

COVID 19

BUMC-P

Edwin Yu

Coronavirus

Non-SARS

(Human)

URTI - common cold

229E

NL63

OC43

HKU1

SARS

(Zoonotic)

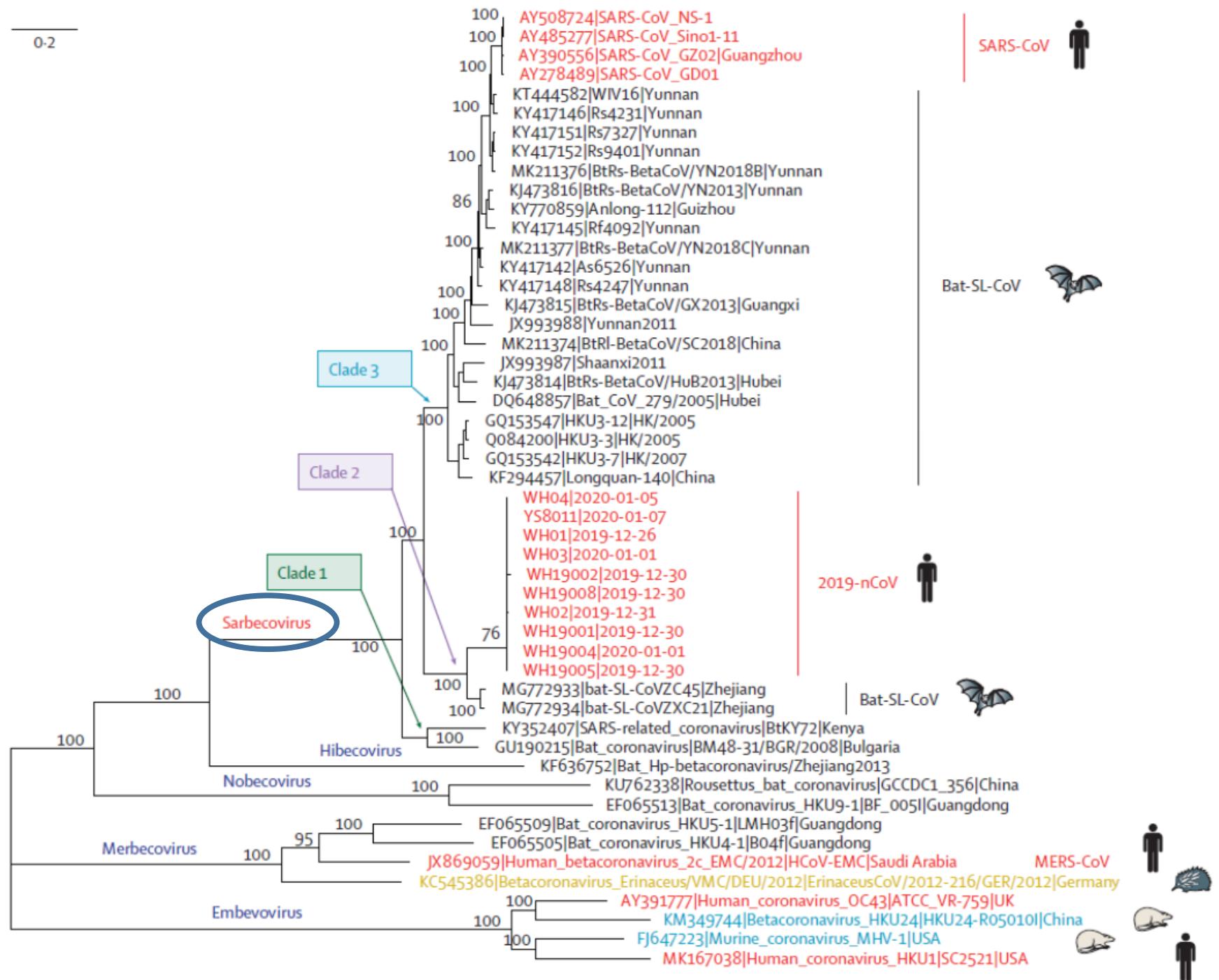
LRTI - pneumonia

SARS Co-V

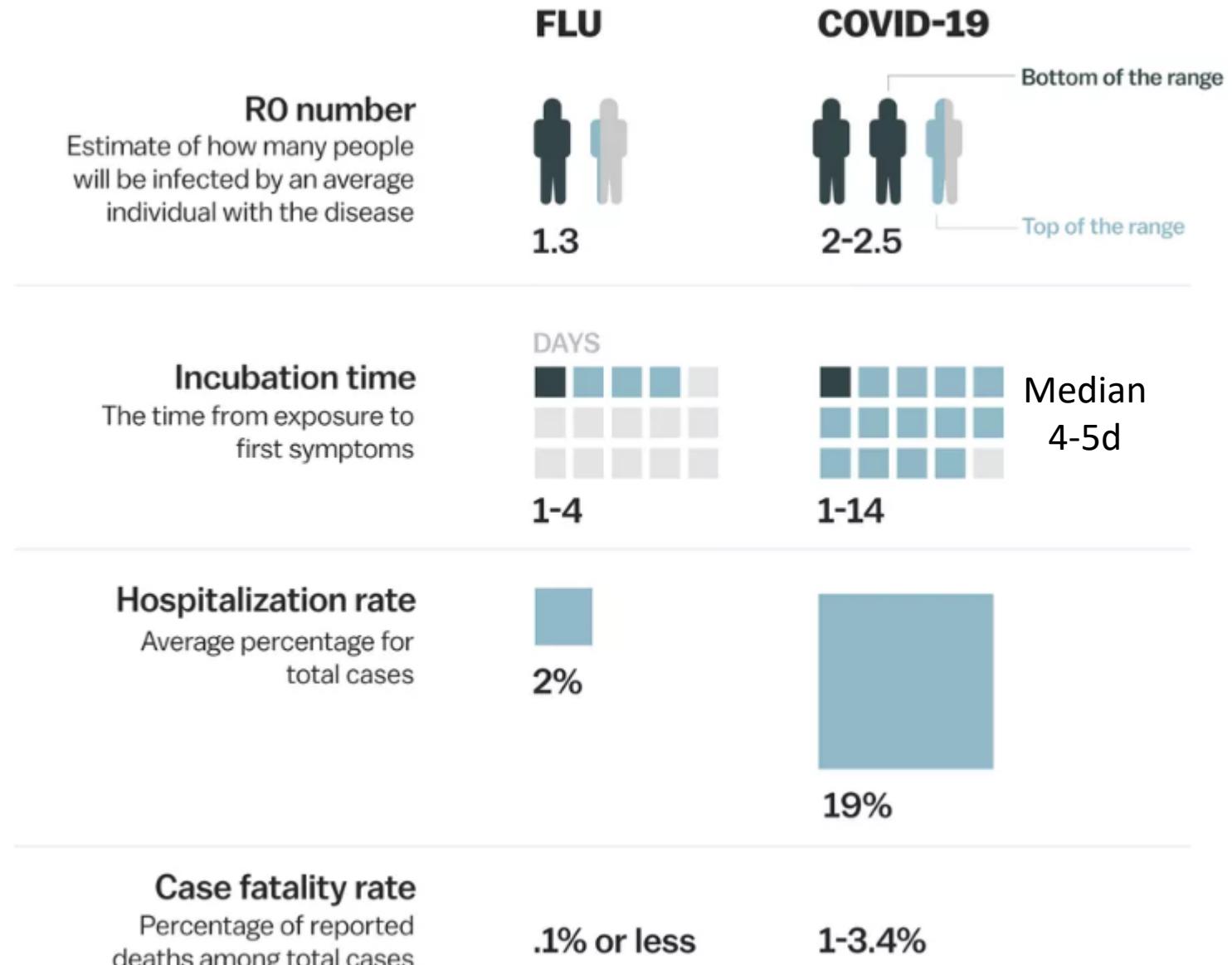
MERS Co-V

SARS Co-V-2 / 2019 nCoV
(2019 novel Coronavirus)

0.2



How seasonal flu and Covid-19 compare



Clinical Presentation

CHINA

- Severity

- Asymptomatic infection
 - Low grade fever, CT with GGO
- Mild 80%
 - No or mild pneumonia
- Severe 15%
 - Hypoxia, dyspnea
- Critical 5%
 - Resp failure, shock, MODS
 - ~50% fatality rate

Signs and symptoms	TOTAL	ICU	NON-ICU	
Fever	136 (98.6)	36 (100)	100 (98.0)	>.99
Fatigue	96 (69.6)	29 (80.6)	67 (65.7)	.10
Dry cough	82 (59.4)	21 (58.3)	61 (59.8)	.88
Anorexia	55 (39.9)	24 (66.7)	31 (30.4)	<.001
Myalgia	48 (34.8)	12 (33.3)	36 (35.3)	.83
Dyspnea	43 (31.2)	23 (63.9)	20 (19.6)	<.001
Expectoration	37 (26.8)	8 (22.2)	29 (28.4)	.35
Pharyngalgia	24 (17.4)	12 (33.3)	12 (11.8)	.003
Diarrhea	14 (10.1)	6 (16.7)	8 (7.8)	.20
Nausea	14 (10.1)	4 (11.1)	10 (9.8)	>.99
Dizziness	13 (9.4)	8 (22.2)	5 (4.9)	.007
Headache	9 (6.5)	3 (8.3)	6 (5.9)	.70
Vomiting	5 (3.6)	3 (8.3)	2 (2.0)	.13
Abdominal pain	3 (2.2)	3 (8.3)	0 (0)	.02

JAMA 2020; 323(11): 1061-9

Clinical Case #1

79 F presents with altered mental status. Brought in by EMS from airport because of confusion.

PMH hyperlipidemia

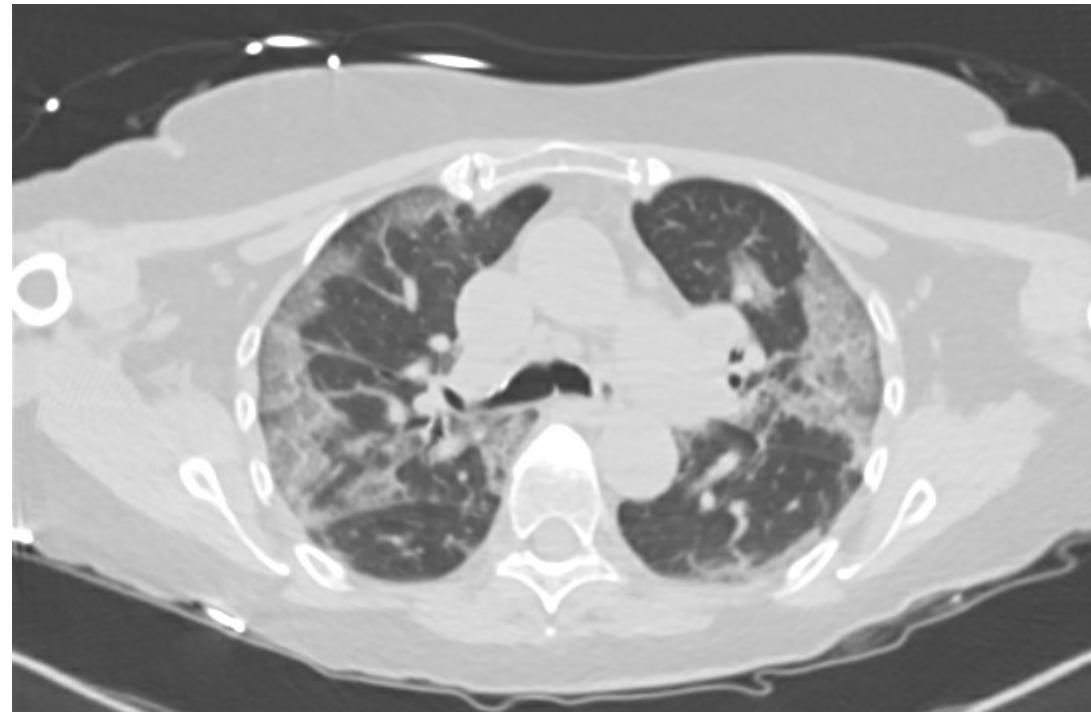
T 37.9 C, P113, RR30, BP 120/61, O₂ SAT 93%RA

Portable CXR - negative

Should you rule-out COVID?

- A. Yes
- B. No
- C. Need more information first

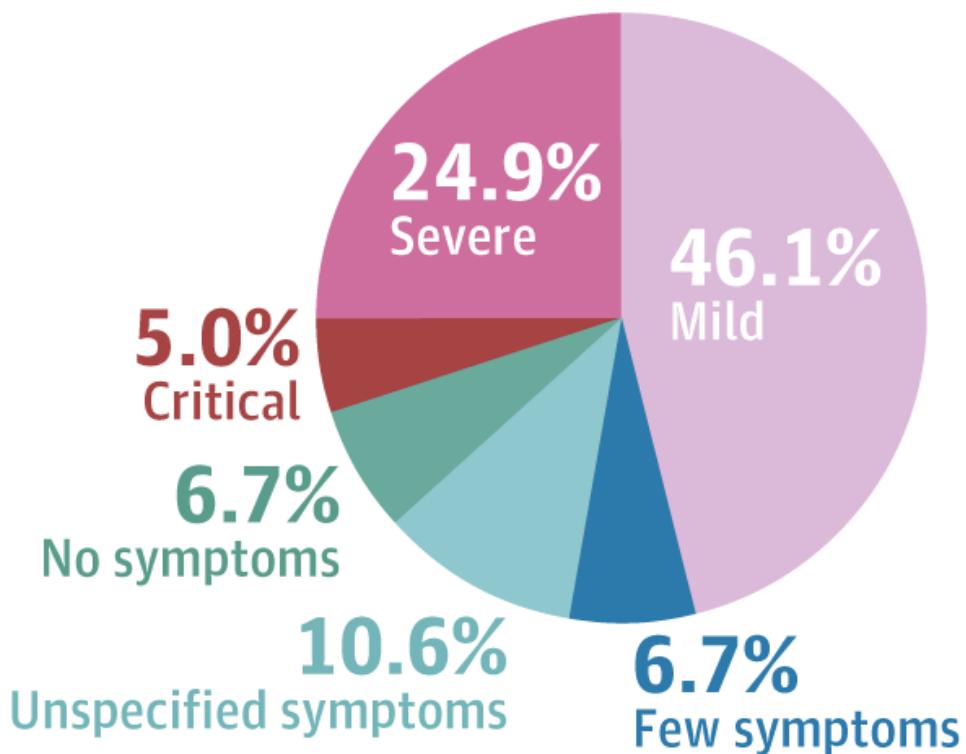
Clinical Case #1



Clinical Presentation

ITALY

Cases by severity



JAMA. Published online March 17, 2020.
doi:10.1001/jama.2020.4344

Washington State

Admission symptoms

Cough	11 (47.6)
Shortness of breath	17 (76.2)
Fever ^c	11 (52.4)
Temperature (range), °C	37.6 (35.3-39.2)

21 Patients admitted to the ICU

Mean age 70

Comorbidities 86%

CKD 47%, CHF 42%, DM 33%, COPD 33%

Mean duration of symptoms 3.5d

Abnormal CXR 95%

ICU within 24h of admission 81%

Cardiomyopathy 33%

JAMA. Published online March 19, 2020.
doi:10.1001/jama.2020.4326

SYMPTOMS OF COVID-19

MOST COMMON



Fever



Cough

SOMEWHAT COMMON



Sore throat



Shortness of
breath



Fatigue/aches
and pains



Headache

RARE



Runny or
stuffy nose



Diarrhea

Less common in elderly

Loss of smell/taste

Asymptomatic / Pre-symptomatic

- USS Theodore Roosevelt
- N=382 sample (of 1417 sailors)
- Questionnaire, NP PCR & ELISA
- Median age 30 (58% white)
- **18% asymptomatic**
- FM OR 0.3, SD OR 0.5
- Known contact OR 2.5
- King County Washington SNF
- 76 residents
- 23 lab confirmed positive
- Mean age 80.7
- 43% pre-symptomatic
- **13% asymptomatic**

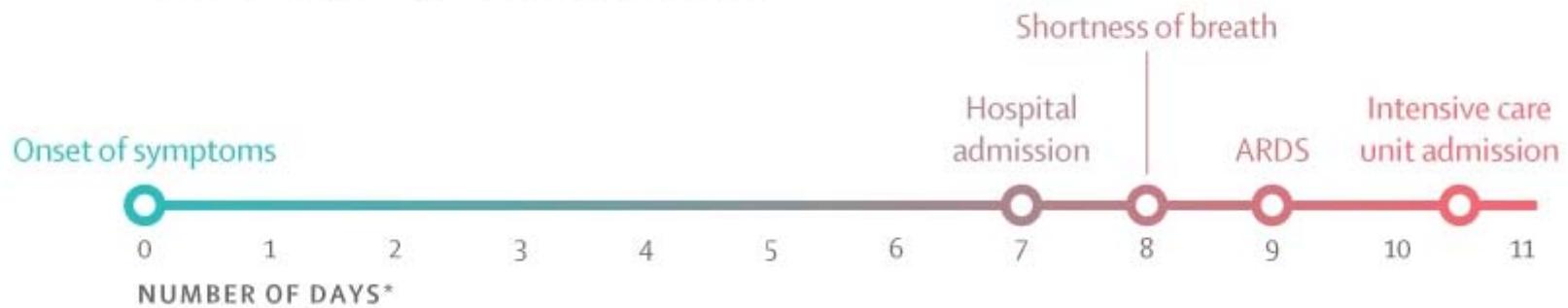
<https://www.cdc.gov/mmwr/volumes/69/wr/mm6913e1>

Asymptomatic / Pre-symptomatic

- NYC – Pregnant women
- 215 symptom screened
- 4 (1.9%) + symptoms, + PCR
- 210 without symptoms -> PCR
- 29 (13.7%) + PCR
 - 3 pre-symptomatic
 - Median length of stay 2d
- 26/33 (79%) “asymptomatic”
- China – nationwide case series
- N=2135 pediatric COVID
- 34% PCR +, 66% suspected
- Median age = 7 y.o.
- 5% asymptomatic
- 51% mild (URI)
- 39% moderate (pneumonia)

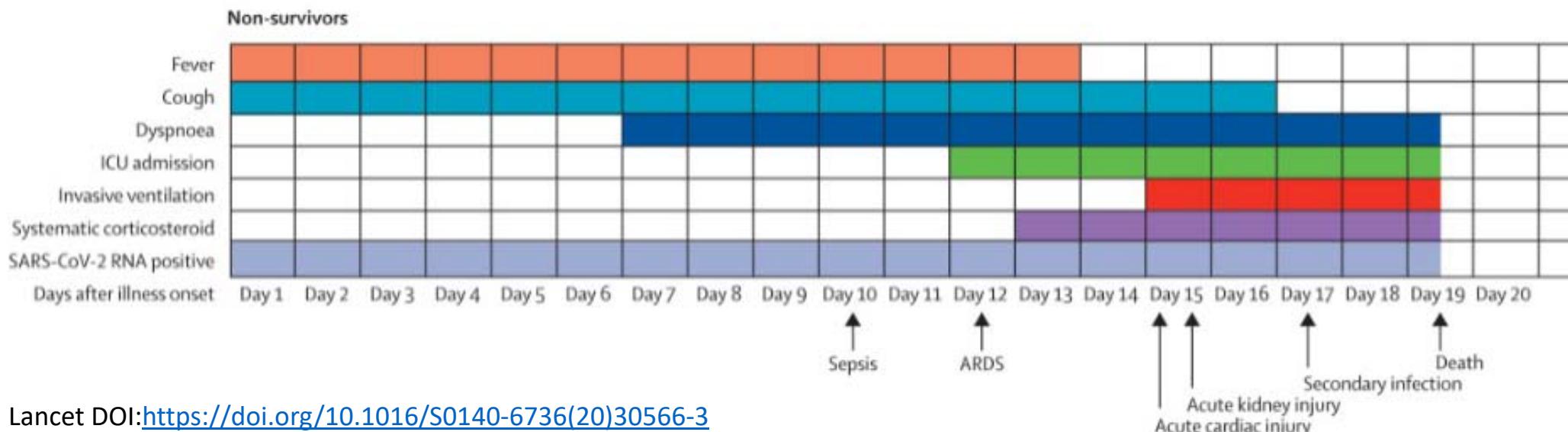
Clinical Course

Timeline of coronavirus onset



~20-30% of
hospitalized will
require ICU

<https://www.thelancet.com/infographics/coronavirus>



Risk Factors

	TOTAL	ICU	NON-ICU	
Comorbidities	64 (46.4)	26 (72.2)	38 (37.3)	<.001
Hypertension	43 (31.2)	21 (58.3)	22 (21.6)	<.001
Cardiovascular disease	20 (14.5)	9 (25.0)	11 (10.8)	.04
Diabetes	14 (10.1)	8 (22.2)	6 (5.9)	.009
Malignancy	10 (7.2)	4 (11.1)	6 (5.9)	.29
Cerebrovascular disease	7 (5.1)	6 (16.7)	1 (1.0)	.001
COPD	4 (2.9)	3 (8.3)	1 (1.0)	.054
Chronic kidney disease	4 (2.9)	2 (5.6)	2 (2.0)	.28
Chronic liver disease	4 (2.9)	0	4 (3.9)	.57
HIV infection	2 (1.4)	0	2 (2.0)	>.99

Condition*	CFR
Cardiovascular disease	10.5%
Diabetes	7.3%
Chronic respiratory disease	6.3%
Hypertension	6.0%
Cancer	5.6%
No comorbidities	0.9%

JAMA 2020; 323(11): 1061-9

<https://www.cebm.net/global-covid-19-case-fatality-rates>

Outcome

USA 2/2–3/16

Age group (yrs) (no. of cases)	Percent		
	Hospitalization	ICU admission	Case-fatality
0–19 (123)	1.6–2.5	0	0
20–44 (705)	14.3–20.8	2.0–4.2	0.1–0.2
45–54 (429)	21.2–28.3	5.4–10.4	0.5–0.8
55–64 (429)	20.5–30.1	4.7–11.2	1.4–2.6
65–74 (409)	28.6–43.5	8.1–18.8	2.7–4.9
75–84 (210)	30.5–58.7	10.5–31.0	4.3–10.5
≥85 (144)	31.3–70.3	6.3–29.0	10.4–27.3
Total (2,449)	20.7–31.4	4.9–11.5	1.8–3.4

Clinical Case #2

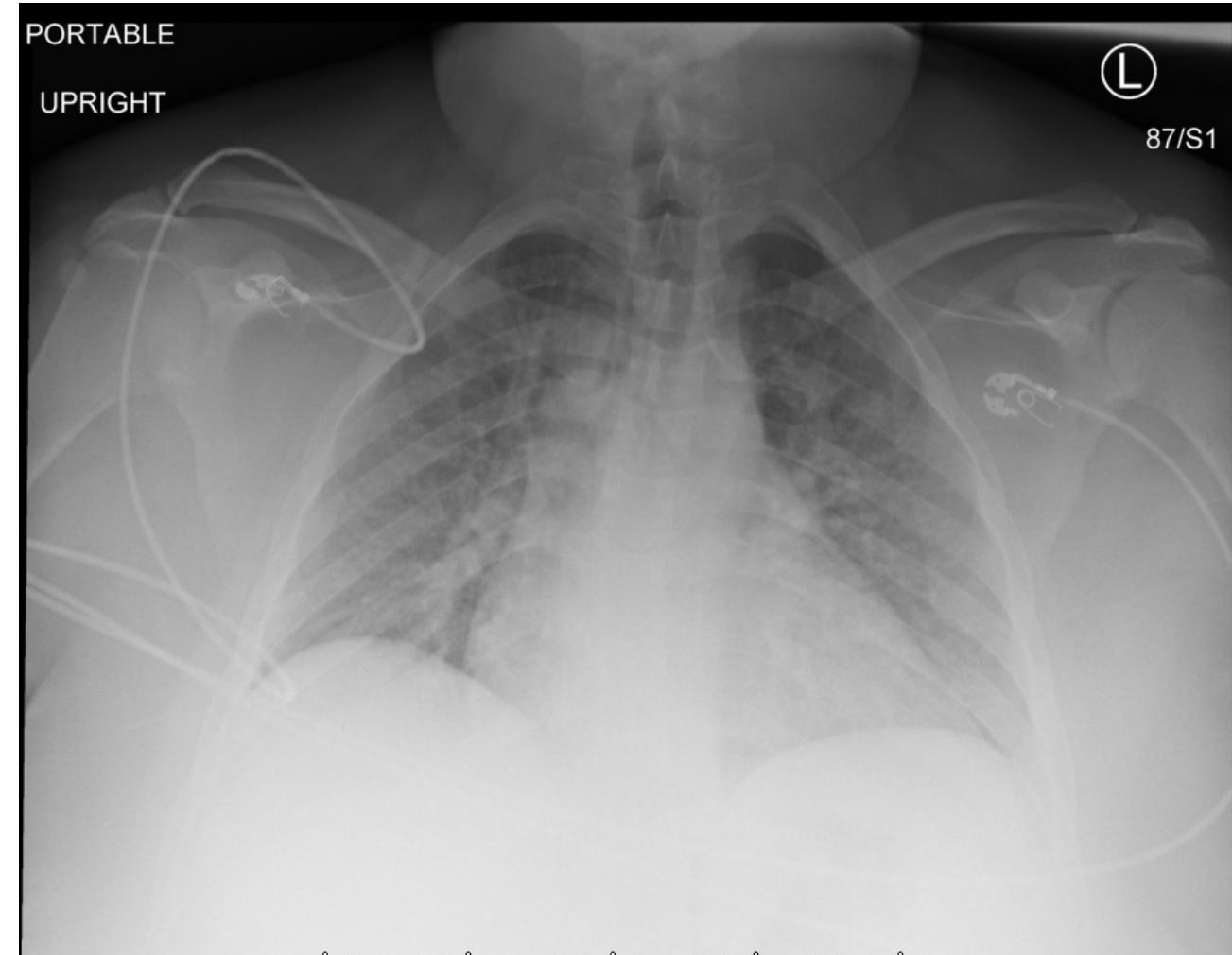
37 F presents with malaise x 5d followed by fevers, aches, dry cough x 2d. Lives in a homeless shelter. Multiple sick contacts with similar symptoms.

PMH asthma, marijuana use

T 39.4 C, P114, RR20, BP 110/55, O₂ SAT 97%RA

WBC 25 (89%N), Cr and LFTs nml

CXR – subtle patchy opacities



Clinical Case #2

Admit, CAP. NP Influenza PCR neg

HD1 - O2 sat 87% RA -> 4L NC

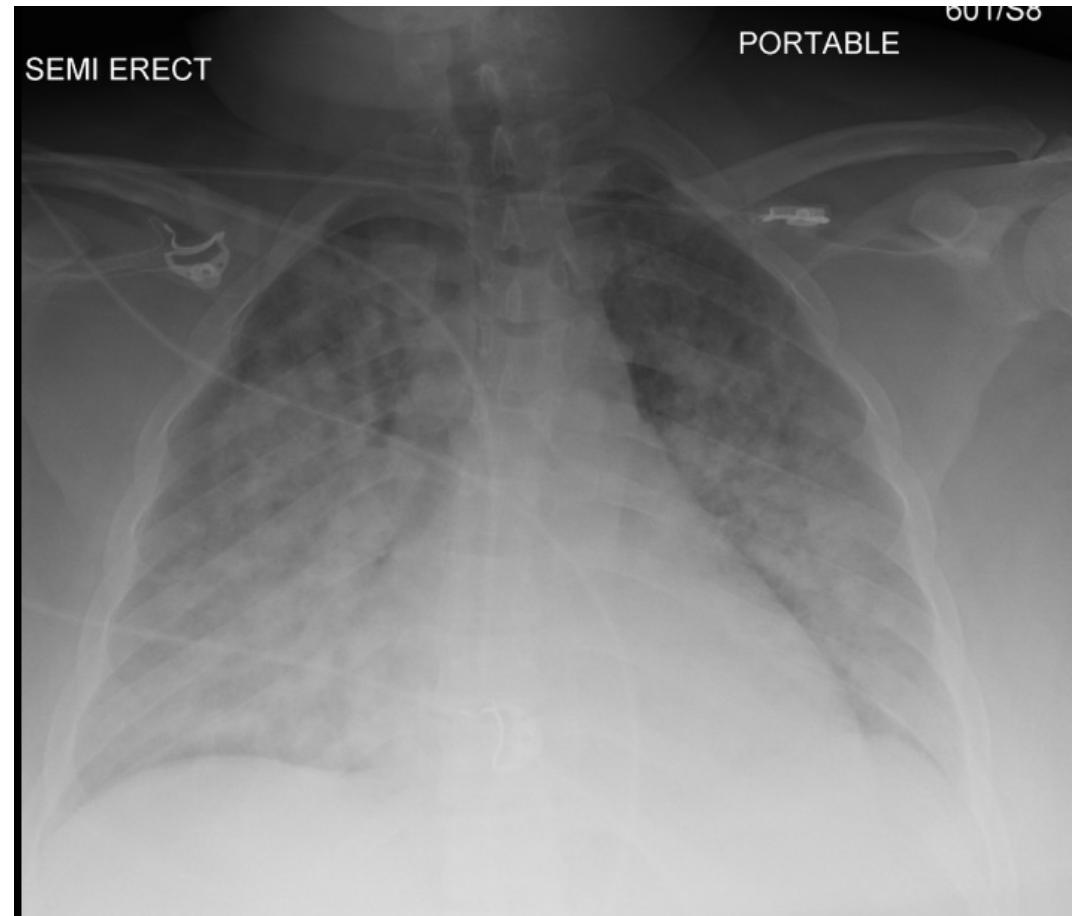
HD2 - O2 sat 88% 5L -> 50% HFNC

HD3 - Persistent fever 39 C

NP RVP multiplex PCR neg, BC neg

Does this patient have COVID?

1. Yes
2. No

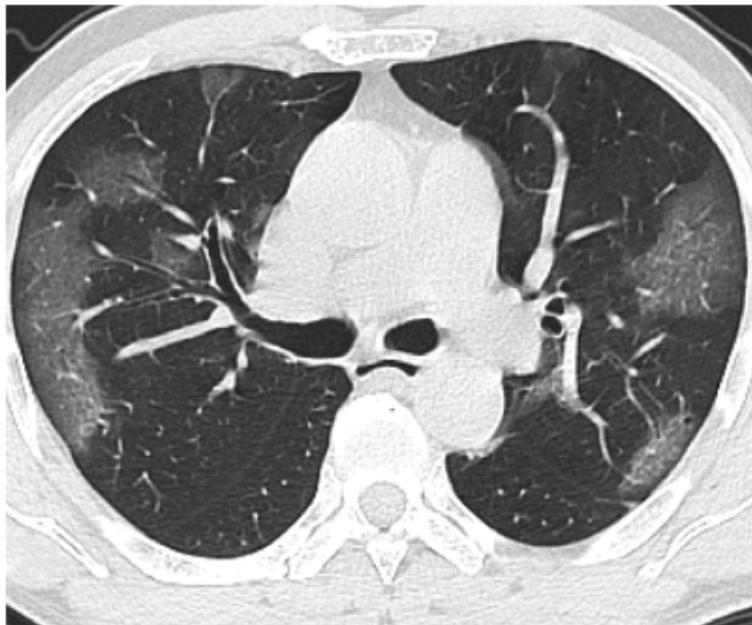


Laboratory and Imaging

	ALL	NON-SEVERE	SEVERE
WBC (median)	4.7	4.9	3.7
WBC > 10 / < 4	6% / 33%	5% / 28%	11% / 61%
Lymph < 1500/mm ³	83%	80%	96%
PLT < 150	36%	32%	57%
CRP > 10 mg/L	60%	56%	81%
PCT > 5 ng/mL	5%	3%	13%
LDH > 250 U/L	41%	37%	58%
	ALL	NON-SEVERE	SEVERE
Abnormal CXR	60%	55%	76%
Abnormal CT	86%	85%	95%

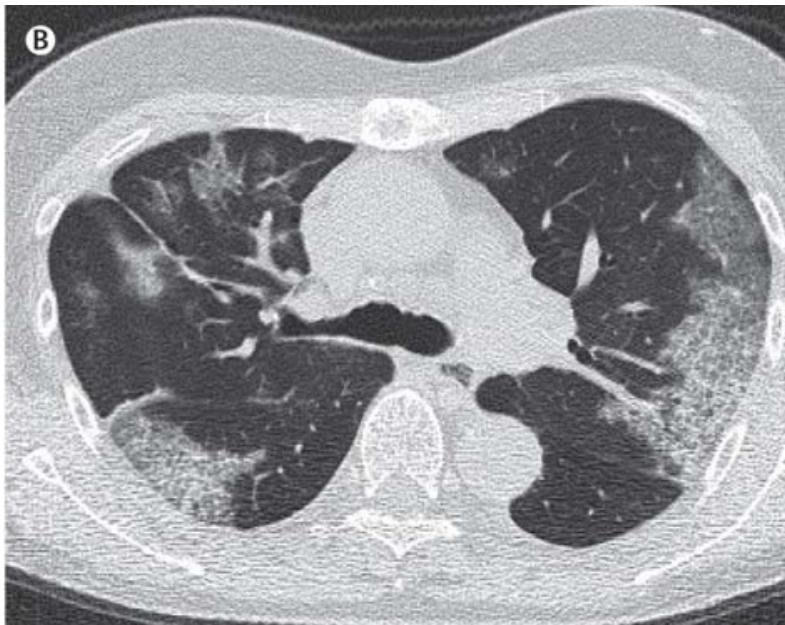
Severe = as defined by ATS/IDSA CAP criteria

Imaging



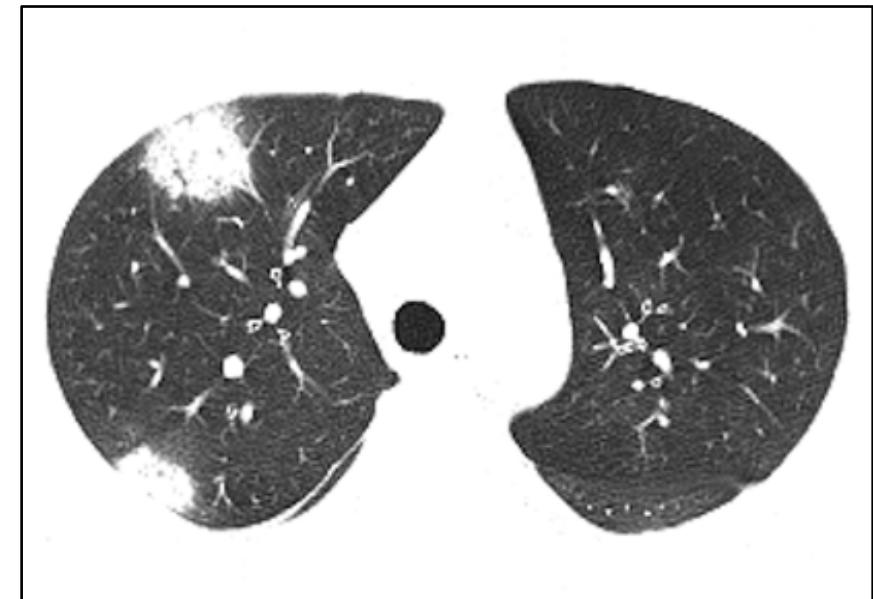
Ground glass opacities

Peripheral
Rounded



Crazy paving

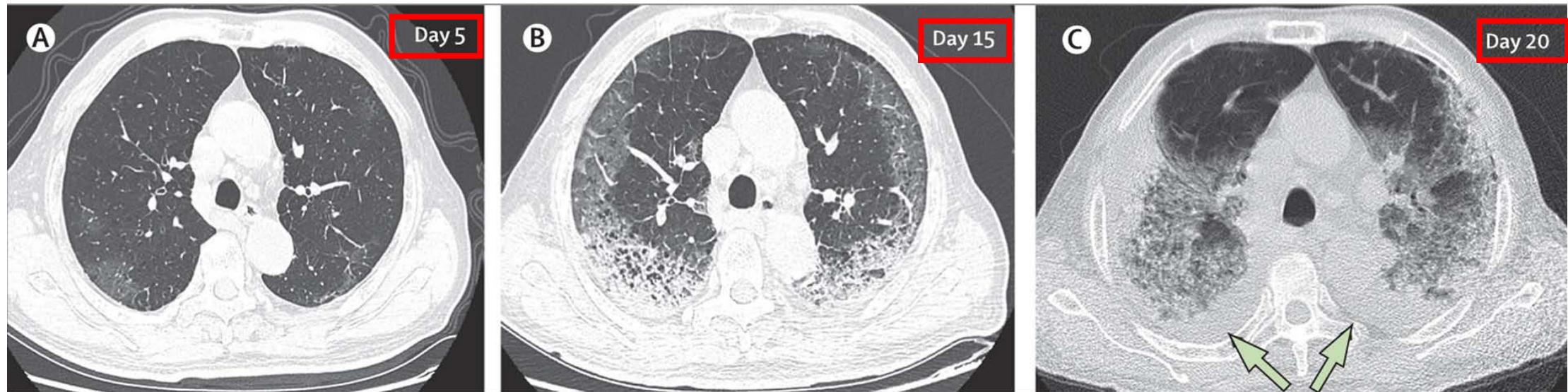
Septal thickening



Consolidation

Rounded

Imaging



Lancet Inf Dis. Radiological findings from 81 patients with COVID-19 pneumonia in Wuhan, China: a descriptive study.
DOI:[https://doi.org/10.1016/S1473-3099\(20\)30086-4](https://doi.org/10.1016/S1473-3099(20)30086-4)

Clinical Case #3

36M found down at home → ED.

VITALS: AF, P117, BP 155/100, RR 22, O₂ SAT 100% RA.

PE: vomitus in airway, crackles throughout all lung fields, GCS 5

Intubated.

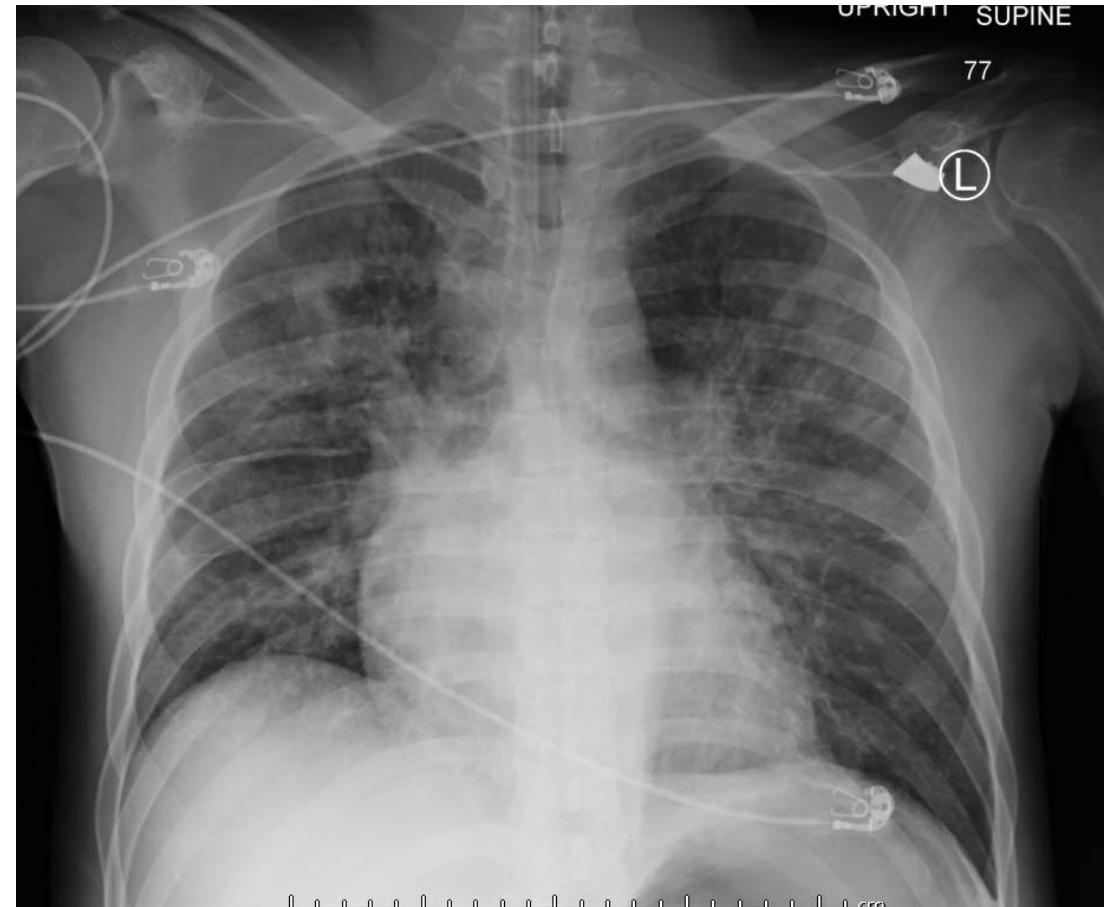
WBC 17, PLT 530. EtOH neg, UDS + Amphetamine, THC

CXR post-intubation: multifocal infiltrates/GGO, ? COVID.

ETA performed – COVID PCR neg

Does this patient have COVID?

- A. Yes
- B. No



China: 52 patients suspected Covid-19 paired sampling throat and sputum

Diagnosis

Table 2. Comparison of qRT-PCR results between throat swabs and sputum specimens

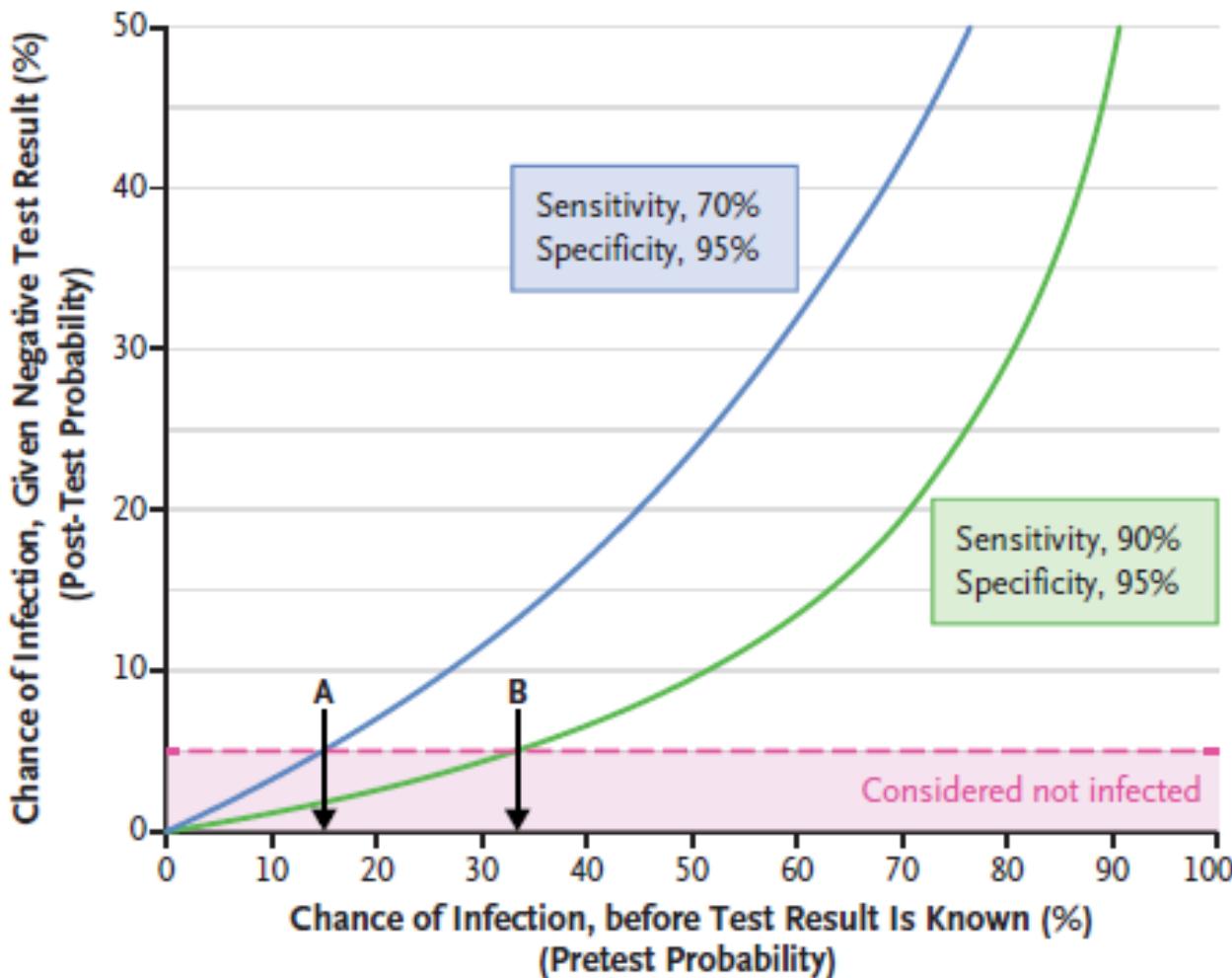
No. (%) of throat swabs result	No. (%) of sputum specimens result	
	Positive	Negative
Positive	19 (36.5%)	4 (7.7%)
Negative	21 (40.4%)	8 (15.4%)

P value = 0.001 by McNemar test.

doi: <https://doi.org/10.1101/2020.02.21.20026187>

Table. Detection Results of Clinical Specimens by Real-Time Reverse Transcriptase-Polymerase Chain Reaction

Specimens and values	Bronchoalveolar lavage fluid (n = 15)	Fibrobronchoscope brush biopsy (n = 13)	Sputum (n = 104)	Nasal swabs (n = 8)	Pharyngeal swabs (n = 398)	Feces (n = 153)	Blood (n = 307)
Positive test result, No. (%)	14 (93)	6 (46)	75 (72)	5 (63)	126 (32)	44 (29)	3 (1)
Cycle threshold, mean (SD)	31.1 (3.0)	33.8 (3.9)	31.1 (5.2)	24.3 (8.6)	32.1 (4.2)	31.4 (5.1)	34.6 (0.7)
Range	26.4-36.2	26.9-36.8	18.4-38.8	16.9-38.4	20.8-38.6	22.3-38.4	34.1-35.4
95% CI	28.9-33.2	29.8-37.9	29.3-33.0	13.7-35.0	31.2-33.1	29.4-33.5	0.0-36.4



Chance of SARS-CoV-2 Infection, Given a Negative Test Result, According to Pretest Probability.

DOI: 10.1056/NEJMp2015897

Complications

- ARDS – “late onset” (~9d)
- Cardiac injury: myocarditis, heart failure, arrhythmias, ACS
- Renal injury: ~20% in ICU, ~30% requiring RRT in MV
- Coagulopathy: PIC, micro/macro, arterial/venous
- Cytokine release syndrome / Hyperferritinemic syndrome
- Neurologic complications: acute CVA, impaired consciousness, encephalopathy, meningitis/encephalitis, GBS
- Pediatric multisystem inflammatory syndrome

Clinical Case #4

51M presents with fevers, cough, dyspnea x9d. COVID +.

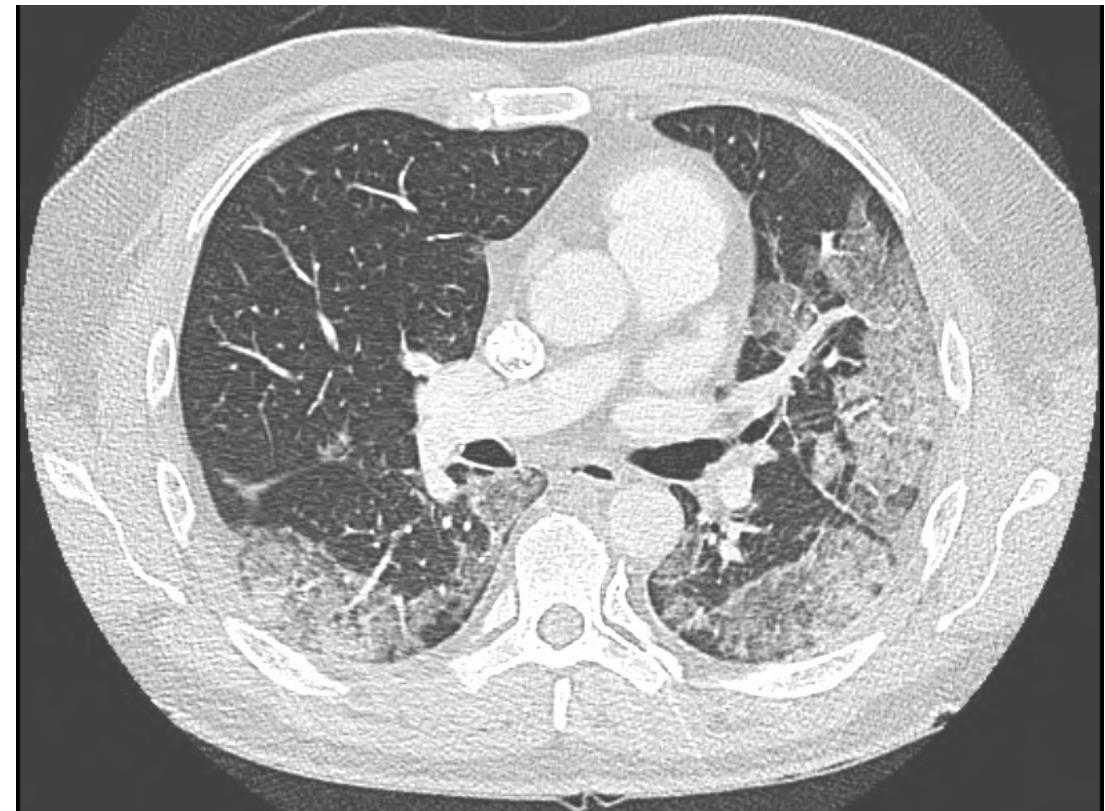
PE: T37.9 C, P70, BP 122/76, O₂ Sat 92% RA, non-toxic appearing

WBC 6.5, PLT 173, Cr 0.9, LFTs nml, CRP 430, D-Dimer 1200 ng/mL

Started on LMWH & dexamethasone

What is the best treatment?

- A. Ceftriaxone + azithromycin
- B. Remdesivir
- C. Hydroxychloroquine
- D. A&B
- E. All of the above



Bacterial Co-infection / Superinfections

Study population	No. (%)
No. of patients	201
Age, median (IQR), y	51 (43-60)
≥65	40 (19.9)
<65	161 (80.1)
Other respiratory pathogen infection	
Other viruses (n = 173)	1 (0.6)
Bacteria ^c (n = 148)	0

JAMAInternMed.doi:10.1001/jamainternmed.2020.0994

Co-infection – concurrent w/ initial
China – Wuhan

- 201 hospitalized patients
- 26% ICU
- 32% co-morbidities (HTN, DM)
- 74% sputum cultures
- Within first day

Superinfection – following initial

- Depends on severity
- Thought to be common
- Prolonged intubation, steroids



Management

- Antivirals
 - Remdesivir
 - RCT, more rapid recovery (11d v 15d), primarily in pts on O₂ (not HF, NIPPV, MV)
 - Hydroxychloroquine
 - Convalescent plasma
- Immunomodulators
 - Corticosteroids
 - RCT, mortality benefit (29% vs 41% IMV; 21.5% vs 25% O₂; 17% vs 13% no O₂)
 - Biologics
- Anticoagulation
 - Heparin/LMWH
 - Retrospective, mortality benefit (33% vs 52% D-Dimer > 6x ULN)

Infection Prevention and Control

PATIENT

Facemask helps limit transmission to others

Keep room door closed

Limit transport/movement outside the room

Cohort cases in a designated unit

Avoid aerosol generating procedures (AGP)
- Nebulizers, NIPPV

Airborn isolation room for AGP
- Intubation, open suction of airways

PROVIDER

Hand hygiene

N95 preferable over facemask

- N95 for AGP/NP swab
- Limited supply of N95
- Remove last after exiting room and closing door

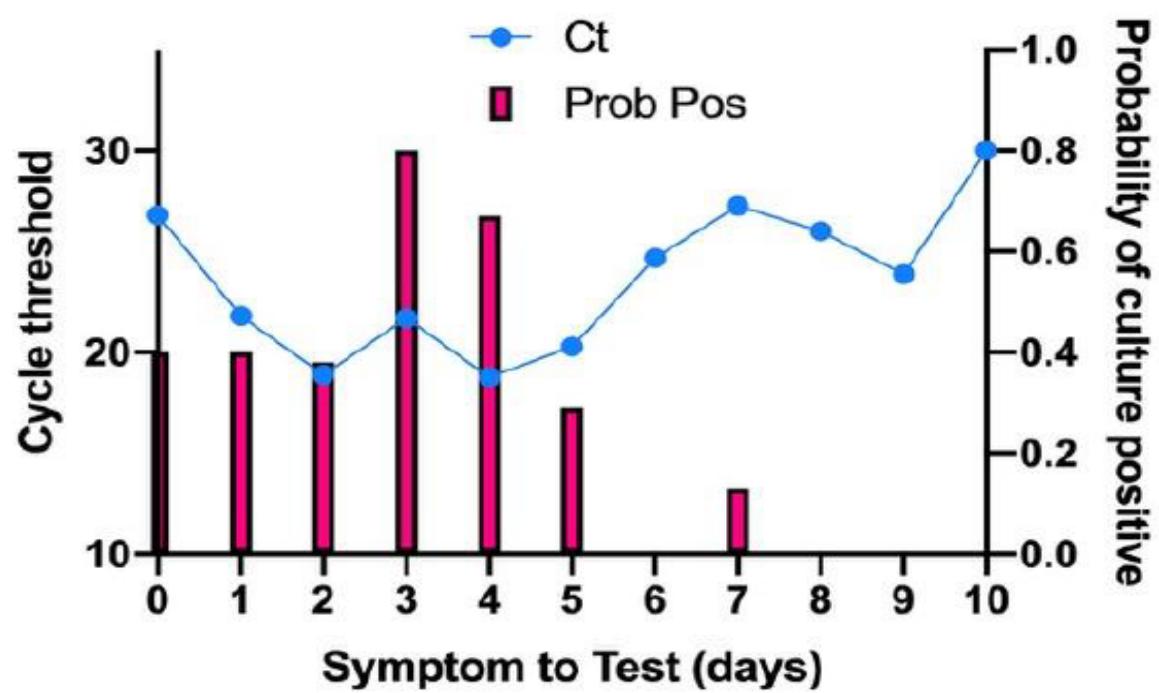
Eye protection

- Goggles or face shield

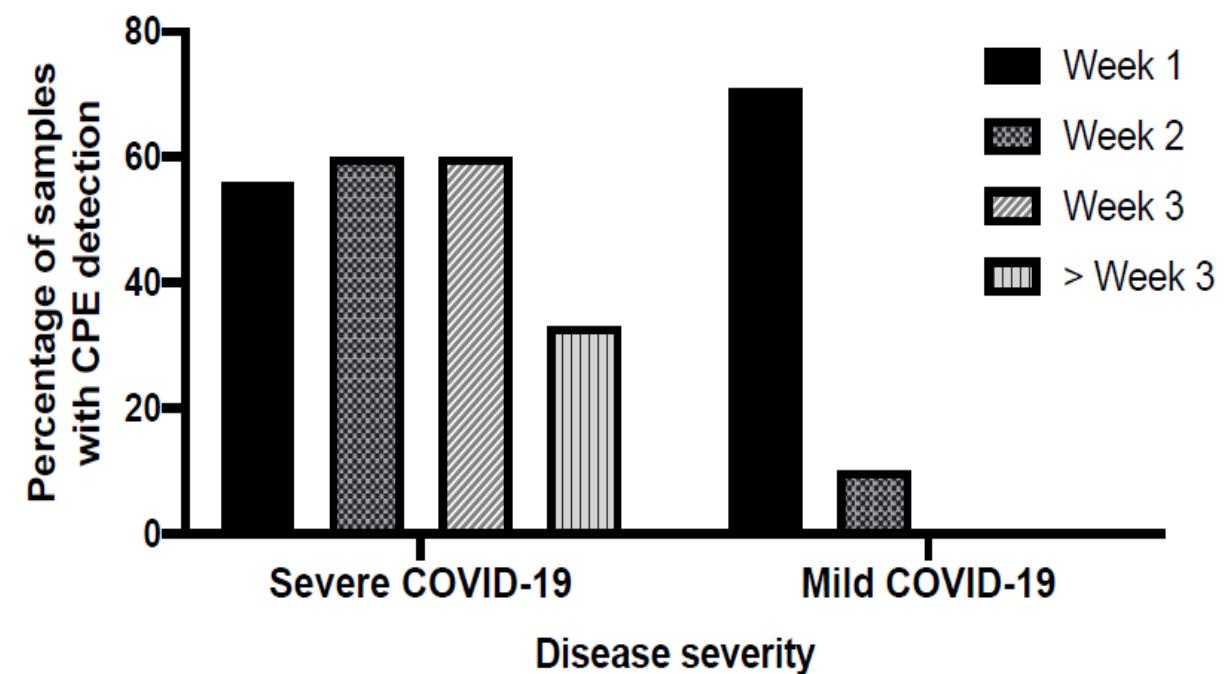
Gloves and gown

If high clinical suspicion, do not d/c isolation

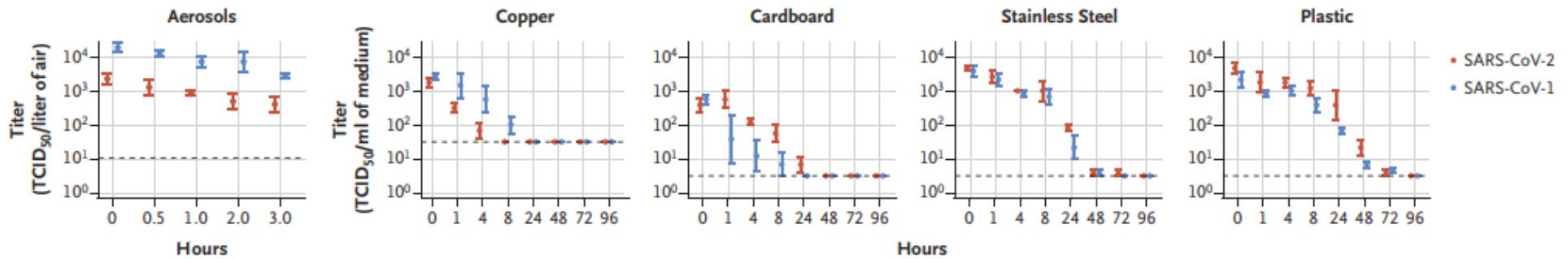
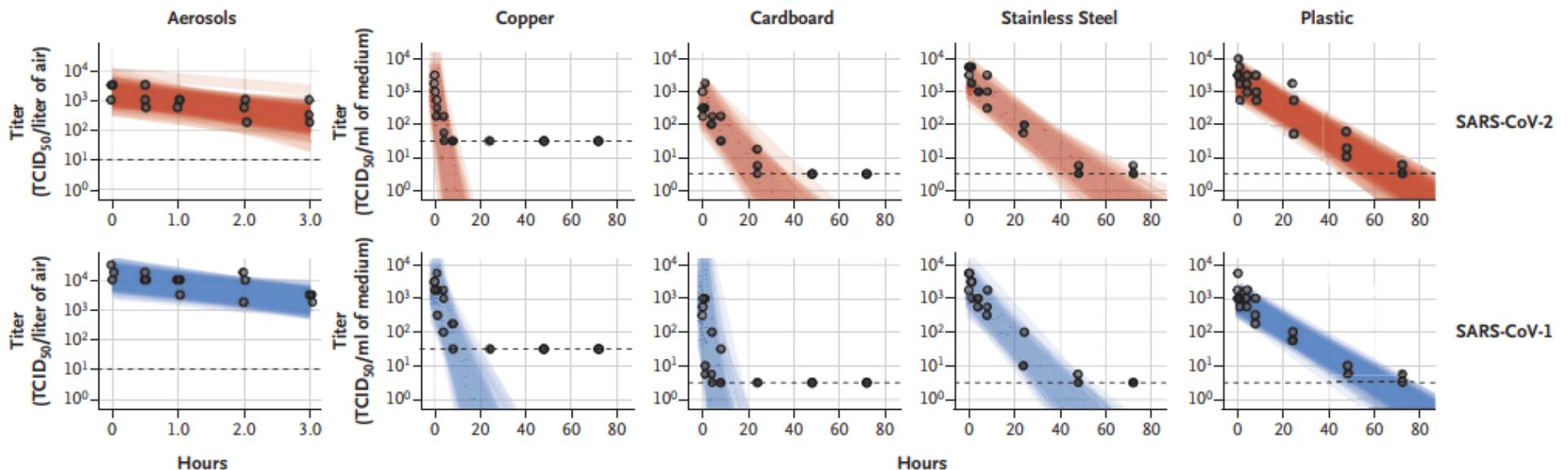
PCR versus Viral Culture



DOI: 10.1093/cid/ciaa638/5842165



DOI: 10.1101/2020.06.10.20127837

A Titors of Viable Virus**B Predicted Decay of Virus Titer****C Half-Life of Viable Virus**