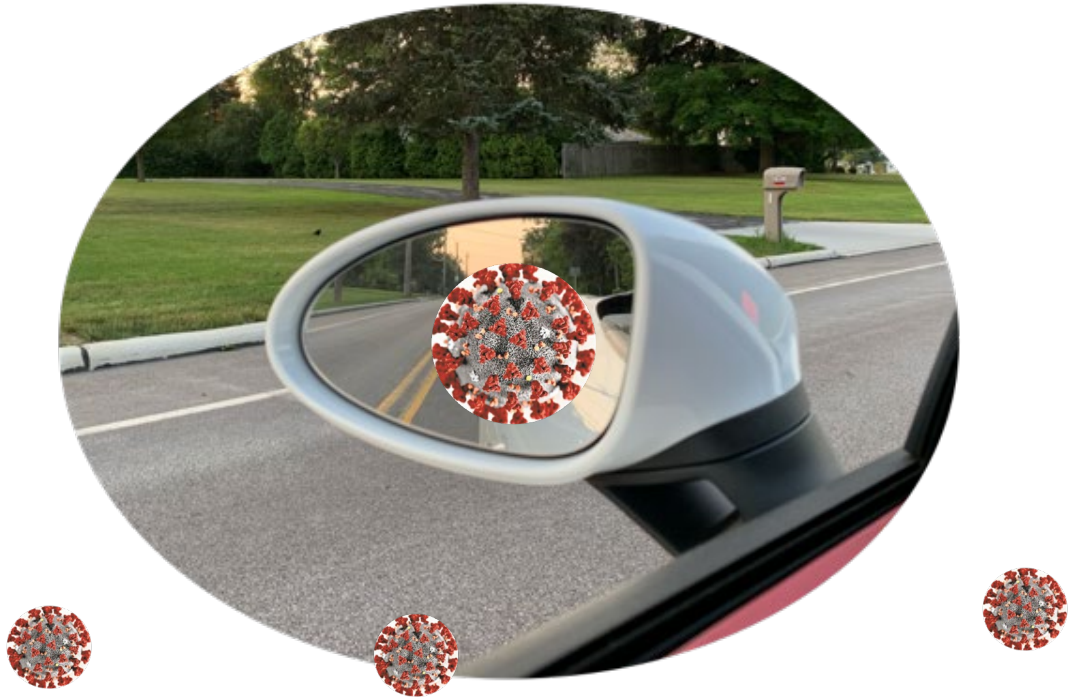
Patient Presentation, Part 4

- Completed 9 days of remdesivir
- Improved and was sent home on 2 L of oxygen on Hospital Day 12
- Continued to have fatigue at hospital follow-up 3 weeks later
- Symptoms prevented her from returning to work

The care path of COVID-19 has been treacherous

having to navigate difficult bends and curves along the way

and just when things seemed to have calmed….



The evolving face of COVID-19 sneaks up behind us

Creating challenges for providers and society, forcing GPS to suggest an alternative route

One of those challenges: the Post-acute sequelae of SARS-CoV-2 (PASC)

- **PASC** is the **research term** for the wide range of **health consequences** that are present **more than four weeks** after the **acute COVID-19 illness**.
- Patient **advocacy groups** refer to **PASC** as individuals having **long haul** manifestations or **long COVID**

Long haul/Long COVID…….origin of the names

Amy Watson

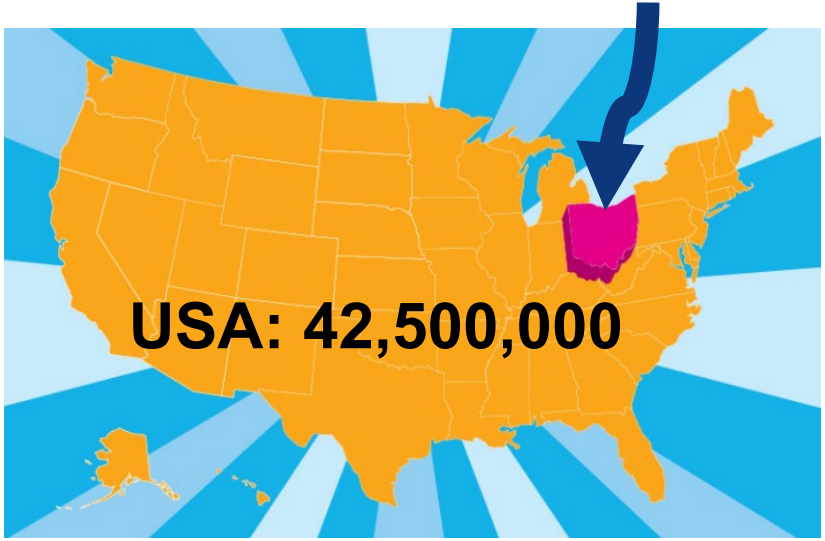
- **Amy Watson** a pre-school teacher in Portland, Oregon on March 15, 2020 became sick with COVID-19
- A month later with **persistent symptoms** and **inspired** by a picture of her wearing a **trucker's when** her **PCR testing** was **performed……**
- She started a **support group** Long Haul Covid Fighters
- **Elisa Perego** from **Lombardy Italy** in response to her prolonged illness coined the term **"Long COVID"**

Questions for you to consider regarding Long COVID (True/False)

- Long COVID generally associated only with complicated Acute COVID-19
- Risk factor generally are the same as those associated with the acute disorder
- Long COVID not a disorder of concern for younger adults, children, and those with asymptomatic infection
- Generally <10% of patients with Acute COVID will develop long haul sequelae
- Unvaccinated with long COVID may benefit from immunization
- Nearly every organ system is susceptible to the adverse effects of the disorder
- Behavioral health issues are primarily associated only with preexisting psychological disorders
- Population health concerns can potentiate long haul symptoms
- A team approach may be beneficial to the care of affected patients

Total Number of Acute COVID-19 cases*

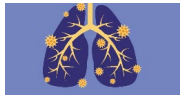
Ohio: 1,350,000



Cuyahoga County: 133,000

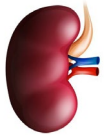
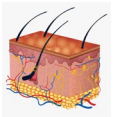
*New York Times data base

Multi-organ involvement related to long COVID







- **Fatigue**
- **Difficulty thinking/concentrating** (“brain fog”)
- **Depression and Anxiety**
- **Difficulty breathing**
- **Coughing**
- **Painful joints** or **muscles**
- **Trouble sleeping**
- **Chest pain**
- **Palpitations**
- **Dizziness on standing**
- **Headache**
- **Fever**
- **Loss of smell** or **taste**
- **alopecia**

Long COVID: risk factors

- While known **risk factors** are associated with **developing acute COVID-19** such as **obesity, hypertension, COPD** and **smoking,** definite risk factors are **unknown** for **Long COVID**
- What is known is that **long COVID** can occur in **anyone** infected with SARS-CoV-2, from **young to old** and even those who have **asymptomatic** infection
- **Potentially greater risk:** female > males; older children > younger children; >5 initial symptoms; disease severity

Prevalence of Long haul manifestations

- Fair Health White Paper looked at **claims data** of nearly **2 million patients** with SARS-CoV-2 infection for **prevalence** of post acute COVID conditions **30 days or more** after acute illness
- **23.2 %** had **at least** one post-COVID condition
- More prevalent in **hospitalized patients** approximately **50%, symptomatic patients** non hospitalized **27.5 %;** those with **asymptomatic acute infection** long haul symptoms present in **19%**

A FAIR Health White Paper June 15, 2021
a detailed study of patients with Long-Haul COVID: an analysis of private healthcare claims

One contributing factor for long COVID manifestations (among those with severe acute disease) is the Post-intensive care syndrome (PICS)

- **Constellation** of **cognitive, psychiatric, and physical signs and symptoms** newly-recognized or worsened after a **critical illness**
- Common symptoms include **weakness, poor mobility**, **poor concentration** and **difficulty with self care**
- **Anxiety symptoms** – 34 to 38 percent of patients
- **Depressive symptoms** – 29 to 32 percent
- **PTSD** – 18 to 34 percent

Hatch Critical Care 2018

Other hypothesized causes…….

- Persistent **hyper-inflammatory** response
- Ongoing **viral activity** associated with a **host reservoir**
- **Inadequate antibody** response
- **Organ damage** from **acute** infection
- Worsening of **pre-morbid conditions**
- Physical **deconditioning**

Long COVID complaints likely are potentiated by other factors resultant from the pandemic

- Adverse effects of quarantine, confinement and loneliness
- Economic hardships along with food and housing insecurities

How many are in it for the long haul?

- Within Cuyahoga County: **133,000** cases of **COVID-19**
- Assume **20%** have developed **long COVID**……..approximately **27K**
- Assume **4 out-patient visits** for long COVID care following acute illness
- Approximately **100K visits** since the pandemic began

Evaluation of Long COVID: history

- Outline the **course of the acute infection**, **severity**, **Rx,** etc.
- Establish a **timeline** of **long COVID symptoms (**when they began relative to acute illness) along with their **frequency** and **intensity**
- Detail **co-morbid conditions** which may have been **exacerbated** or **unmasked** by the infection
- Define **impact** on **QOL, functionality**, **work capacity**, **return to school**, etc.
- Record if and how **social determinants** are **impacting** the illness

Evaluation of Long COVID: testing

- **Remember:** “One size does not fit all”; **standard order sets** for Long COVID are **difficult to establish**
- **Laboratory** and **diagnostic testing** needs to be **guided** by a **patient’s history, physical examination, clinical findings**
- Generally, **more conservative testing** during the **first 12 weeks** after acute COVID-19
- However, with **persistent** or **exacerbating manifestations** a **more comprehensive evaluation** is needed

Long COVID: dx assessment

system	diagnoses	Dx considerations
Respiratory: dyspnea, cough, wheezing, chest pain	Persistent COVID pneumonia, ILD, PE/DVT, asthma, super infection	Chest X-ray, PFTs, 6MW; consider D Dimer, CTA, HRCT
Poor general well being: fatigue, muscle pain, malaise	PTSD, chronic fatigue, myositis, collagen vascular disorder, sleep disordered breathing, anxiety, depression	CBC, Comprehensive metabolic panel; TSH, free T4 sed rate, CRP, ferritin, ANA RF, ant-CCP, anti-cardiolipin, CK PHQ9, GAD7, Ru-SATED (sleep)
Nervous system: memory loss, headache, dizziness, focal weakness, paresthesias, numbness, etc.	Encephalopathy, stroke, neuropathy, POTS	CBC, Comprehensive metabolic panel; TSH, sed rate, MOCA, neuropsychogical testing, MRI, autonomic testing
Cardiovascular: chest pain, dyspnea, palpitations, tachycardia	Myocarditis, arrhythmia, autonomic dysfunction, ischemic heart disease	Troponin, BNP, EKG, echocardiogram; CK, Cardiac MR, event monitors, tilt table testing
Behavioral Health	Anxiety, depression, psychosis, manic depression	CBC, Comprehensive metabolic panel; TSH, sed rate, PHQ9, GAD7, Ru-SATED (sleep)

PASC: dx assessment

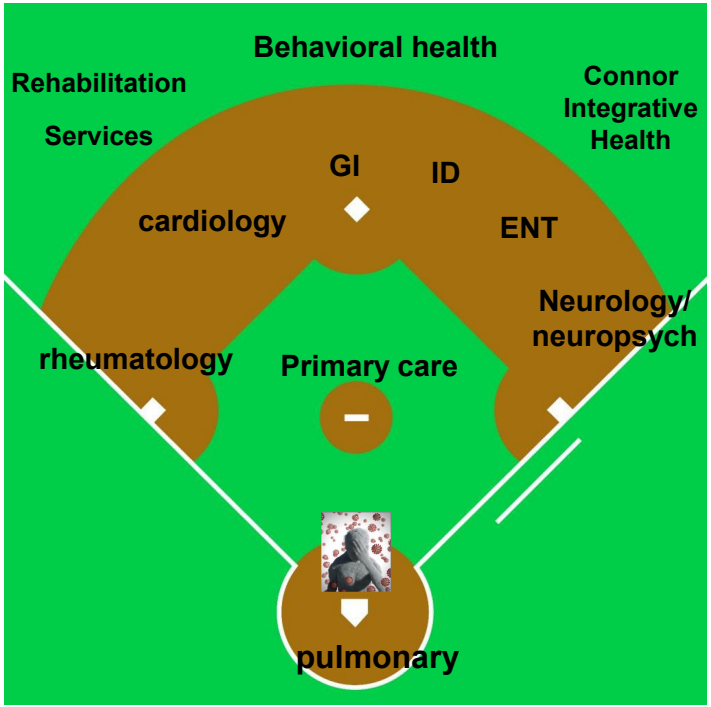
system	diagnoses	Dx considerations
Metabolic disorders:	worsening diabetes, thyroiditis, AKI, osteoporosis	comprehensive metabolic panel, TSH, free T4, U/A, renal ultrasound
Gastrointestinal:	gastroenteritis, IBS, aggravation of underlying IBD, elevated LFTs with hepatitis	Liver functions, stool cultures, US gall bladder, etc.
ENT:	Persistent loss of taste and smell; tracheal stenosis, vocal cord issues, Bell's palsy	Consider smell retraining protocol, referral to ENT as needed
MISC:	alopecia	Comprehensive metabolic panel, TSH

Highway of Care…… UH COVID Recovery Clinic

Multi- disciplinary team approach

UH COVID RECOVERY CLINIC

Manager



Other specialists

Social services

Support group

UH COVID RECOVERY CLINIC

INTEGRATED

Conferences to discuss disease management

RESEARCH

Designed to aid in the investigation of PASC: clinical manifestations, pathogenesis, natural history.

Goals: 1) provide long haul patients hope that recovery is possible: 2) guide them along a diagnostic and therapeutic care path facilitating their return to a normal life!! 3) expand our knowledge base regarding PASC helping to understand the many facets of this complex disorder

In regards to returning to normal life we want recovering patients to feel like they have won a championship….

Guardians

University Hospitals
Cleveland | Ohio

GO GUARDIANS!!!

Patient Presentation Conclusion

- The patient continued to have symptoms over a year from initial diagnosis
  - Profound fatigue and sense of heaviness
  - Lack of motivation and depression
  - Headaches and body aches
  - Memory impairment and fogginess
- Diagnosed severe sleep apnea and started on CPAP
- Evaluated for bariatric surgery and referred to psychology
- Working remains limited to a few days per month
- Referred to the COVID-19 Recovery Clinic