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## COVID-19: The Pandemic Continues...



Faculty  
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Clinical Pharmacy Specialist, Infectious  
Diseases/Antimicrobial Stewardship,  
MUSC Health

This presentation will briefly discuss the background and epidemiology of the virus, including its virulence and risk to public health. Additionally, therapeutic options, including supportive care and potential agents will be discussed. Lastly, the presentation will discuss various roles that pharmacy personnel can play in education, patient care, and global health.

### Learning Objectives

#### Pharmacist

1. Recognize the evolving epidemiology and emerging knowledge of SARS-CoV-2
2. Identify trends in development and recommendations of therapeutic options for COVID-19
3. Identify the role of pharmacy personnel as integral members of the response team
4. Recognize appropriate educational resources available to the general public

#### Pharmacy Technician

1. Recognize the evolving epidemiology and emerging knowledge of SARS-CoV-2
2. Identify trends in development and recommendations of therapeutic options for COVID-19
3. Identify the role of pharmacy personnel as integral members of the response team
4. Recognize appropriate educational resources available to the general public

#### Nurse

1. Recognize the evolving epidemiology and emerging knowledge of SARS-CoV-2
2. Identify trends in development and recommendations of therapeutic options for COVID-19
3. Identify the role of pharmacy personnel as integral members of the response team
4. Recognize appropriate educational resources available to the general public

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Pharmacists, Pharmacy Technicians, Nurses

## Universal Activity Number

### Pharmacist

0798-0000-20-128-L01-P

### Pharmacy Technician

0798-0000-20-128-L01-T

### Nurse

0798-0000-20-128-L01-N

### Credit Hours

1.25 Hours

### Activity Type

Knowledge-Based

### CE Broker Tracking Number

20-774774

### Activity Release Date

April 23, 2020

### Activity Offline Date

April 23, 2023

### ACPE Expiration Date

April 23, 2023

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## Learning Objectives

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At the conclusion of this activity, participants should be better able to:

- Recognize the evolving epidemiology and emerging knowledge of SARS-CoV-2
- Identify trends in development and recommendations of therapeutic options for COVID-19
- Identify the role of pharmacy personnel as integral members of the response team
- Recognize appropriate educational resources available to the general public

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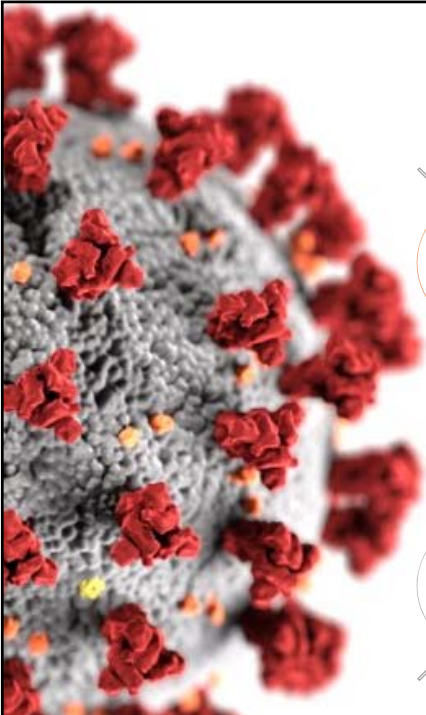
## SARS-CoV-2

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## Background

Outbreak of respiratory illness caused by a novel coronavirus first detected in Wuhan City, China

**“SARS-CoV-2”** is the virus


- Severe acute respiratory syndrome coronavirus 2

**“COVID-19”** is the disease

- Coronavirus disease 2019

[https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-\(covid-2019\)-and-the-virus-that-causes-it](https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-(covid-2019)-and-the-virus-that-causes-it)

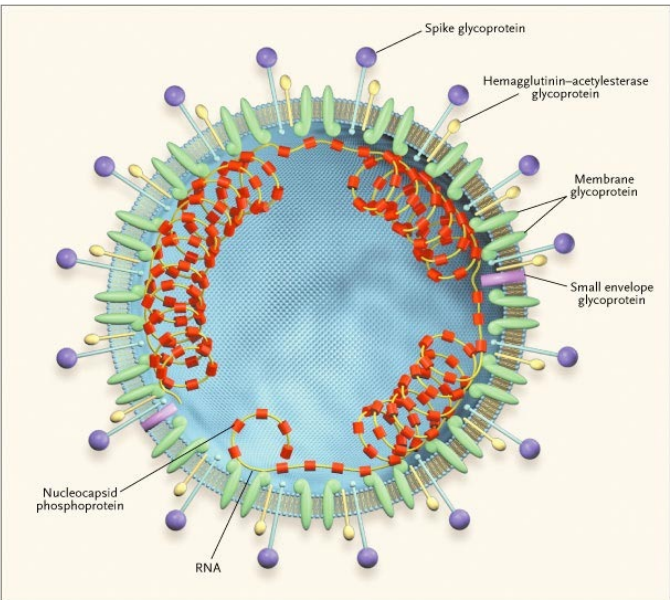
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## Microbiology

- Single-stranded enveloped RNA virus belonging to Coronaviridae family
- Preliminary genetic analysis appears to be nearly identical to 2 bat-derived SARS-like coronaviruses (genus *Betacoronavirus*, subgenus *Sarbecovirus*)
- Latin word *corona*, meaning crown
- Important structural proteins
  - Spike glycoproteins bind to receptors on host cells and fuse the viral envelope with host cell membranes
- Human entry via angiotensin-converting enzyme 2 (ACE2)

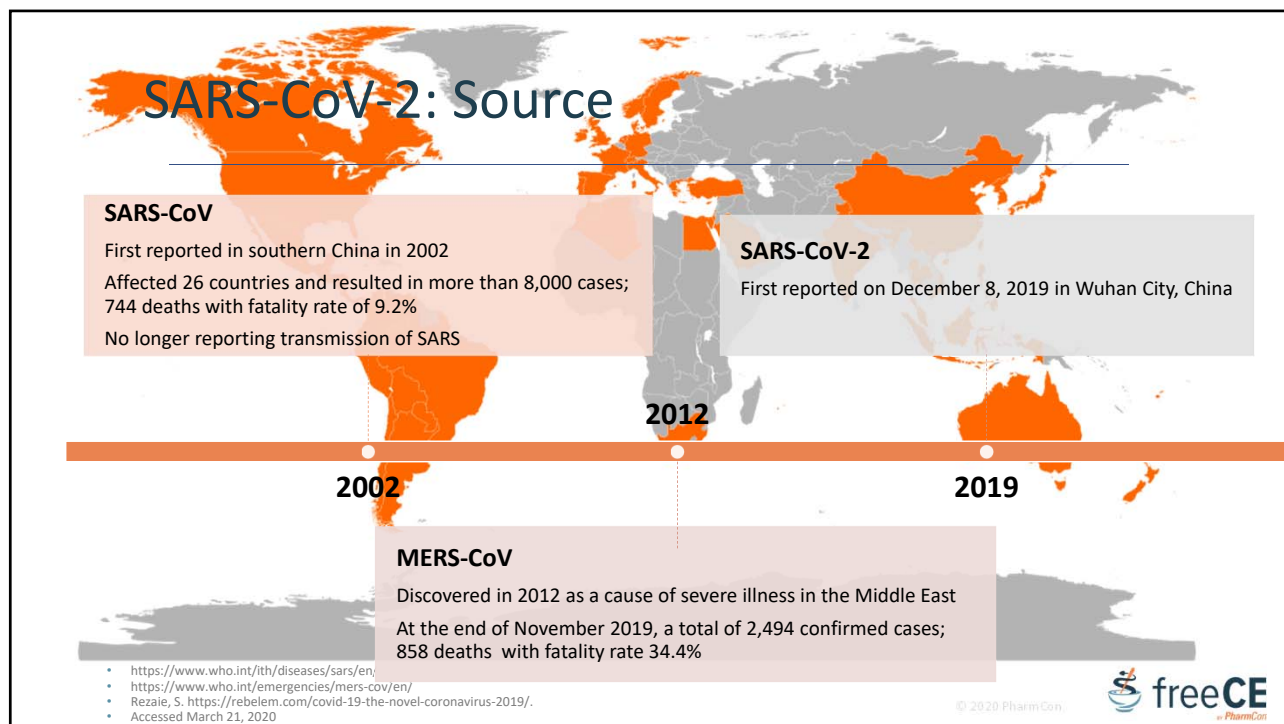


• Holmes, K. NEJM. 2003;348:1948-1951. <https://doi.org/10.1056/NEJMp030078>

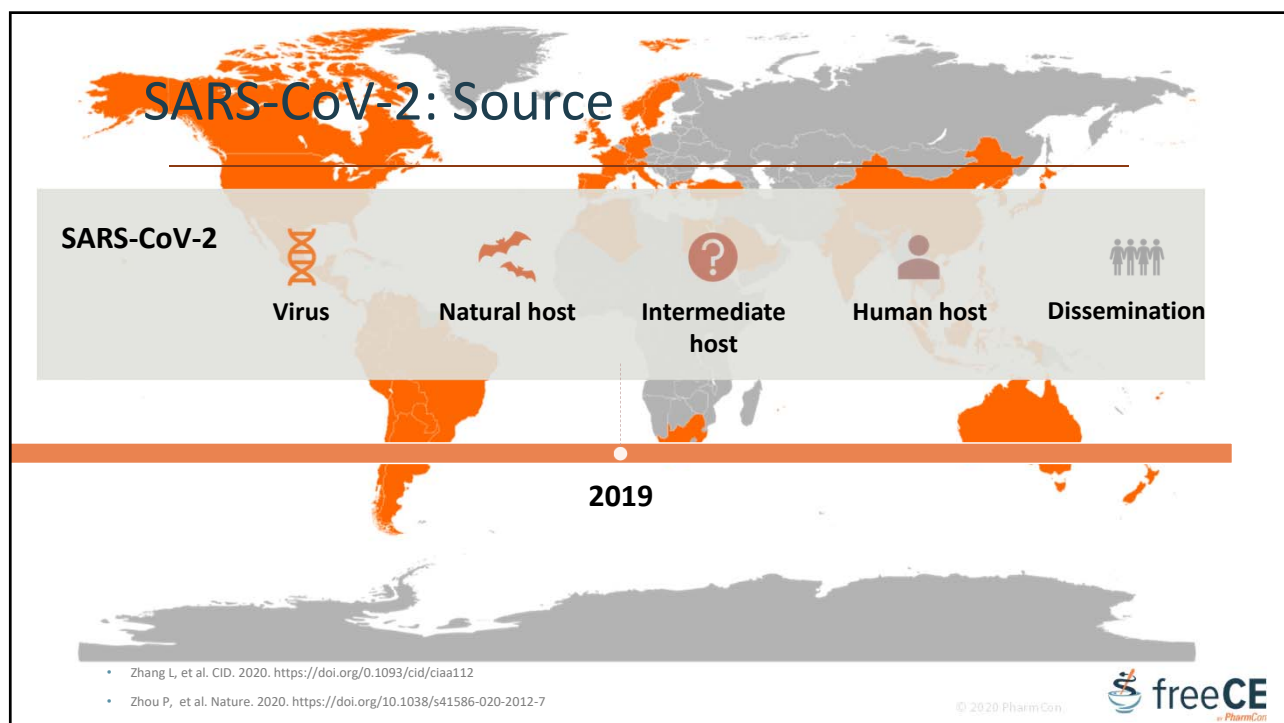
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## SARS-CoV-2: Incubation Period

Current estimates of incubation period range from 2 to 14 days with a median of 5 to 6 days

Study	Range (days)	Median (days)
Linton N, et al.	2 – 14	5
Backer J, et al.	2.1 – 11.1	6.4
Li Q, et al.	4.1 – 12.5	5.2
Wei-jie G, et al.	0 - 24	4

- Linton NM, et al. J Clin Med 2020. <https://doi.org/10.3390/jcm9020538>
- Backer JA, et al. Euro Surveill 2020. <https://doi.org/10.2807/1560-7917.ES.2020.25.5.2000062>
- Li Q, et al. NEJM 2020. <https://doi.org/10.1056/NEJMoa2001316>
- Wei-jie G, et al. NEJM 2020. <https://doi.org/10.1056/NEJMoa2002032>

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## SARS-CoV-2: Reproductive Number ( $R_0$ )

- **$R_0$** : expected number of secondary cases produced by a single infected person in a susceptible population
  - Affected by biological, socio-behavioral, and environmental factors
- SARS-CoV-2: 2 – 3
  - MERS-CoV: 0.45 – 8.1; SARS-CoV: 2 – 4; Influenza: 1.3
- Asymptomatic carrier transmission is possible
- No evidence for perinatal transmission

- Rio C, et al. JAMA 2020. <https://doi.org/10.1001/jama.2020.3072>
- Bai Y, et al. JAMA 2020. <https://doi.org/10.1001/jama.2020.2565>
- Chen H, et al. Lancet 2020. [https://doi.org/10.1016/S0140-6736\(20\)30360-320](https://doi.org/10.1016/S0140-6736(20)30360-320)

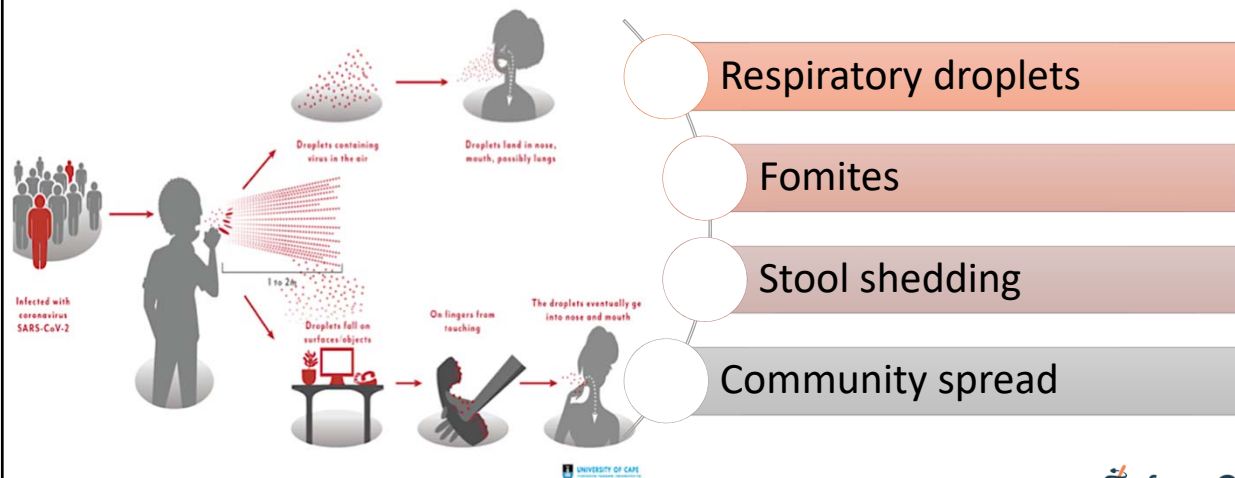
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## SARS-CoV-2: Transmission



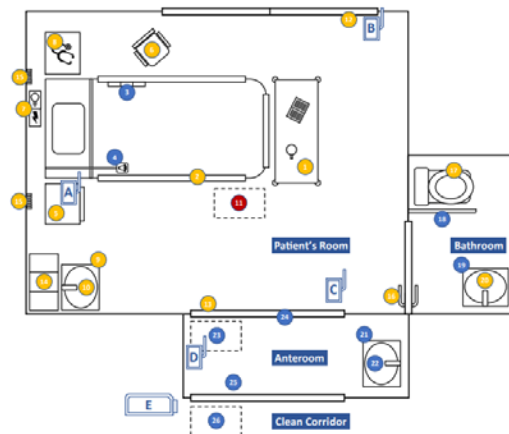
• Coronavirus transmission. Worldheartfederation.org. 21 Mar 2020.

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## Air, Surface Environmental, and Personal Protective Equipment Contamination



Sites <sup>a</sup>	Positive samples (patient C; before routine cleaning) <sup>b</sup>	Cycle threshold value <sup>c</sup>
<b>Environmental sites<sup>d</sup></b>		
<b>Patient's room</b>		
1. Cardiac table, including handle	1/1	35.44
2. Entire length of bed rail	1/1	37.95
3. Control panel on bed	0/1	
4. Call bell attached to bed	0/1	
5. Locker with hand slot	1/1	36.21
6. Chair	1/1	37.07
7. Light switches behind bed	1/1	37.54
8. Stethoscope	1/1	38.24
9. Sink, external rim	1/1	35.54
10. Sink, internal bowl	1/1	36.79
11. Floor	1/1	30.64
12. Glass window in room	1/1	35.79
13. Glass door interior	1/1	35.71
14. PPE storage area over sink	1/1	34.89
15. Air outlet fan	2/3	32.96, 37.94
<b>Toilet area</b>		
16. Door handle	1/1	35.83
17. Toilet bowl, surface	1/1	37.75
18. Hand rail	0/1	
19. Sink, external rim	0/1	
20. Sink, internal bowl	1/1	37.11
<b>Anteroom</b>		
21. Sink, external rim	0/1	
22. Sink, internal bowl	0/1	
23. Floor	0/1	
24. Glass door, room side	0/1	
25. Glass door, corridor side	0/1	
<b>Corridor outside room</b>		
26. Floor	0/1	
Total, No. (%)	17/28 (61)	

• Ong SWX et al. JAMA. 2020. <https://doi.org/10.1001/jama.2020.3227>

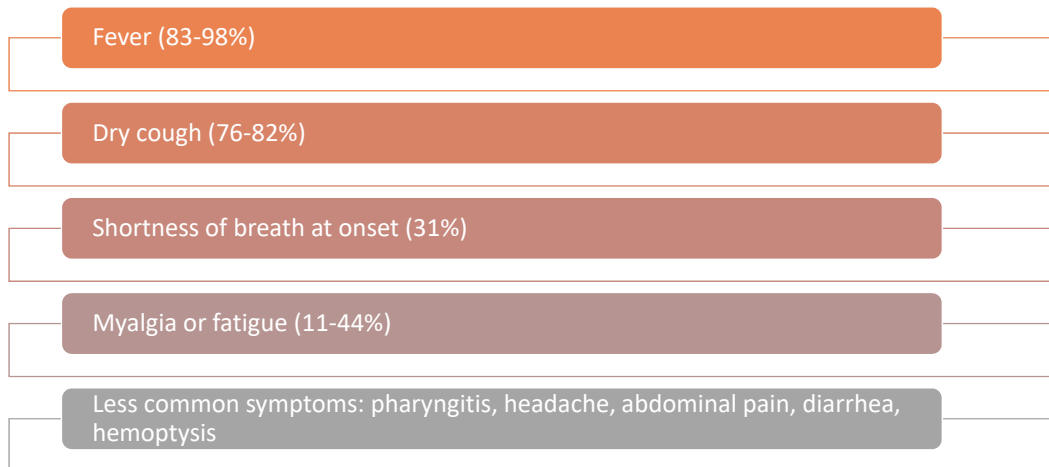
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## COVID-19: Symptoms



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## COVID-19: Clinical Characteristics

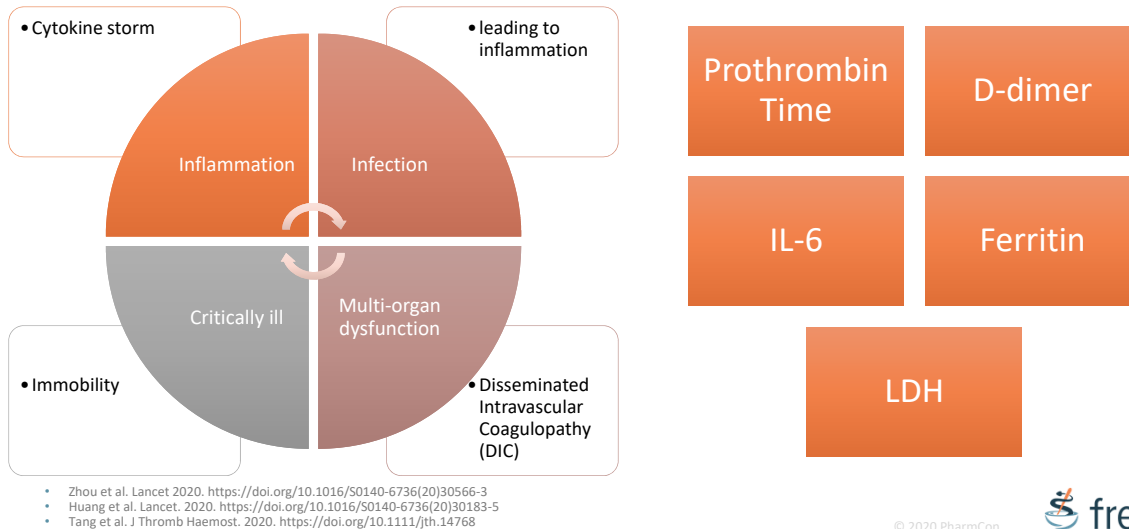
- Median age, 50 years
- Laboratory findings:
  - Lymphopenia, 70%
  - Prolonged prothrombin time, 40%
  - Elevated lactate dehydrogenase, 40%
- Radiological:
  - CXR: bilateral patchy infiltrates
  - Chest CT scans: ground-glass infiltrates
- Disease severity various
  - ~80% of infections are not severe and may be asymptomatic

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## Coagulopathies



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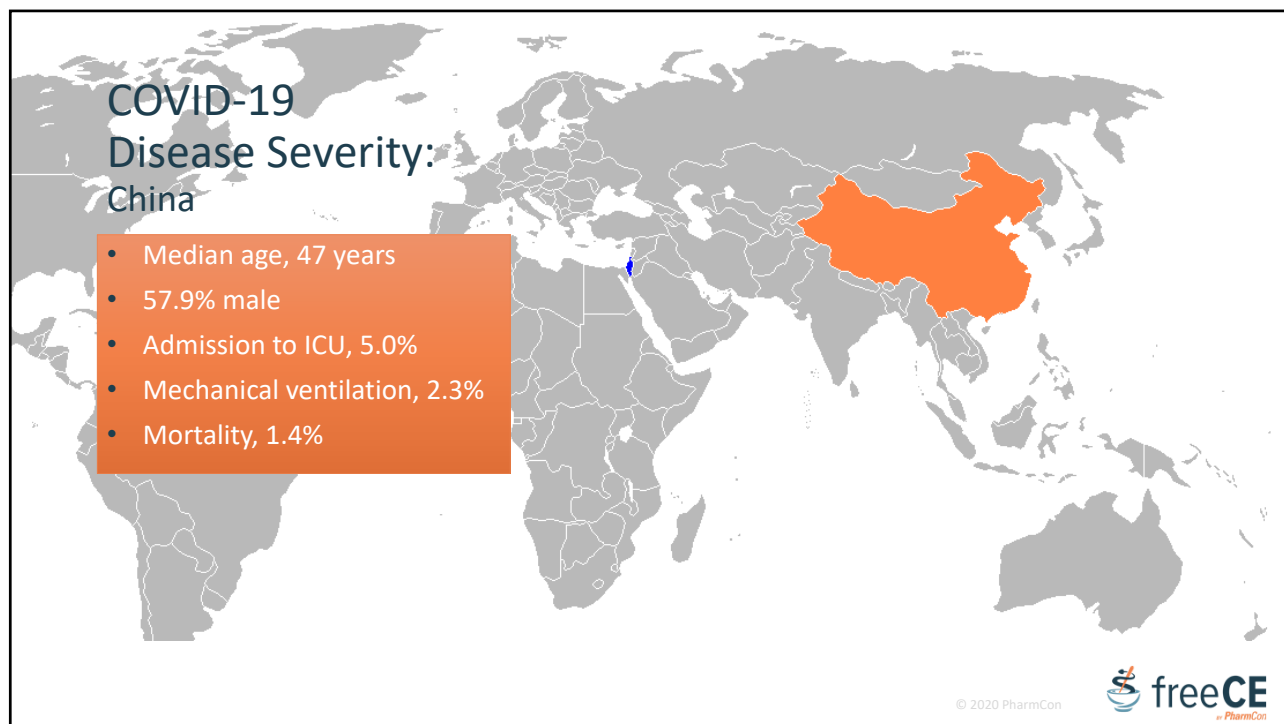
## Coagulopathies

Zhou et al	<ul style="list-style-type: none"> <li>• N= 813 hospitalized pts</li> <li>• Retrospective study; China</li> <li>• ↑ d-dimer associated w/ mortality</li> <li>• Non-survivor 5.2 (1.5, 21.1) vs. survivor 0.6(0.3,1.0)</li> <li>• All markers ↑↑ over time in non-survivors: d-dimer, IL-6, LDH, hs-Tn, ferritin</li> </ul>
Huang et al	<ul style="list-style-type: none"> <li>• N=41 hospitalized pts</li> <li>• Retrospective study; China</li> <li>• D-dimer associated w/ need for ICU care</li> <li>• ICU 2.4 (0.4,14.4) vs. no ICU 0.5 (0.3,0.8)</li> </ul>
Tang et al	<ul style="list-style-type: none"> <li>• N=183 hospitalized pts</li> <li>• Unclear methodology; China</li> <li>• ↑ d-dimer associated with mortality</li> <li>• Non-survivor 2.12 (0.77,5.27) vs. survivor 0.61 (0.35, 1.29)</li> <li>• ↑FDP also associated</li> </ul>

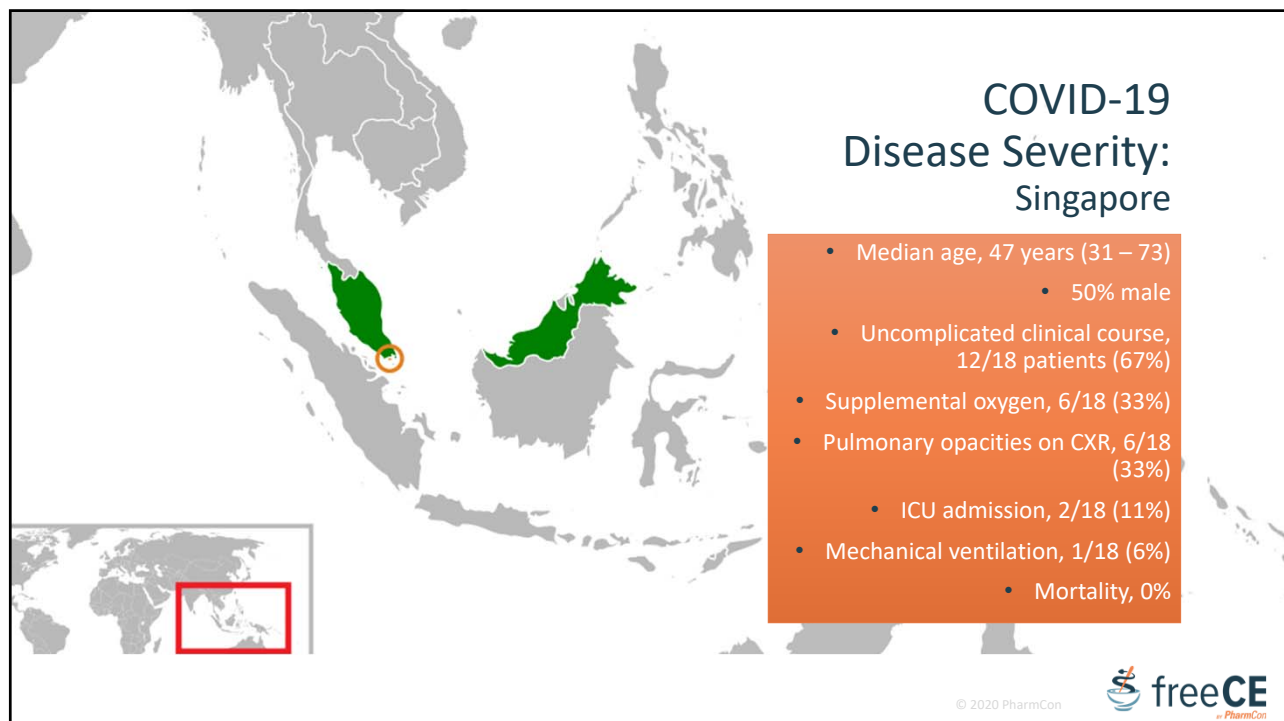
- Zhou et al. Lancet 2020. [https://doi.org/10.1016/S0140-6736\(20\)30566-3](https://doi.org/10.1016/S0140-6736(20)30566-3)
- Huang et al. Lancet. 2020. [https://doi.org/10.1016/S0140-6736\(20\)30183-5](https://doi.org/10.1016/S0140-6736(20)30183-5)
- Tang et al. J Thromb Haemost. 2020. <https://doi.org/10.1111/jth.14768>

FDP, fibrin degradation product

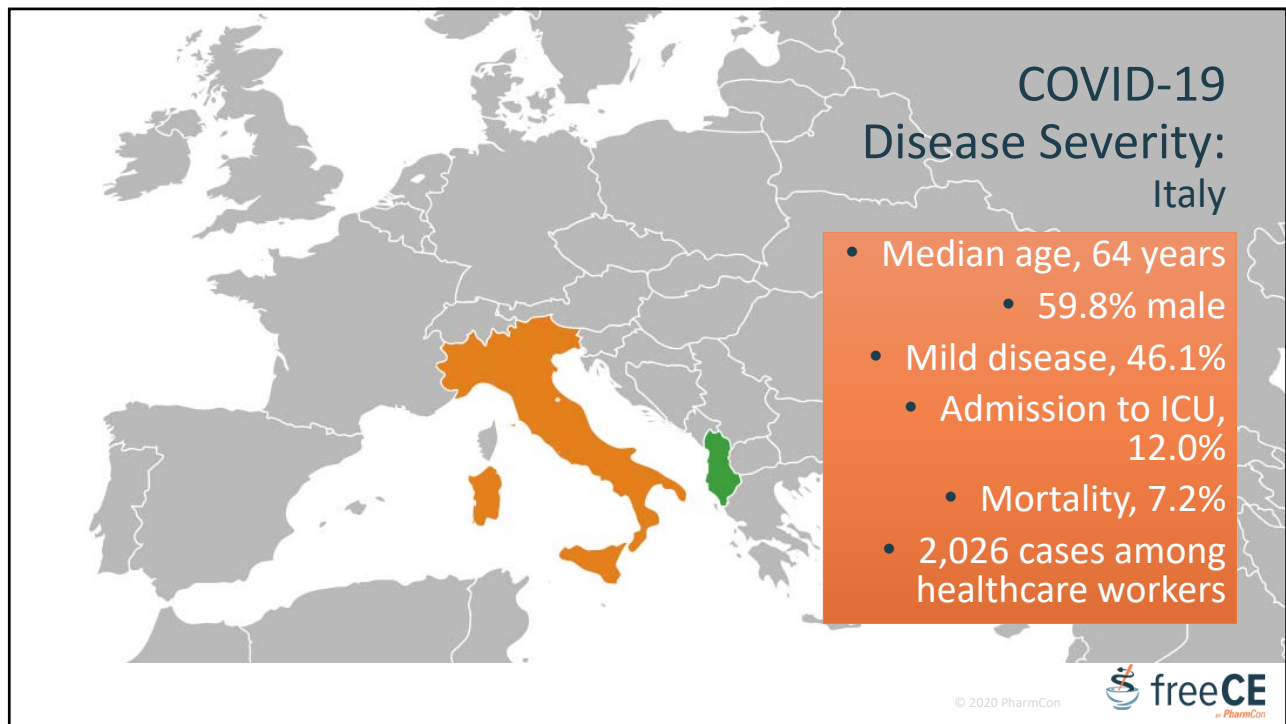
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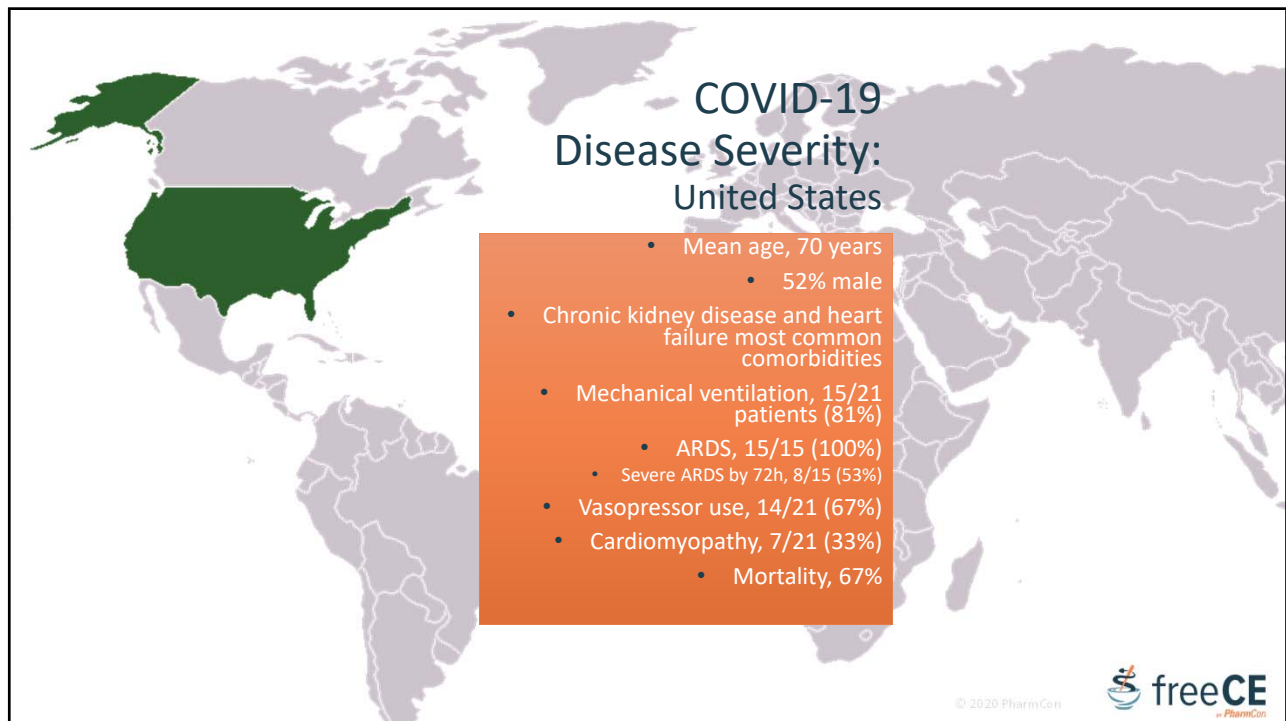
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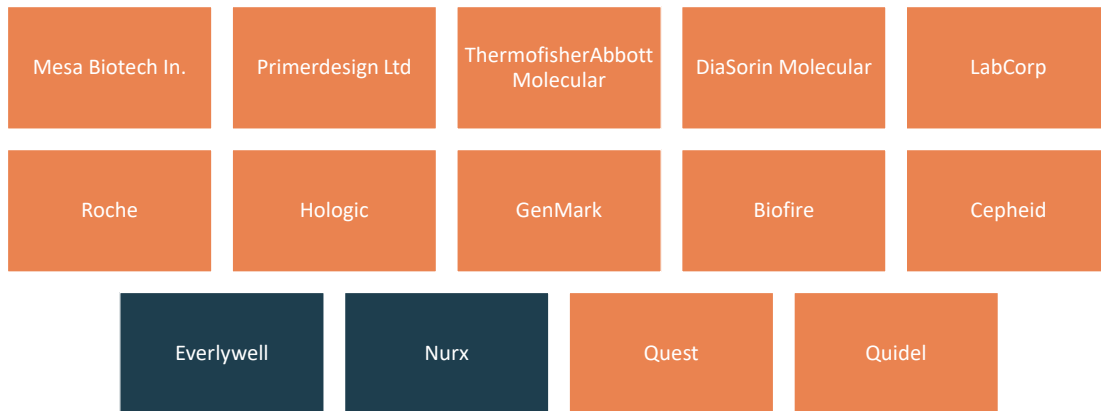


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## The COVID-19 Olympics



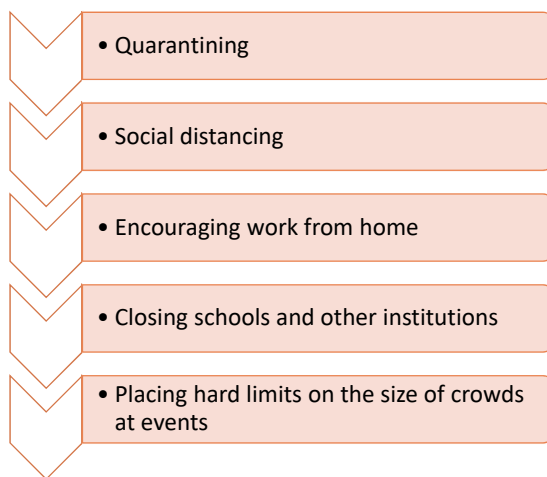
• <https://www.fda.gov/medical-devices/emergency-situations-medical-devices/emergency-use-authorizations>

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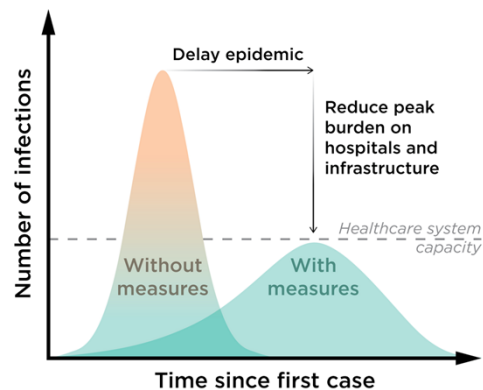


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## “Flatten the Curve”



### Impact of protective measures



• <https://www.weforum.org/agenda/2020/03/covid19-coronavirus-countries-infection-trajectory>

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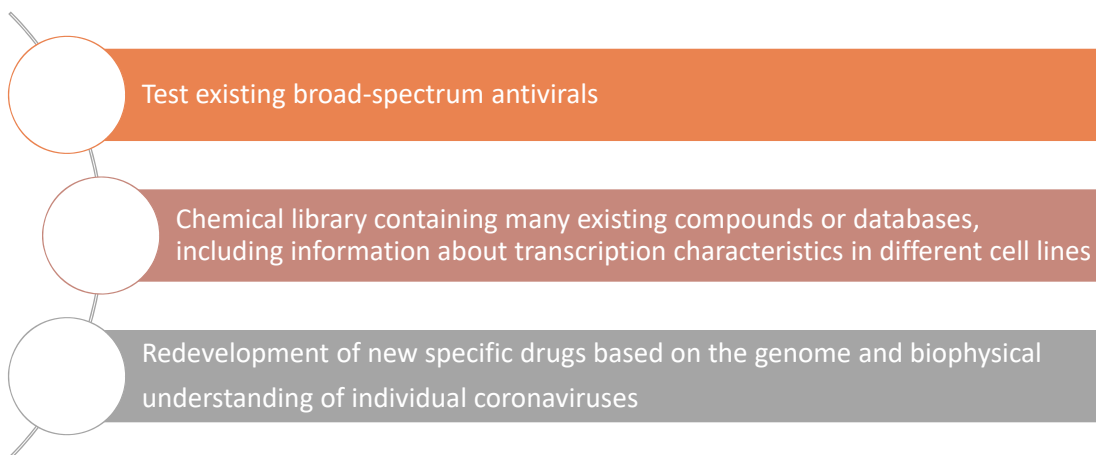
# Therapeutic Agents

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## Principles for Pharmacotherapy



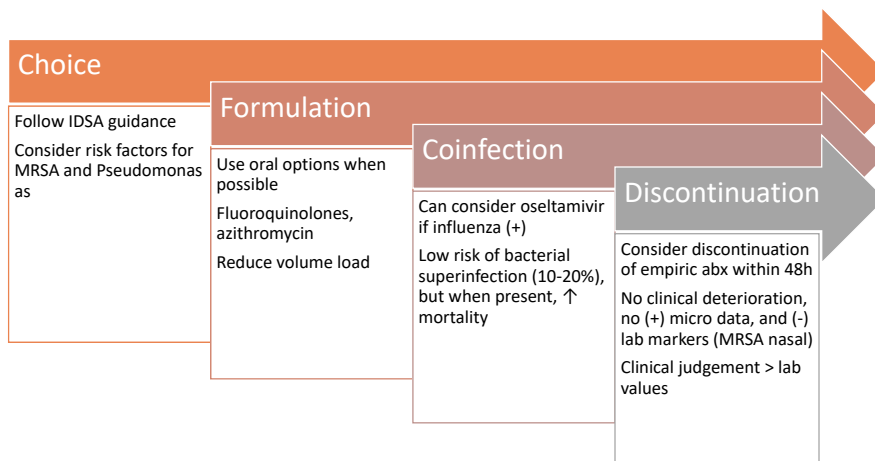
• Lu, Biosci Treans. 2020. <https://doi.org/10.5582/bst.2020.01020>

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# Antibiotic Stewardship



• Zhou et al., Lancet, 2020; Yang et al., Lancet, 2020; Lippi and Plebani, Clinica Chimica Acta, 2020; WHO, COVID-19 Guidelines, 2020

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# Remdesivir (GS-5734)

MOA	<i>in vitro</i> activity	Animal data	Therapeutic Index	Dosing
<ul style="list-style-type: none"> <li>Investigational prodrug of adenosine analog</li> <li>Active form → binds to RNA-dependent RNA polymerase → RNA chain terminator</li> <li>Ebola outbreak in W. Africa from 2014-2016</li> </ul>	<ul style="list-style-type: none"> <li>Potent <i>in vitro</i> activity against SARS-CoV-2 with EC<sub>50</sub> of 0.77 μM at 48h</li> <li>Potent <i>in vitro</i> activity against SARS-CoV-1 and MERS-CoV with EC<sub>50</sub> of 0.07 μM</li> </ul>	<ul style="list-style-type: none"> <li>Ebola: suppression of viral replication, protection from lethal diseases</li> <li>MERS: reduced virus lung titers, weight loss, lung hemorrhage, and lung injury scores</li> </ul>	<ul style="list-style-type: none"> <li>Highly selective for viral polymerases; low propensity to cause human toxicity</li> <li>Wide therapeutic index in human airway epithelial cells</li> <li>High genetic barrier to resistance in coronaviruses</li> </ul>	<ul style="list-style-type: none"> <li>Long intracellular T<sub>1/2</sub></li> <li>Under investigation:                             <ul style="list-style-type: none"> <li>200mg IV on day 1, then</li> <li>100mg IV daily for up to 10d</li> <li>Infusion over 30-60 mins</li> </ul> </li> <li>ACQUISITION</li> </ul>

• McCreary E, Pogue J. OFID. 2020. <https://doi.org/10.1093/ofid/ofaa105>

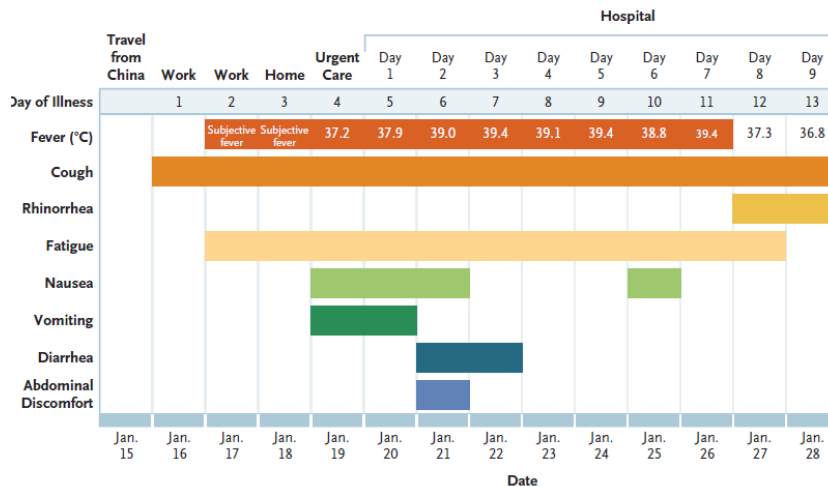
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## Clinical Presentation: A Case Report



### First U.S. Case

**35 y/o man presented with 4-day history of cough and fever**

- Recent travel to Wuhan City
- Days 2 – 5: vitals normal
- Day 6: CXR bibasilar opacities
- Day 7: Remdesivir initiated

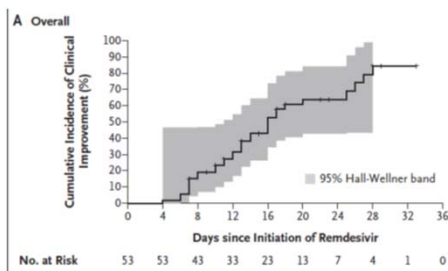
Holshe et al. NEJM. 2020;382:929-36.

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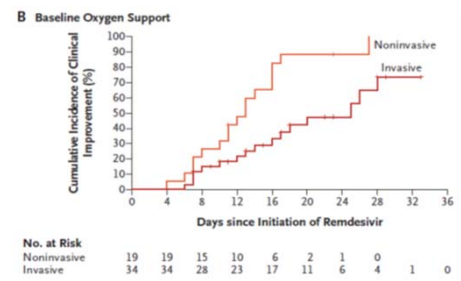


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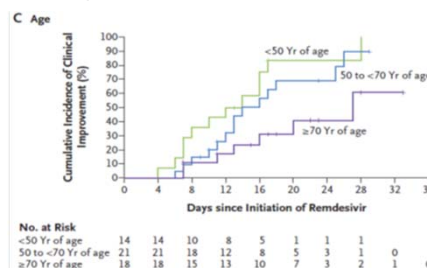
## Remdesivir – Compassionate Use



"Patients received a 10-day course of remdesivir, consisting of 200 mg administered intravenously on day 1, followed by 100 mg daily for the remaining 9 days of treatment."



"...mortality was 18% (6 of 34) among patients receiving invasive ventilation and 5% (1 of 19) among those not receiving invasive ventilation."



"... patients hospitalized for severe Covid-19 who were treated with compassionate-use remdesivir, clinical improvement was observed in 36 of 53 patients (68%). Measurement of efficacy will require ongoing randomized, placebo controlled trials of remdesivir therapy."

Grein J et al. NEJM 2020. <https://doi.org/10.1056/NEJMoa2007016>

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# Chloroquine/Hydroxychloroquine

MOA: antiviral	CQ: <i>in vitro</i> activity	HCQ: <i>in vitro</i> activity	Dosing	ADEs
<ul style="list-style-type: none"> <li>Intracellular alkalinization → inhibits pH-dependent viral replication</li> <li>Impaired viral receptor glycosylation</li> </ul>	<ul style="list-style-type: none"> <li>Potent <i>in vitro</i> activity against SARS-CoV-1 (1-8.8μM) and MERS-CoV with EC<sub>50</sub> of 3.0μM</li> <li>Potent <i>in vitro</i> activity against SARS-CoV-2 with EC<sub>50</sub> of 1.13μM at 48h</li> </ul>	<ul style="list-style-type: none"> <li>Potency of HCQ &gt; CQ (EC<sub>50</sub> of 0.72μM) for SARS-CoV-2</li> <li>Shown to be up to 7.6X more potent than CQ for SARS-CoV-2</li> </ul>	<ul style="list-style-type: none"> <li>CQ: 500mg PO twice daily</li> <li>HCQ: 800-1200mg LD, then 400-600mg PO (split dosing to ↓ GI side effects)</li> <li>Duration: 5-10d</li> </ul>	<ul style="list-style-type: none"> <li>GI disturbance</li> <li>ECG abnormalities                             <ul style="list-style-type: none"> <li><b>Prolonged QTc</b></li> </ul> </li> <li>Endocrine disturbance</li> <li>Retinal damage (dose-dependent)</li> <li>Crosses placenta in pregnancy</li> <li>Excreted into breast milk</li> </ul>

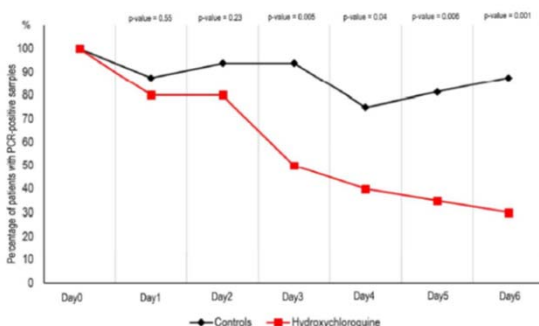
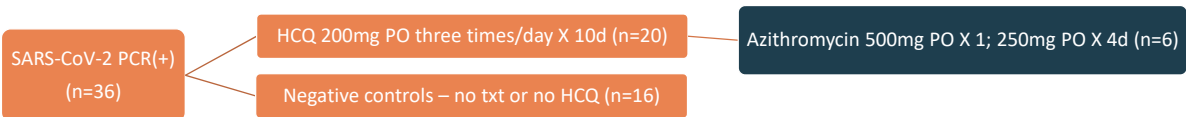
- McCreary E, Pogue J. OFID. 2020. <https://doi.org/10.1093/ofid/ofaa105>
- Yao X, et al. Clin Infect Dis. 2020. <https://doi.org/10.1093/cid/ciaa237>.
- Barber BE, Eiden DP. "Chloroquine" in Kucers, 6th Ed.

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## Hydroxychloroquine



- Not randomized; convenience controls
- Primary endpoint: virologic clearance (NP swab) at day 6
- Small sample size (20 received hydroxychloroquine)\*
- In some patients, clinicians sometimes also used azithromycin to prevent bacterial pneumonia*

Significant reduction in % of patients with a PCR-positive NP swab, starting 3 days after treatment start.  
70% vs 12.5% (p=0.001)

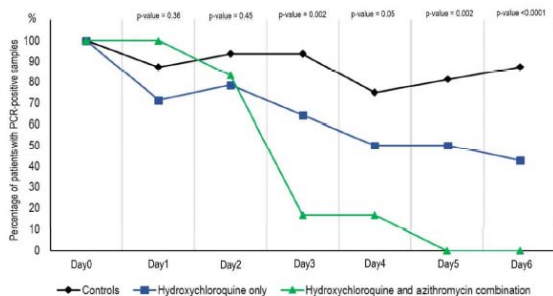
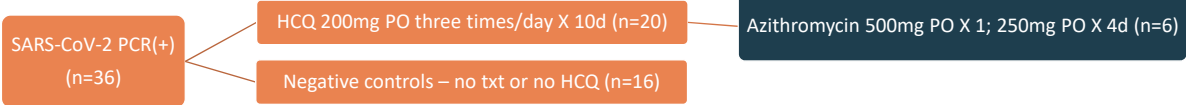
- Gautret P, et al. IJAA 2020. <https://doi.org/10.1016/j.ijantimicag.2020.105949>

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## Hydroxychloroquine + Azithromycin



- Not randomized; convenience controls
- Primary endpoint: virologic clearance (NP swab) at day 6
- Small sample size (20 received hydroxychloroquine)\*
- *In some patients, clinicians sometimes also used azithromycin to prevent bacterial pneumonia*

Significant reduction in % of patients with a PCR-positive NP swab, starting 3 days after treatment start.  
100% vs 12.5% ( $p=0.001$ )\*\*\*

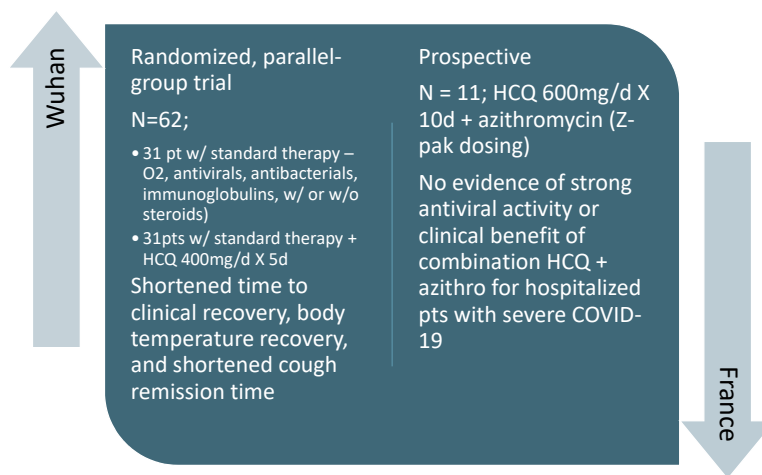
\* Gautret P, et al. UAA 2020. <https://doi.org/10.1016/j.ijantimicag.2020.105949>

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## HCQ + Azithro - Updates



\* Molina JM, et al. Med Mal Infect. 2020. <https://doi.org/doi:10.1016/j.medmal.2020.03.006>

\* Chen Z, et al. PrePrint. 2020. <https://doi.org/10.1101/2020.03.22.20040758>

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## Lopinavir/ritonavir (Kaletra®) – LPV/r

Protease inhibitors	Lopinavir	Ritonavir	Monitoring	ADEs
<ul style="list-style-type: none"> <li>Antiviral agents for HIV</li> <li>Inhibition of HIV-1 protease → formation of <b>immature, noninfectious</b> viral particles</li> </ul>	<ul style="list-style-type: none"> <li><b>POTENTIAL INHIBITION</b> of Chymotrypsin-like protease (3CLpro) in SARS-CoV</li> </ul>	<ul style="list-style-type: none"> <li>CYP3A4 inhibitor</li> <li><b>DECREASES metabolism = INCREASE serum levels</b></li> </ul>	<ul style="list-style-type: none"> <li>Lopinavir                             <ul style="list-style-type: none"> <li><b>Peak:</b> 9.6µg/mL</li> <li><b>Trough:</b> 5.5µg/mL</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Dermatologic</li> <li>Endocrine/ Metabolic</li> <li>Gastrointestinal</li> <li>Hepatic</li> <li>Respiratory</li> <li>Cardiac</li> <li>Central Nervous System</li> <li>Hematologic</li> </ul>

- Infectious diseases. Nat Rev Drug Discov 3, S26–S32 (2004). <https://doi.org/10.1038/nrd1409>;
- Farkas J. COVID-19: The Internet Book of Critical Care. [https://emcrit.org/ibcc/COVID19/#lopinavir/ritonavir\\_\(KALETRA\)](https://emcrit.org/ibcc/COVID19/#lopinavir/ritonavir_(KALETRA)). Date Accessed March 14, 2020.
- Totura AL. Expert Opin Drug Discov. 2019;14(4):397-412. <https://doi.org/10.1080/17460441.2019.1581171>

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## LPV/r: COVID-19 in China

Open-label, individually randomized

SARS-CoV-2 PCR(+) (n=199)

Standard care PLUS LPV/r (400mg/100mg) PO q12h (n=99) X14d

Standard Care (n=100)

**Standard Care:** Supplemental O<sub>2</sub>, noninvasive and invasive ventilation, abx, vasopressor support, renal-replacement therapy, and extracorporeal membrane oxygenation (ECMO)

1° Outcome	LPV/r (n=99)	Standard Care (n=100)	Difference
Time from illness onset to randomization, median days (IQR)	13 (11–17)	13 (10–16)	-
Time to clinical improvement, median days (IQR)	16.0 (13.0 to 17.0)	16.0 (15.0 to 18.0)	1.31 (0.95 to 1.80)
ITT 28d mortality, n (%)	19 (19.2)	25 (25.0)	-5.8 (-17.3 to 5.7)
mITT 28d mortality, n (%)	16 (16.7)	25 (25.0)	-8.3 (-19.6 to 3.0)
Time from randomization to d/c, median days (IQR)	12 (10 to 16)	14 (11 to 16)	1 (0 to 3)
Pts w/ clinical improvement at 14d, n (%)	45 (45.5)	30 (30.0)	15.5 (2.2 to 28.8)

- Cao B, et al. NEJM, 2020. <https://doi.org/10.1056/NEJMoa2001282>

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# Nitazoxanide

## MOA

- Interference with host regulated pathways involved in viral replication rather than virus-specific pathways
- Active metabolite: tizoxanide
- Viral: hemagglutinin inhibition

## In vitro animal data

- *In vitro* activity against SARS-CoV-2 with EC<sub>50</sub> of 2.12 µM
- *In vitro* activity against MERS-CoV with EC<sub>50</sub> of 0.92 µM (nitazoxanide) and 0.83µM (tizoxanide)
- Broad spectrum antiviral activity

## Human data

- Influenza: outpatient management w/ 600mg PO BID
- ~1 day improvement in time to resolution of sx (p=0.008)
- Resp viruses: failed to reduce duration of hospitalization or time to sx alleviation.
- Three Phase 3 RCTs – pending data

## Dosing

- Adults: 300mg PO BID
- Administer w/ food to increase AUC
- Solution ≠ tablet

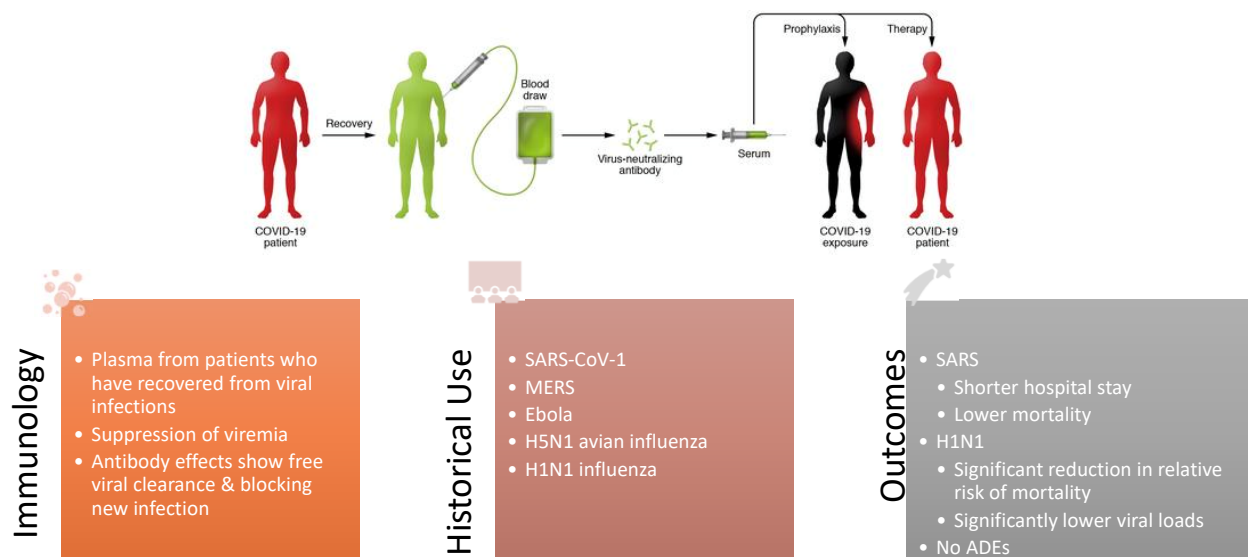
- McCreary E, Pogue J. OFID. 2020. <https://doi.org/10.1093/ofid/ofaa105>
- Barlow A, et al. Pharmacotherapy. 2020. <https://doi.org/10.1002/PHAR.2398>

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# Convalescent Plasma



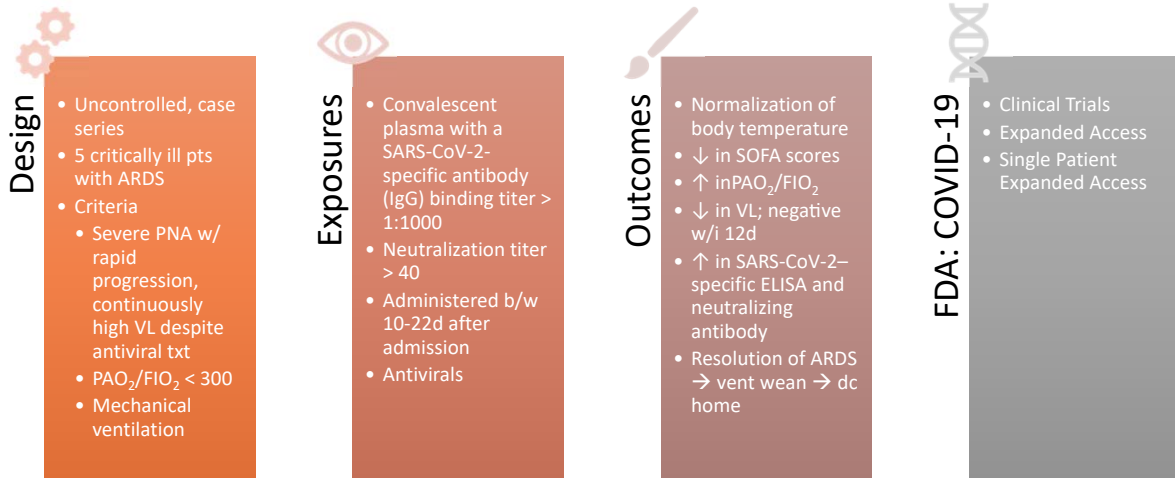
- Chen et al. Lancet ID. 2020. [https://doi.org/10.1016/S1473-3099\(20\)30141-9](https://doi.org/10.1016/S1473-3099(20)30141-9)
- McCreary E, Pogue J. OFID. 2020. <https://doi.org/10.1093/ofid/ofaa105>

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# Convalescent Plasma: COVID-19



• Shen et al. JAMA 2020. <https://doi.org/10.1001/jama.2020.4783>

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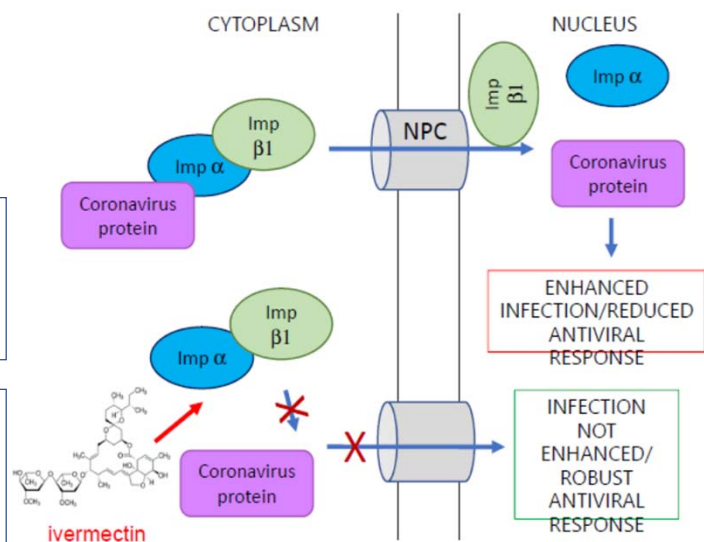
# Ivermectin

## MOA

- Anti-parasitic agent
- Inhibits viral nuclear import and replication
- HIV, Dengue, West-nile, simian virus etc.

## *in vitro* activity

- @ 24h: 93% reduction in supernatant (released virions), 99.8% reduction in cell-associated viral RNA (unreleased/unpackaged RNA)
- ~5000 fold reduction of viral RNA
- $IC_{50} \sim 2\mu M$



• Caly et al. Antiviral Research, 2020. <https://doi.org/10.1016/j.antiviral.2020.104787>

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## Fewer coronavirus deaths seen in countries that mandate tuberculosis vaccine

### BCG Vaccine



#### MOA

- Live, attenuated strain of *Mycobacterium bovis*
- Most commonly administered vaccine worldwide
- Not TB-specific mortality benefit
- Decrease in neonatal sepsis and respiratory tract infections
- Boosts host immunity



#### Animal & Human data

- Improved immunity against listeria, influenza, *S. aureus* and *Candida* spp.
- Improved anti-viral immunity and decreased viral loads when re-challenged w/ yellow fever
- **Epigenetic-mediated non-specific immune benefits last at least a year.**



#### COVID--19

- Evaluate as means to prime host immunity, mitigate crisis (**not a cure**)
- Countries
  - Yes: 131
  - No: 21
  - Unknown: 26
- Increased incidence of COVID-19 and death rate seen in countries without program
- **2 studies enrolling for BCG vaccine in HCWs**

• <https://www.japantimes.co.jp/news/2020/04/09/world/science-health-world/fewer-coronavirus-deaths-seen-countries-mandate-tuberculosis-vaccine/#.XpDCWDJKIUk>; Hegarty P et al. Preprint. <https://doi.org/10.13140/RG.2.2.35948.1088>

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### Tocilizumab - Adjunctive

Humanized monoclonal Ab

Inhibits both membrane-bound and soluble IL-6 receptors

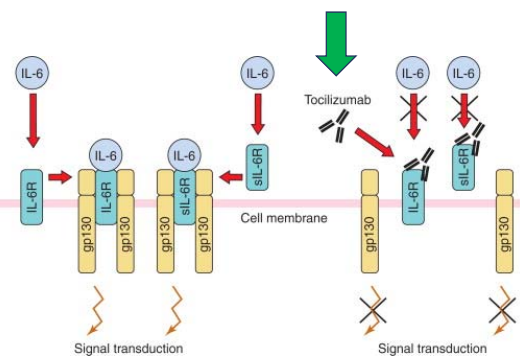
Inhibits signal transduction

Prevention of "Cytokine Storm" – cytokine release syndrome (CRS)

Rheumatoid arthritis, CAR-T associated CRS

COVID-19: rapid resolution of fever, CRP, decreased O<sub>2</sub> requirements, resolution of lung opacities

Monitoring: IL-6 → Send out labs



• McCreary E, Pogue J. OFID. 2020. <https://doi.org/10.1093/ofid/ofaa105>

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## Supportive Care

COVID-19 with mild ARDS	COVID-19 with Mod to Severe ARDS	Rescue/Adjunctive therapy
✓ <b>Do:</b> Vt 4-8 ml/kg and $P_{plat} < 30$ cm H <sub>2</sub> O	⚠ <b>CONSIDER:</b> Higher PEEP	🔍 Uncertain: Antivirals, chloroquine, anti-IL6
✓ <b>Do:</b> Investigate for bacterial infection	⚠ <b>CONSIDER:</b> NMBA boluses to facilitate ventilation targets	⚠ <b>CONSIDER:</b> if proning, high $P_{ps}$ , asynchrony NMBA infusion for 24 h
✓ <b>Do:</b> Target SPO <sub>2</sub> 92% - 96%	⚠ <b>CONSIDER:</b> if PEEP responsive Traditional Recruitment maneuvers	⚠ <b>CONSIDER:</b> Prone ventilation 12-16 h
⚠ <b>CONSIDER:</b> Conservative fluid strategy	⚠ <b>CONSIDER:</b> Prone ventilation 12-16 h	⚠ <b>CONSIDER:</b> STOP if no quick response A trial of inhaled Nitric Oxide
⚠ <b>CONSIDER:</b> Empiric antibiotics	⚠ <b>CONSIDER:</b> if proning, high $P_{ps}$ , asynchrony NMBA infusion for 24 h	⚠ <b>CONSIDER:</b> follow local criteria for ECMO V-V ECMO or referral to ECMO center
🔍 Uncertain: Systematic corticosteroids	🚫 <b>Don't do:</b> Staircase Recruitment maneuvers	
	⚠ <b>CONSIDER:</b> Short course of systemic corticosteroids	
	🔍 Uncertain: Antivirals, chloroquine, anti-IL6	

• Alhazzani et al. SCCM COVID-19 Guidelines.

• [https://scm.org/getattachment/Disaster/SSC-COVID19-Critical-Care-Guidelines.pdf?lang=en-US&\\_zs=WSjld1&\\_zf=j1cc6](https://scm.org/getattachment/Disaster/SSC-COVID19-Critical-Care-Guidelines.pdf?lang=en-US&_zs=WSjld1&_zf=j1cc6)

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## Corticosteroids

### Negative effects on similar viruses

- No net benefit
- Increased mortality
- ↑ secondary infections
- Impaired viral clearance
- ↑ ADEs

### COVID-19

- Retrospective cohort
- N=201; 42% developed ARDS
- ↓ risk of death with methylprednisolone (HR, 0.38; 95% CI, 0.20-0.72)

### Recommendations

- NO:
  - in mechanically ventilated pts w/ COVID-19 and respiratory failure (**without ARDS**)
- YES:
  - ARDS
  - Multipressor shock

• Lee et al., J Clin Virol, 2004; Stockman et al., PLoS Med, 2006; Arabi et al., Am J Respir Crit Care Med, 2018; WHO, COVID-19 Guidelines, 2020; Wu et al., JAMA Int Med, 2020)

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## Agents Under Investigation

Anakinra	Arbidol (Umifenovir))	Baricitinib	Bevacizumab	Brilacidin	Convalescent plasma
Darunavir/ cobicistat	Disulfiram	Ecuzumab	Favipiravir	Galidesivir (BCX4430)	Griffithsin
IVIG	Nelfinavir	Niclosamide	REGN3048	Sarilumab	Sofosbuvir
	TZLS-501	Vitamin C	XueBiJing		

• McCreary E, Pogue J. OFID. 2020. <https://doi.org/10.1093/ofid/ofaa105>

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## (Additional) Roles of Pharmacists and Associated Personnel

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## Assist With Symptom Management For Patients W/ Minor Viral Illnesses

SYMPTOMATIC  
CARE

Over the  
Counter

Cough

Nasal Congestion

Rhinorrhea

Pain

Fever

Throat Pain

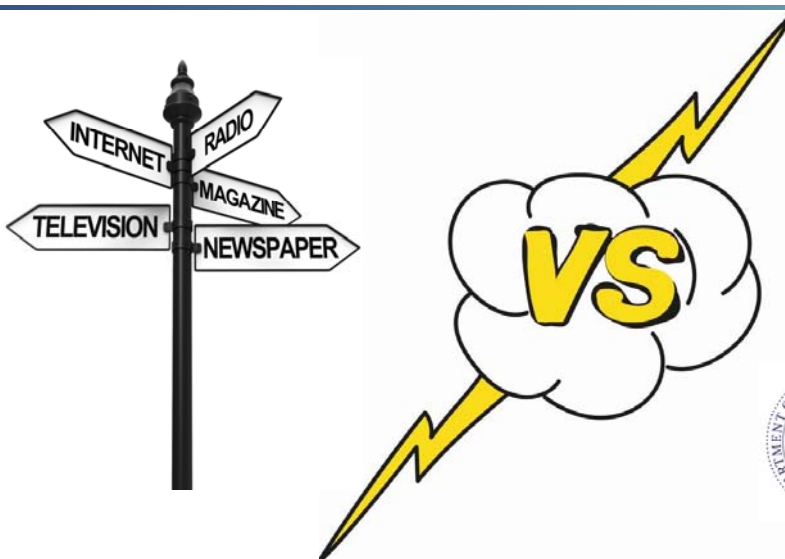
• <https://www.idstewardship.com/five-ways-pharmacists-can-help-coronavirus-sars-cov-2-outbreak/>

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## Direct People To Reliable Resources



World Health  
Organization



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## Keep Up With Evolving Literature And Related Situations

CDC

WHO

Academic  
Journals

Institutional  
Correspondence

Social Media\*

Academic  
Listsers

Internationally  
Available  
Tracking

• <https://www.idstewardship.com/five-ways-pharmacists-can-help-coronavirus-sars-cov-2-outbreak/>

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## Shortages



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# Educational Opportunities for the Public

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## Media

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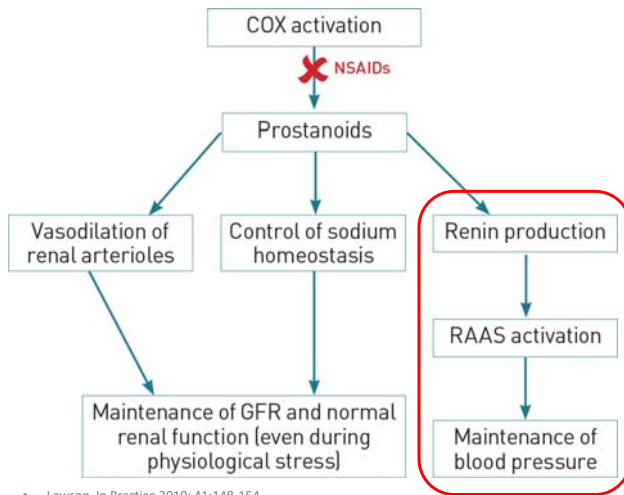


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## NSAIDs



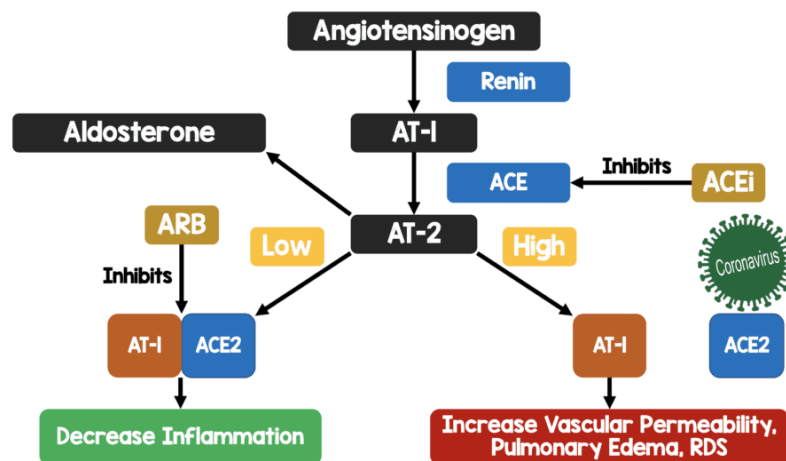
- Lawson. In Practice 2019; 41:148-154
- <https://twitter.com/WHO>

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## ACEi/ARBs



- Rezaie, S. <https://rebelem.com/covid-19-the-novel-coronavirus-2019/>.
- Accessed March 21, 2020

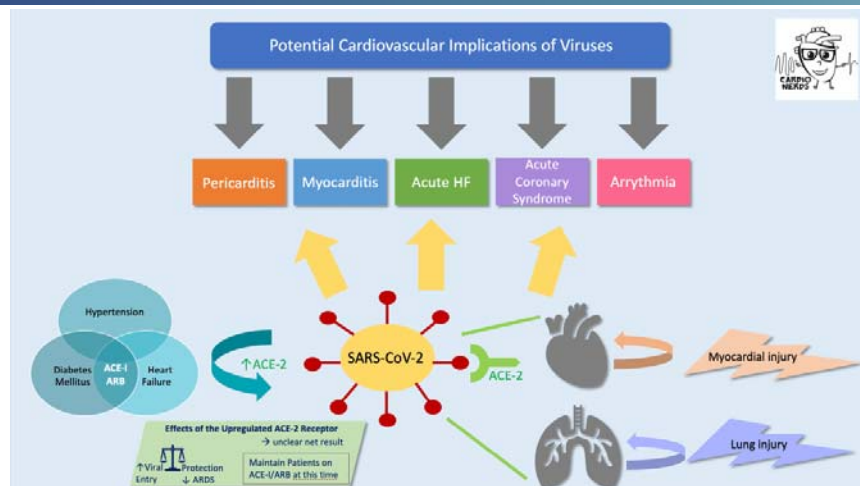
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## ACEi/ARBs



“...wish to highlight the **lack of any evidence** supporting harmful effect of ACEi and ARB in the context of the pandemic COVID-19 outbreak... **strongly recommend that physicians and patients should continue treatment with their usual anti-hypertensive therapy** because there is no clinical or scientific evidence to suggest that treatment with ACEi or ARBs should be discontinued because of the Covid-19 infection.

- Hiremath, P. <https://www.cardionerds.com/episodes/covid19/>;
- [https://www.escardio.org/Councils/Council-on-Hypertension-\(CHT\)/News/position-statement-of-the-esc-council-on-hypertension-on-ace-inhibitors-and-ang](https://www.escardio.org/Councils/Council-on-Hypertension-(CHT)/News/position-statement-of-the-esc-council-on-hypertension-on-ace-inhibitors-and-ang); <https://www.acc.org/latest-in-cardiology/articles/2020/03/17/08/59/hfsa-acc-aha-statement-addresses-concerns-re-using-raas-antagonists-in-covid-19>; Accessed March 21, 2020

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## Pregnancy

### Transmission from mother to fetus/newborn

- Unknown; no virus detected in amniotic fluid or breastmilk in limited number of cases
- Preterm birth reported, but **unclear** that outcomes related to maternal infection

### Breastfeeding

- No evidence of transmission via breast milk
- Mothers with influenza continue breastfeeding while taking precautions to avoid spreading through respiratory droplets
- PROPER HAND-WASHING PRECAUTIONS AND PUMP CLEANING!
- Consider having someone who is well feed expressed milk to infant.

- <https://www.cdc.gov/coronavirus/2019-ncov/prepare/pregnancy-breastfeeding.html>

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# Stigma

“a set of negative and often unfair beliefs that a society or group of people have about something.” – Merriam-Webster Dictionary

## Occurrence

- Common during disease outbreaks

## Affected

- People, place or things
- Minorities at risk

## Psychological/ economical

- Social avoidance/rejection
- Denial of healthcare, education, housing or employment
- Physical violence

## Assumptions

- Distraction from task at hand
- “invincible” – ignoring public health messages

- [https://emergency.cdc.gov/cerc/cerccorner/article\\_123016.asp](https://emergency.cdc.gov/cerc/cerccorner/article_123016.asp)
- <https://www.cdc.gov/coronavirus/2019-ncov/about/related-stigma.html>

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# Resilience

“the ability of something to return to its original shape after it has been pulled, stretched, pressed, bent, etc.” – Merriam-Webster Dictionary

## Public Health

- Ability to anticipate, withstand, recover, and evolve to be even stronger after an event

## Affected

- “After a disaster, # of people with psychological trauma >>> the # of people with physical injury by as much as 40 to 1...”

## Levels

- Individual – before, during and after
- Community – ability to function at lowest-point needed for success (not the same as pre-disaster)

- <https://blogs.cdc.gov/publichealthmatters/2017/08/predicting-community-resilience-and-recovery-after-a-disaster/>

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## Key Takeaways

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- COVID-19 has quickly proven to be a highly virulent and detrimental pandemic
- Key infection prevention practices should be practiced to slow the spread of the virus
- Sound, confirmatory data on potential therapeutics is largely lacking; therapy is extrapolated from related viruses or case reports
- Pharmacists are at the front-line for providing education about safe practices, the pandemic, stigma and resilience

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## Acknowledgements

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- Sarah Elizabeth Davis, PharmD

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# Thank You

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