Novel Coronavirus from China: Nuisance Cold Virus or the next Pandemic?

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OBJECTIVES

1. To list the most common human Coronavirus strains-vs-this novel Coronavirus from China
2. To understand the infectivity of this virus, and how it compares with other respiratory viruses
3. To be able to protect oneself in the workplace by listing the proper isolation precautions for transport, in clinics, emergency departments, etc.

Pretest on Coronavirus Lecture

- What is the new WHO designation for 2019-nCoV?
- What is the death rate of 2019-nCoV?
- What isolation methods will protect you from 2019-nCoV?
- COVID-19, for Coronavirus Infectious Disease – 2019

Happy New Year!

- On December 31, 2019, the World Health Organization(WHO) was alerted to several cases of pneumonia in Wuhan City, Hubei Province of China, and the virus detected did not match any other known virus.
- On January 7th, Chinese authorities confirmed that they had identified a new virus, a coronavirus, and in the family of viruses that include the common cold, SARS, MERS, and named it “2019-nCoV”
- On January 14, the sequence of 2019-nCoV was published online, and we read of 14 healthcare workers infected in China

WUHAN CORONAVIRUS OUTBREAK*

- CORONAVIRUS CASES:
  95,046
- DEATHS:
  3249
- RECOVERED:
  51,433

* As of 3-4-2020; Worldometer
https://www.worldometers.info/coronavirus/

The Triangle has its Eye on COVID-19

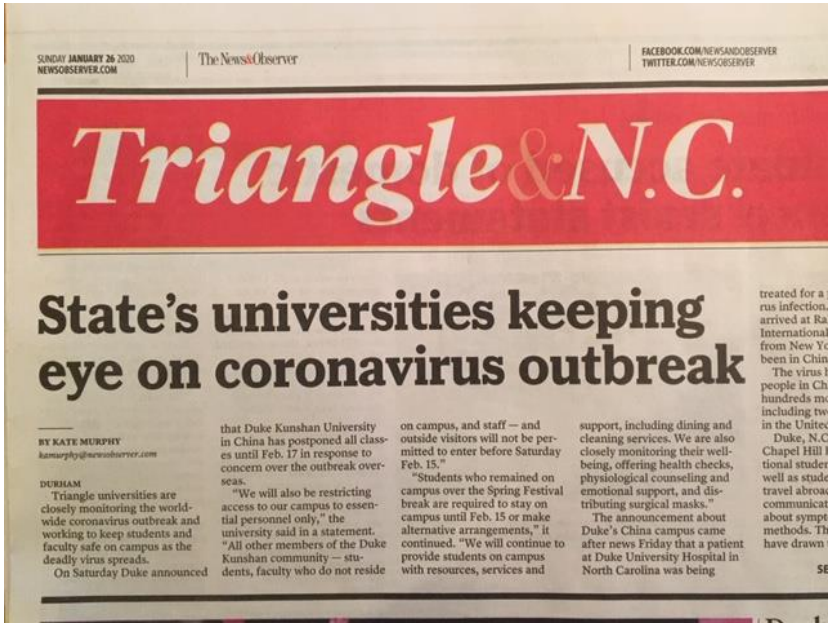
LOCAL

Passenger that landed at RDU tests negative for coronavirus 3A

MONDAY JANUARY 27 2020 $2 Cloudy, showers 53°/35° See 10B

&Observer

OBSERVER.COM



SUNDAY JANUARY 26 2020
NEWSOBSERVER.COM

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Triangle&N.C.

State's universities keeping eye on coronavirus outbreak

BY KATE MURPHY
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DURHAM

Triangle universities are closely monitoring the worldwide coronavirus outbreak and working to keep students and faculty safe on campus as the deadly virus spreads.

On Saturday Duke announced that Duke Kunshan University in China has postponed all classes until Feb. 17 in response to concern over the outbreak overseas.

"We will also be restricting access to our campus to essential personnel only," the university said in a statement. "All other members of the Duke Kunshan community — students, faculty who do not reside on campus, and staff — and outside visitors will not be permitted to enter before Saturday Feb. 15."

"Students who remained on campus over the Spring Festival break are required to stay on campus until Feb. 15 or make alternative arrangements," it continued. "We will continue to provide students on campus with resources, services and support, including dining and cleaning services. We are also closely monitoring their well-being, offering health checks, physiological counseling and emotional support, and distributing surgical masks."

The announcement about Duke's China campus came after news Friday that a patient at Duke University Hospital in North Carolina was being

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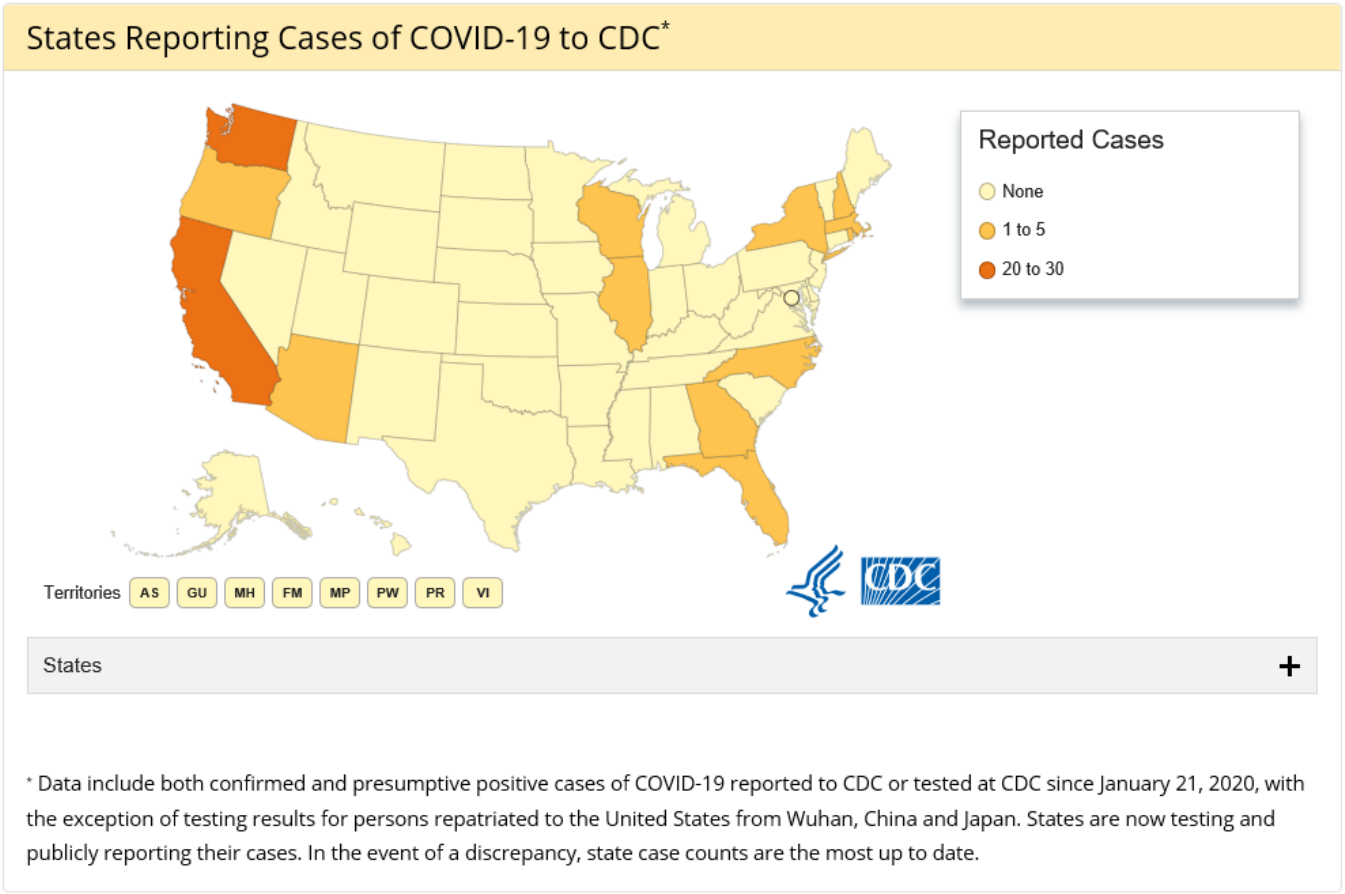
COVID-19 in US*



***as of 3-4-2020**
https://www.cdc.gov/coronavirus/2019-ncov/cases-in-us.html

What is going to happen with COVID-19?

- What is the source of the COVID-19?
- What is it’s infectivity?
- What is the incubation period?
- What is the mortality rate?
- How long can it live on surfaces?
- What measures can we take to prevent it?
- Will it result in a pandemic?
- Will we have a treatment or vaccine?

PATIENT CASE

A male patient was admitted February 22, 2003 to a Hong Kong hospital in respiratory distress.

He had symptoms of a respiratory tract infection since February 15 in Guangdong Province, China. He died the following day.

PATIENT CASE

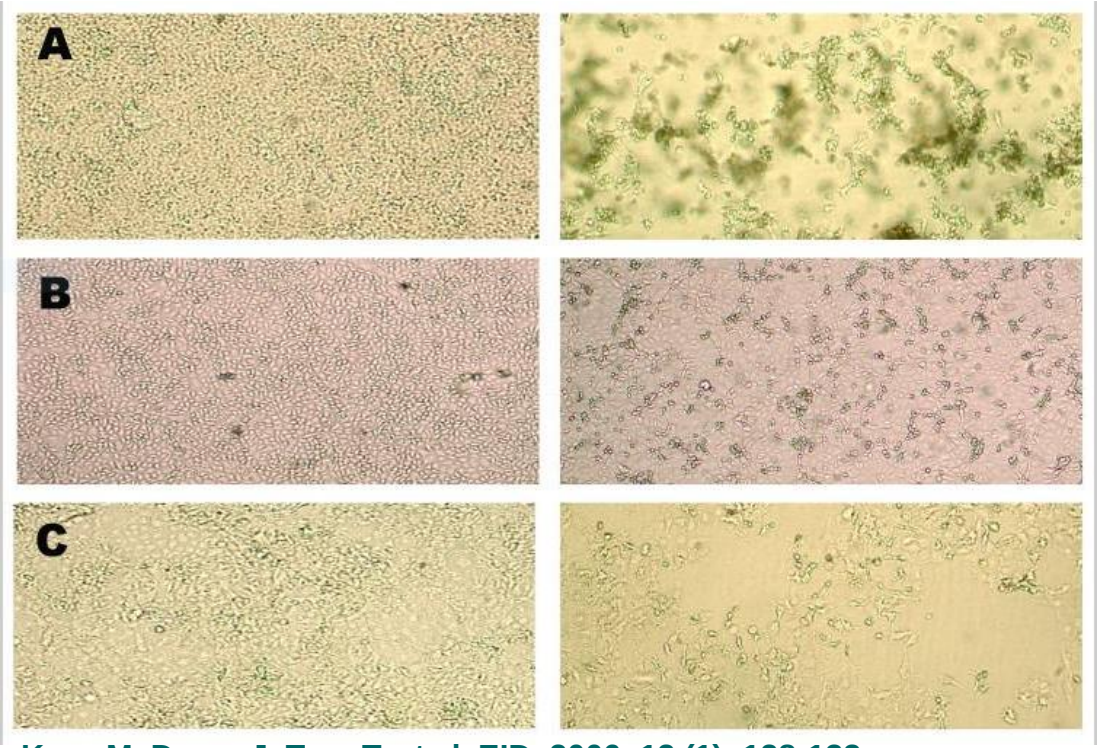
Differential Diagnosis

- Influenza A, B
- “Avian Flu”
- Adenovirus
- Hantavirus Pulmonary Syndrome
- Parainfluenza
- ARDS

Search for Pathogen

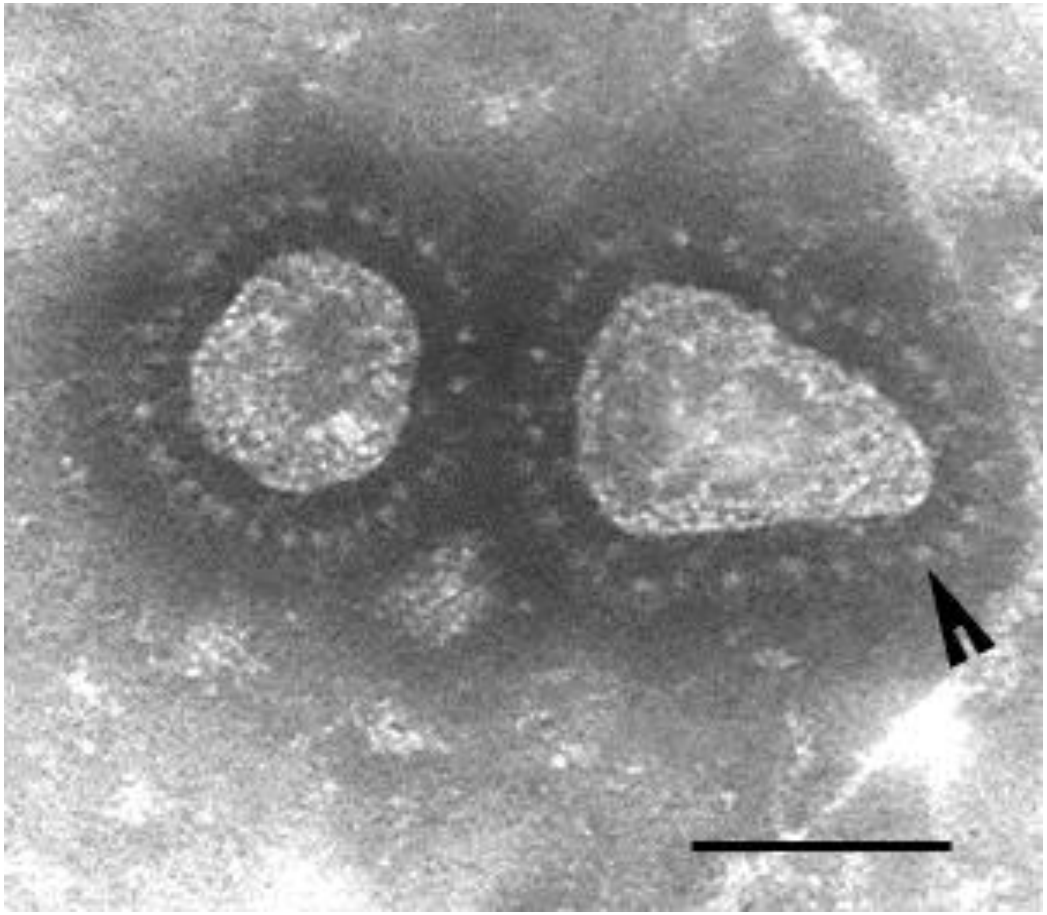
- Lung Pathology
- Lack of isolation of Influenza A, B, Parainfluenza, Adenovirus, etc.
- Virus isolation on Vero 6 cells with classic “rounding up”

Syncytial Giant Cells



Kaye M, Druce J, Tran T, et al. EID. 2006; 12 (1): 128-133.

Electron Microscopy



SARS UPDATE

Search for Pathogen

- EM — Coronavirus morphology from Canadian and Hanoii cases
- IFA — Seroconversions with paired sera
  No non-ill controls with antibody

- Viral Sequences – Coronavirus-like Agent–distinct from known human isolates OC43 and 229E

CORONAVIRUSES

- Isolated in 1960 from a child with a common cold among an outbreak in which Rhinovirus was not isolated*
- 2 human strains known (prior to SARS) 229E and OC43; three more added since SARS, including MERS, HKU1 and NL63**
- Etiology of “winter colds” and uncommon cause of self-limited Pneumonia

*Kendall, EJC, et al. Br Med J. 1962:82-86

**Pyrd K, Berkhout B, van der Hoek L. 2007. J Virology; 81 (7): 3051-3057.

Coronavirus Infections in Military Recruits

Three-Year Study with Coronavirus Strains OC43 and 229E[1-3]

RICHARD P. WENZEL, J. OWEN HENDLEY, JOHN A. DAVIES, and JACK M. GWALTNEY, JR.[4]

TABLE 3

INITIAL SERUM ANTIBODY TITERS AND SEROCONVERSIONS TO CORONAVIRUSES 229E AND OC43 IN MARINE RECRUITS, PARRIS ISLAND, S.C., AND CAMP LEJEUNE, N.C.

OC43			229E		
Initial Serum Titer	No. of Convertors*/ No. of Men	(%)	Initial Serum Titer	No. of Convertors*/ No. of Men	(%)
< 10	5/56	(9)	< 4	12/297	(4)
10	19/108	(18)	4	0/29†	
20	15/113	(13)	8	0/25	
40	3/90	(3)**	⩾ 16	0/6	
⩾ 80	0/17				

*Convertors = men with fourfold antibody rises.

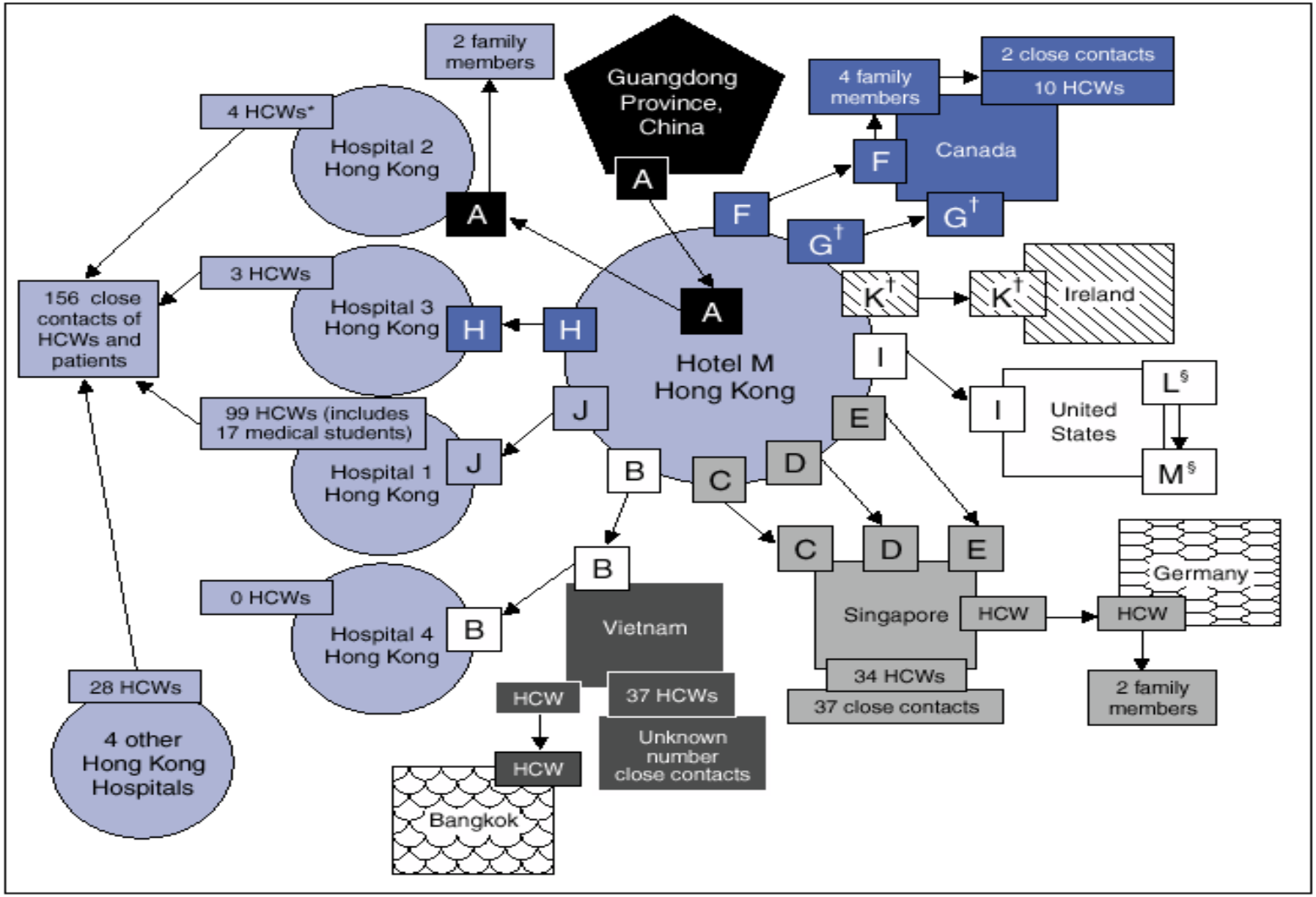
Pneumonia with Coronavirus
OC43 in Adult Recruits

Respiratory signs and symptoms

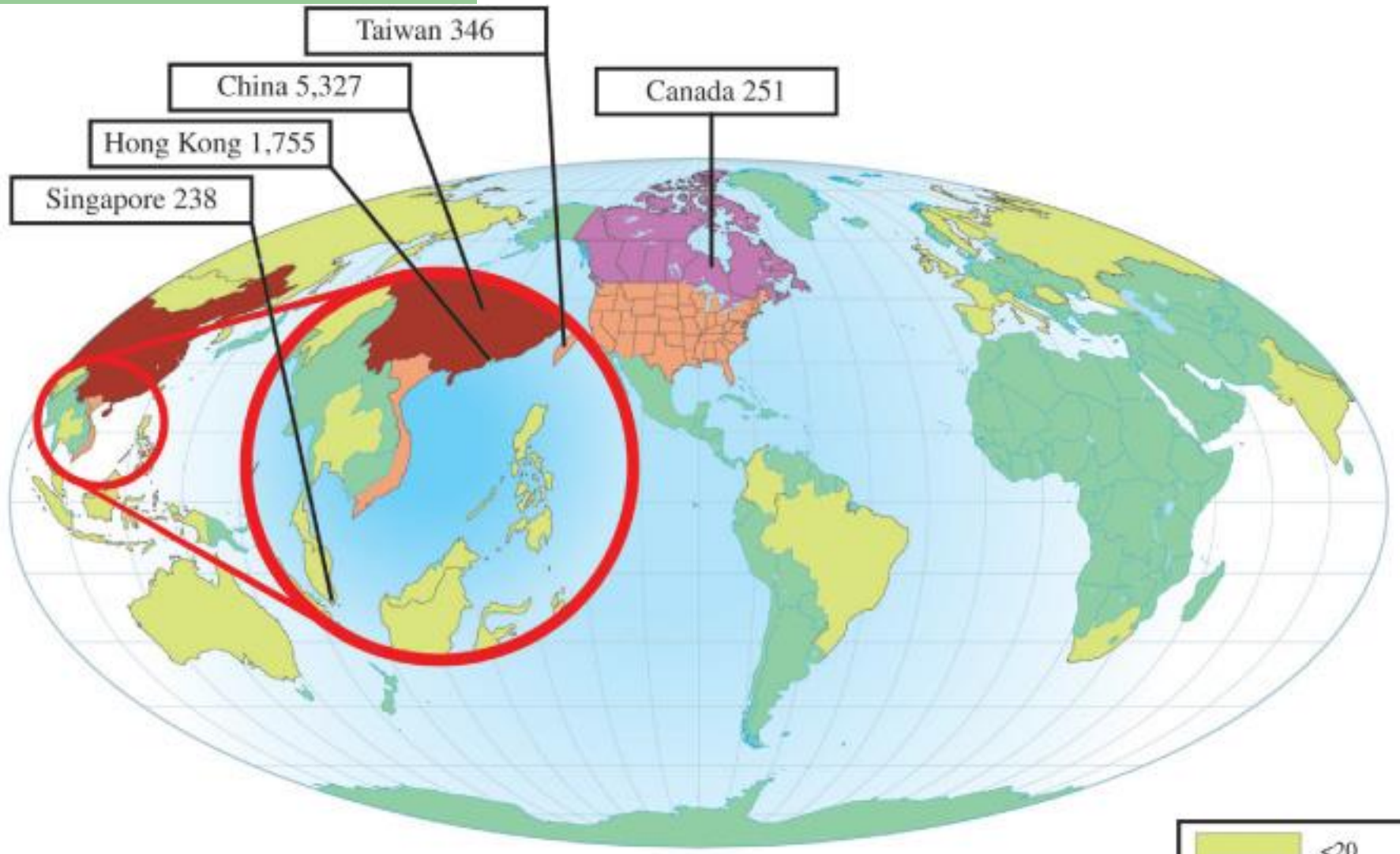
	# with results (%)	
Cough	11/11	100%
Sore throat	8/11	72%
Fever > 102°F	6	54%
Sputum	6	54%
Rales	5	45%
Pneumonia (x-ray)	4	36%

Wenzel, RP, et.al. Rev Resp Dis 1974;109:621

FIGURE 1. Chain of transmission among guests at Hotel M — Hong Kong, 2003



* Health-care workers.
† All guests except G and K stayed on the 9th floor of the hotel. Guest G stayed on the 14th floor, and Guest K stayed on the 11th floor.
§ Guests L and M (spouses) were not at Hotel M during the same time as index Guest A but were at the hotel during the same times as Guests G, H, and I, who were ill during this period.



Total Cases 8,096
Total Deaths 774
Figures as of December 31, 2003

Source:WHO

Coronavirus - SARS

- Incubation period from exposure to fever 2-16 da (Mean 6 da)
- Biphasic Disease
- Radiographic picture consistent with atypical pneumonia
- Virus shed in sputum and feces
- Case Fatality Rate: 4 – 7% initially; up to 15% among elderly

https://www.cdc.gov/sars/about/faq.html

SARS: 10 Yrs Later

- During 2003, 8096 people in 29 countries got SARS, and 774 died
- Only 8 people in the US had SARS, and none of them died
- In six months, the global SARS outbreak cost the world an estimated $40 billion
- The last known case was in 2004 among laboratory workers

https://www.cdc.gov/dotw/sars/

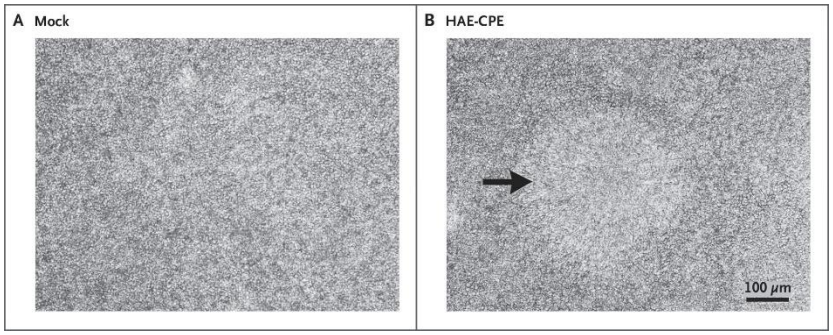
Back to the Present: Wuhan, China, Novel Coronavirus

- 41 cases initially
- First case date of onset: 12/6/19
- First international notice 12/31/2019
- Associated with Wet Market

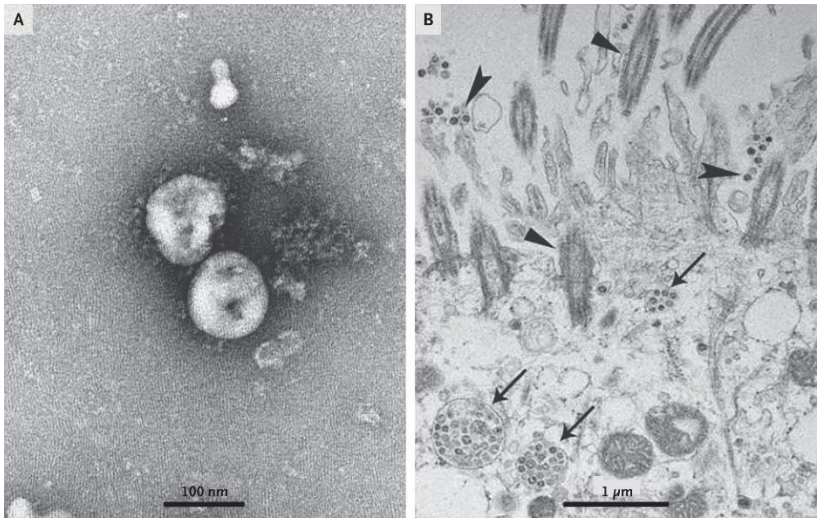
NY Times 1-26-2020

COVID-19 in Cell Cultures and EM

COVID-19 CPE



EM in Lung Tissue

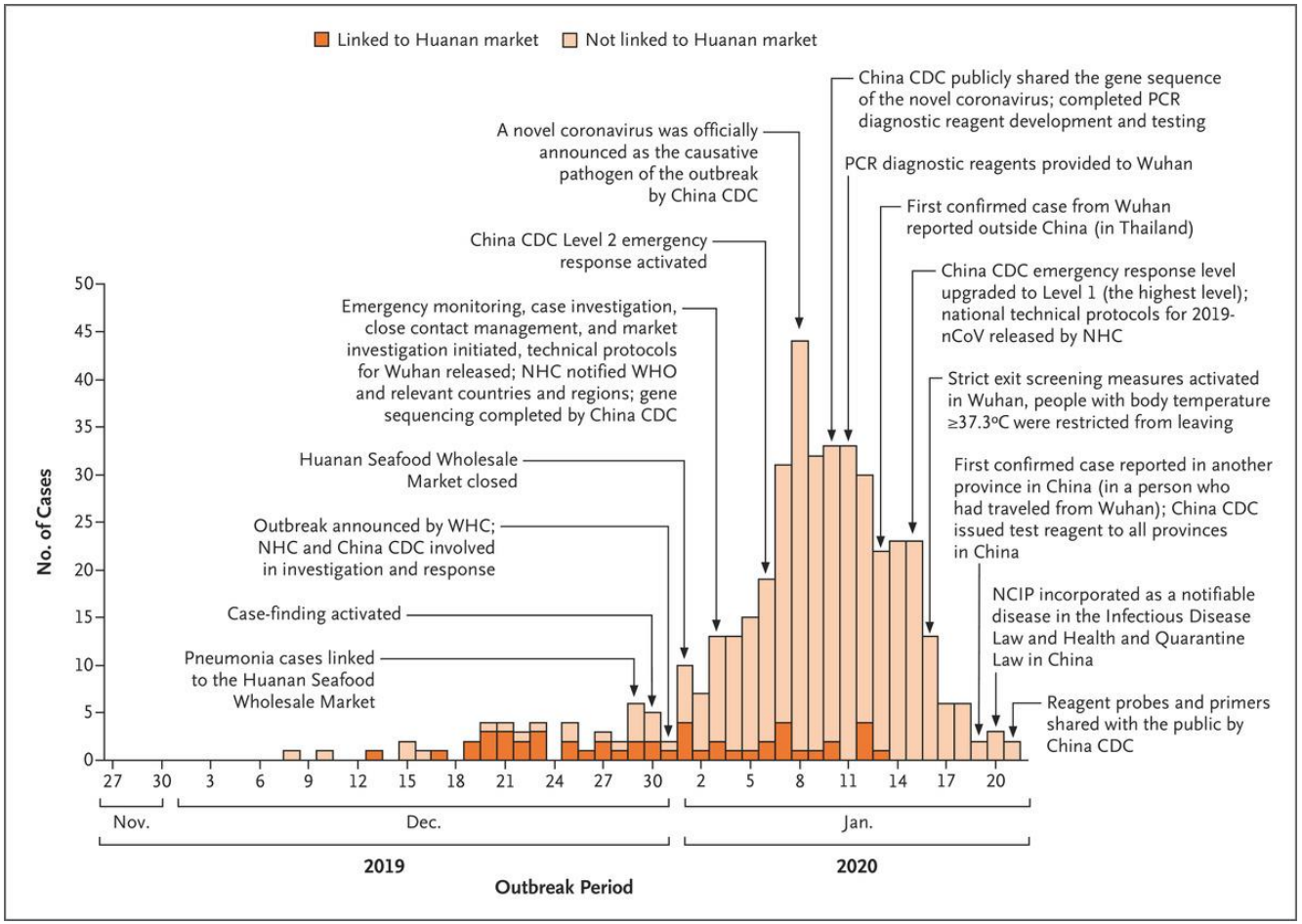


Zhu N, et al. NEJM.2020

COVID-19 Sequenced

Zhou P, Yang X-L, Wang S-G, et al. bioRxiv. 2020

Outbreak Curve of COVID-19 in Wuhan, China



Li, Q, Guan X, Wu P, et al. NEJM.Jan 29, 2020

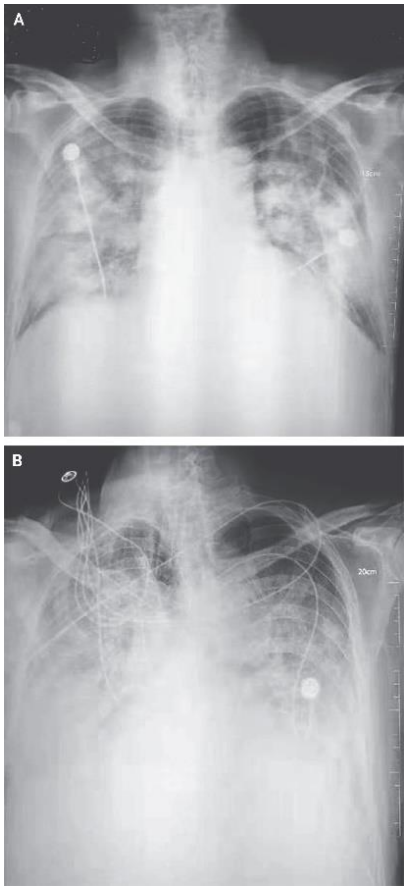
Clinical Features of Initial 41 Patients infected with COVID-19

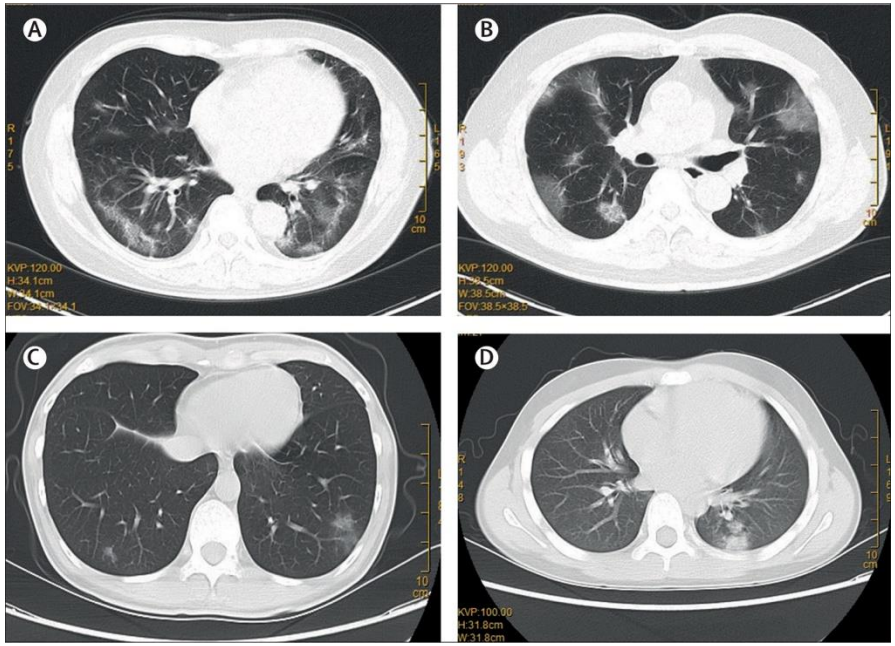
- 41 patients admitted in Wuhan: 27/41 (66%) exposed to Huanan seafood market
- Study compared ICU-vs-non-ICU cases for differences by $_X{}^2$ test, Fisher's Exact Test, or Mann-Whitney U test

Huang C, et al. The Lancet. Jan 24, 2020

- Dyspnea and low systolic pressures were the only clinical features with statistical significance:
- 12/13 (92%)-vs- 10/27 (37%) in non-ICU ($p = 0.002$)
- Lower systolic pressure in ICU cases ($p = 0.018$)
- Most severe cases had lymphopenia, low Procalcitonin, and all cases had bilateral involvement on Chest X-rays
- ARDS in 12/41; RNAemia in 6/41; 6/41 (15%) died, and 5/13 ICU (32%) died.

Chest Radiographs and CT Scans of Initial Cases of COVID-19





- Zhu N, et al. NEJM.2020

Chan J F-W, et al. The Lancet Jan 24, 2020

Case Definition for Novel Coronavirus (COVID-19)-infected pneumonia (NCIP) among initial 425 cases

A suspected case is pneumonia that fulfilled all of the following criteria:

1. Fever (with or without recorded temperature);
2. Radiographic evidence of pneumonia;
3. Low or normal WBC or low lymphocyte counts; and
4. No reduction in symptoms after antimicrobial therapy for 3 days

   OR

has pneumonia and a link to the seafood market in Huanan, or another case of NCIP.

Li, Q, Guan X, Wu P, et al. NEJM. Jan 29, 2020

What is going to happen with COVID-19?

- What is the source of the COVID-19?
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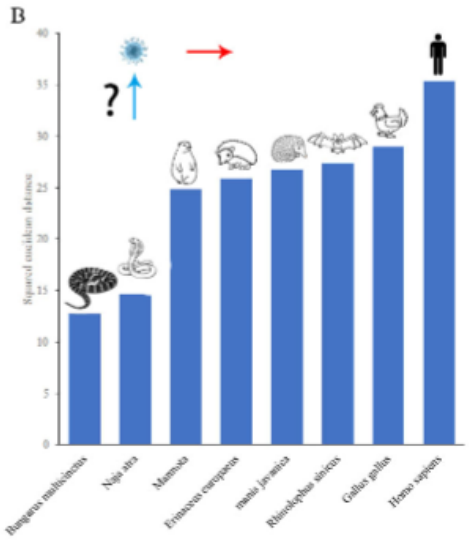
- Will we have a treatment or vaccine?

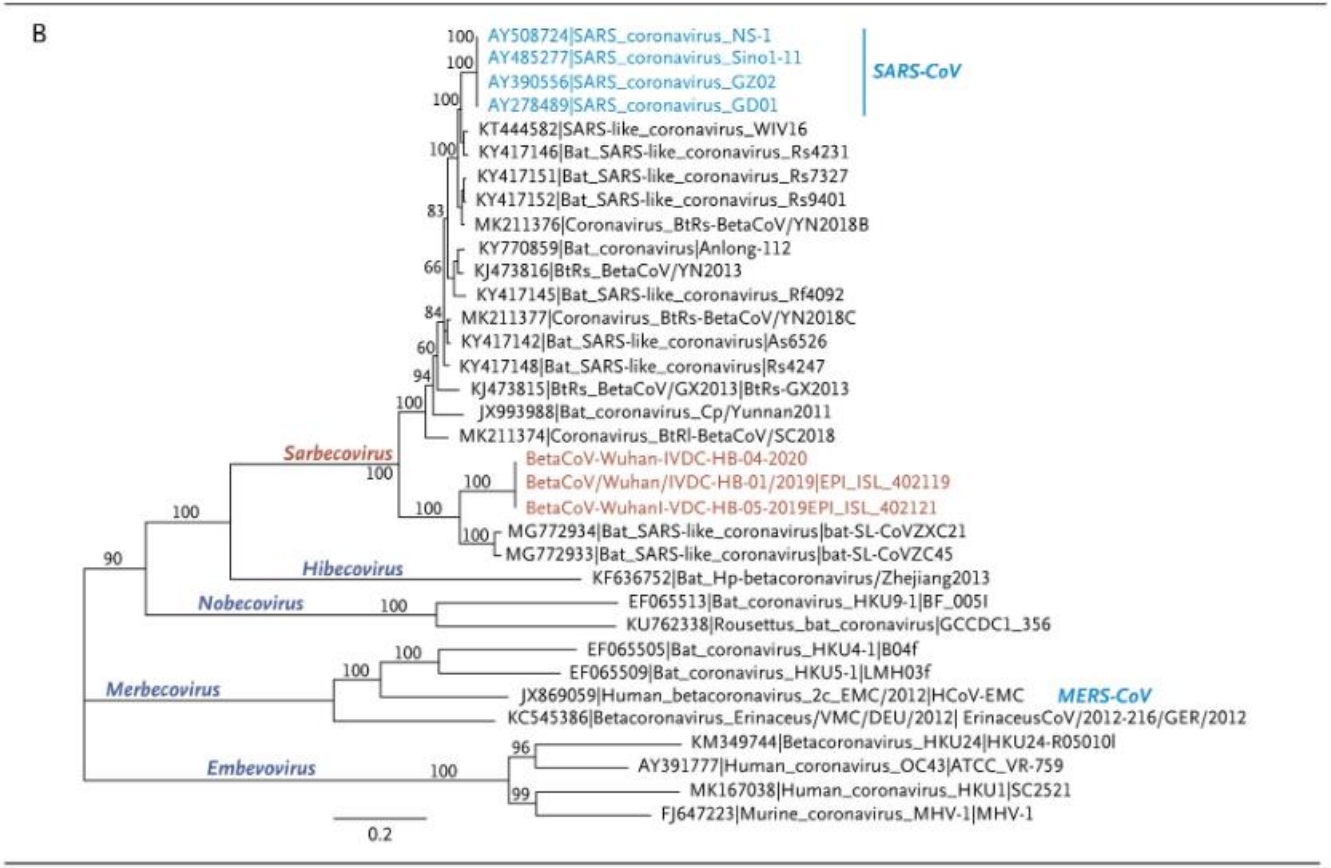
COVID-19 Genetics and Possible Source(s)



Dr. Ji and colleagues sequenced the COVID-19 and noticed some overlaps with both bat and snake coronaviruses; thus, as snakes hunt bats, they theorize that the spike glycoprotein may have recombined in the bat, and now can infect humans

Ji W, Wang W, Shao X, et al. J Med Virology. 22 Jan 2020

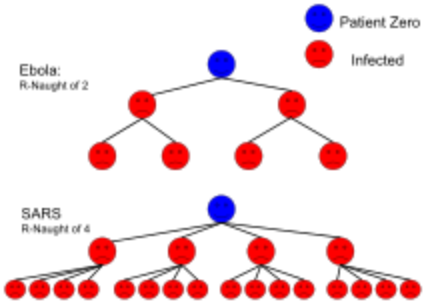
Phylogeny of Human and Bat Coronaviruses



- Ahu N, Zhang D, Wang W, et al. NEJM. Jan 24, 2020
- Wong ACP et al. Global Epidemiology of Bat Coronaviruses. Viruses.2019;11:174

Basic Reproduction number: R_0

- R_0, or R nought, of an infection is the number of cases that one case generates on average over time in an uninfected population.

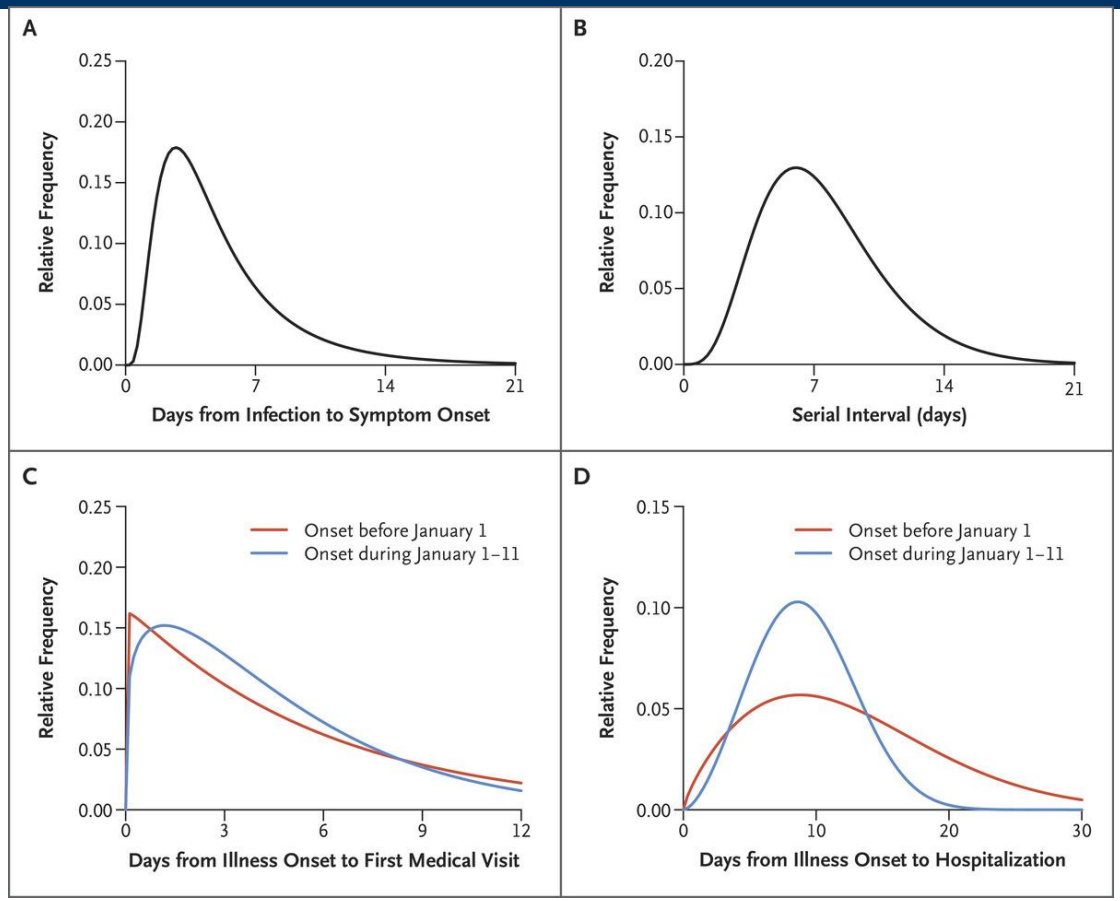


Values of R_0 of well-known infectious diseases[1]

Disease	Transmission	R_0
Measles	Airborne	12–18
Diphtheria	Saliva	6-7
Smallpox	Airborne droplet	5–7
Polio	Fecal-oral route	5–7
Rubella	Airborne droplet	5–7
Mumps	Airborne droplet	4–7
Pertussis	Airborne droplet	5.5[2]
2019-nCoV	Airborne droplet	2.3-5[3][4]
HIV/AIDS	Sexual contact	2–5
SARS	Airborne droplet	2–5[5]
Influenza (1918 pandemic strain)	Airborne droplet	2–3[6]
Ebola (2014 Ebola outbreak)	Bodily fluids	1.5-2.5[7]

Zhao S, et al. *bioRxiv* 2020:01.23.916395

COVID-19Time Events Estimates



Among the initial 425 cases, the mean incubation period was 5.2 days, and the estimated R_0 value is 2.2 (95% CI, 1.4-3.9).

Li, Q, Guan X, Wu P, et al. NEJM. Jan 29, 2020

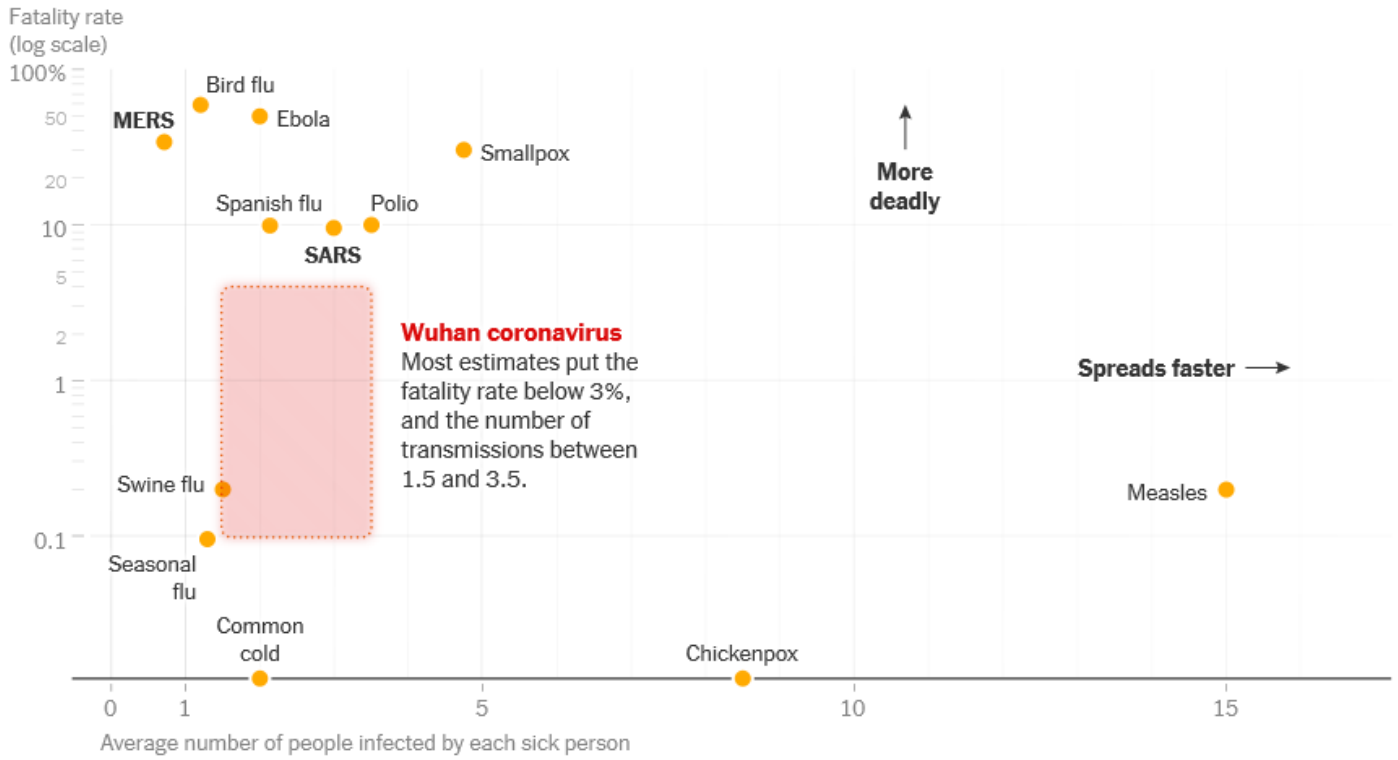
Comparison of Recent Severe Coronavirus Infections

Coronavirus	Attack Rate (% exposed who become infected)	Case-Fatality Rate	Comment
SARS	50%	10%	Higher in those over 65 yrs, co-morbidities
MERS	8%	34%	
COVID-19	??	~ 2-2.4%*	Higher in those over 65 yrs of age, male, co-morbidities

*** As of 2-17-2020;**

Updated Mortality Rate for COVID-19

How Bad Will the Coronavirus Outbreak due to COVID-19 Get?



Knvul Sheikh, Derek Watkins, Jin Wu and Mika Gröndahl. NY Times, updated Feb. 1, 2020

Death Rates among 95,161 Cases of COVID-19*

AGE	DEATH RATE confirmed cases	DEATH RATE all cases
80+ years old	**21.9%**	**14.8%**
70-79 years old		**8.0%**
60-69 years old		**3.6%**
50-59 years old		**1.3%**
40-49 years old		**0.4%**
30-39 years old		**0.2%**
20-29 years old		**0.2%**
10-19 years old		**0.2%**
0-9 years old		**no fatalities**

SEX	DEATH RATE confirmed cases	DEATH RATE all cases
Male	**4.7%**	**2.8%**
Female	**2.8%**	**1.7%**

PRE-EXISTING CONDITION	DEATH RATE confirmed cases	DEATH RATE all cases
Cardiovascular disease	**13.2%**	**10.5%**
Diabetes	**9.2%**	**7.3%**
Chronic respiratory disease	**8.0%**	**6.3%**
Hypertension	**8.4%**	**6.0%**
Cancer	**7.6%**	**5.6%**
no pre-existing conditions		**0.9%**

*** Worldometer 3-4-2020**

COVID-19 in Infants under 1 yr of age

Table. Characteristics of 9 Hospitalized Infants Infected With Coronavirus Disease 2019

Characteristic	Patient 1	2	3	4	5	6	7	8	9
Demographics									
Age	9 mo	11 mo	8 mo	10 mo	7 mo	1 mo 26 d	3 mo	3 mo 22 d	6 mo
Sex	Female	Female	Female	Male	Female	Female	Female	Female	Male
Symptoms at onset	Fever, peaking at 38.8 °C	Mild fever	None	NA	Fever	Runny nose; cough	Cough; sputum production	Fever	NA
Time between admission and diagnosis, d	1	1	3	3	1	1	1	1	2
Epidemiologic history									
No. of family members infected	2	1	5	1	2	2	2	1	1
Linkage to Wuhan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	No
Treatment									
Intensive unit care	No	No	No	No	No	No	No	No	No
Mechanical ventilation	No	No	No	No	No	No	No	No	No
Severe complications	No	No	No	No	No	No	No	No	No

Abbreviation: NA, not available.

Characteristics of 9 Hospitalized Infants Infected With Coronavirus Disease 2019

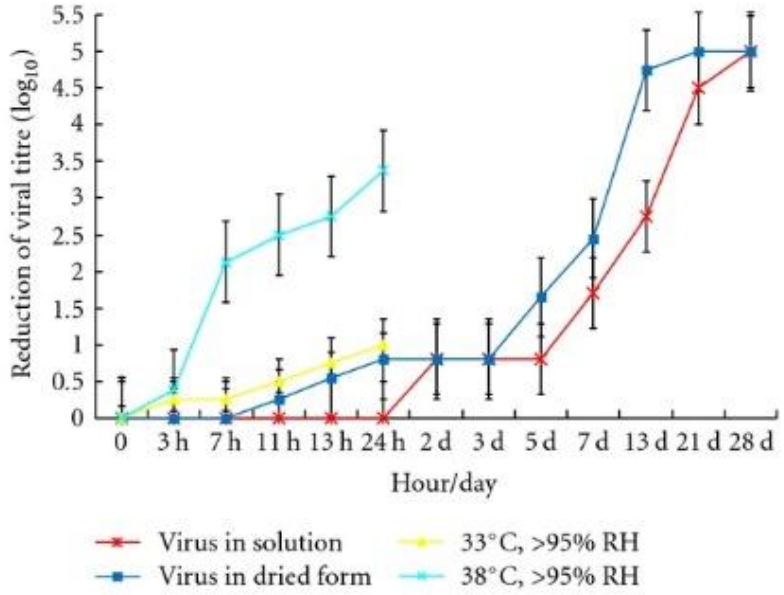
Wei M, et al. Letter. JAMA Network.Feb 14, 2020

Persistence of human Coronavirues on Surfaces

- 22 studies were analyzed for known human coronavirus' persistence on glass, metal, plastic, etc. Studies show that they can live up to 9 days.
- These viruses may be inactivated by surface disinfection procedures with 62-71% ethanol, 0.5% Hydrogen Peroxide, or 0.1% sodium hypochlorite within 1-min.

Kampf G, Todt D, Pfaender S, Steinmann E. J Hosp Inf 2020 (in press)

Effect of Temp and Humidity on SARS-CoV



Chan KH, et Adv Virol 2011: 734690

Evaluation of Patient Under Investigation (PUI) for COVID-19*

Clinical Features	&	Epidemiologic Risk
Fever[1] **or** signs/symptoms of lower respiratory illness (e.g. cough or shortness of breath)	**AND**	Any person, including healthcare workers[2], who has had close contact[3] with a laboratory-confirmed[4] COVID-19 patient within 14 days of symptom onset
Fever[1] **and** signs/symptoms of a lower respiratory illness (e.g., cough or shortness of breath) requiring hospitalization	**AND**	A history of travel from affected geographic areas[5] (see below) within 14 days of symptom onset
Fever[1] with severe acute lower respiratory illness (e.g., pneumonia, ARDS) requiring hospitalization and without alternative explanatory diagnosis (e.g., influenza)[6]	**AND**	No source of exposure has been identified

https://www.cdc.gov/coronavirus/2019-nCoV/hcp/clinical-criteria.html

* As of 2-27-2020

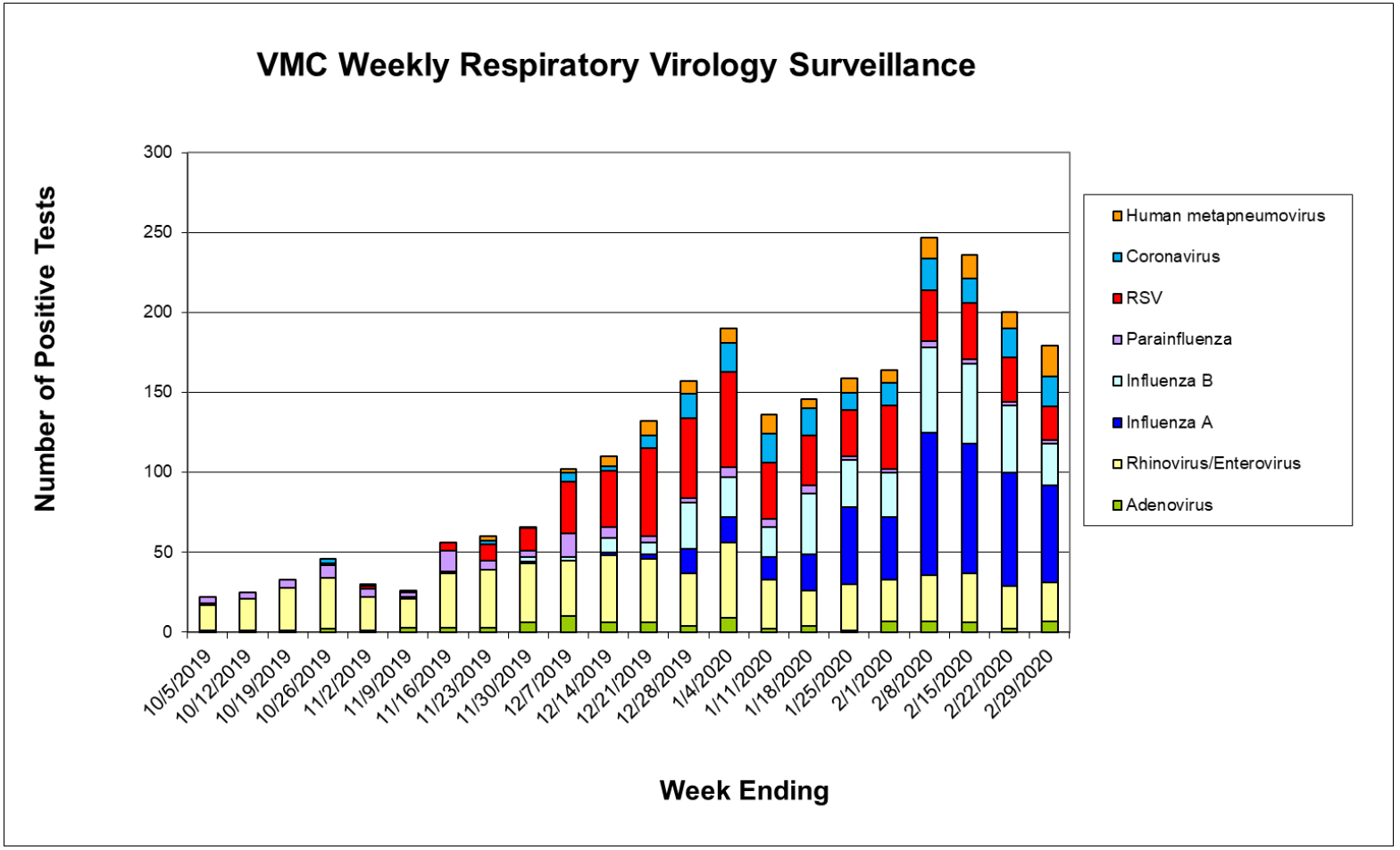
Monitoring while in Self-quarantine by a Person Under Investigation (PUI) in the US

- County Health Department contacts the PUI each morning via phone to ask about symptoms, signs, and temperature measurements twice a day for 14 days.
- If the PUI has fever ($\geq 38^{o}C$ or $\geq 100.4^{o}F$) and respiratory symptoms, the Health Dept staff will visit and obtain swabs to send to the State Lab.
- If the PUI has signs and symptoms that require evaluation at a healthcare facility, the Health Director will contact us.

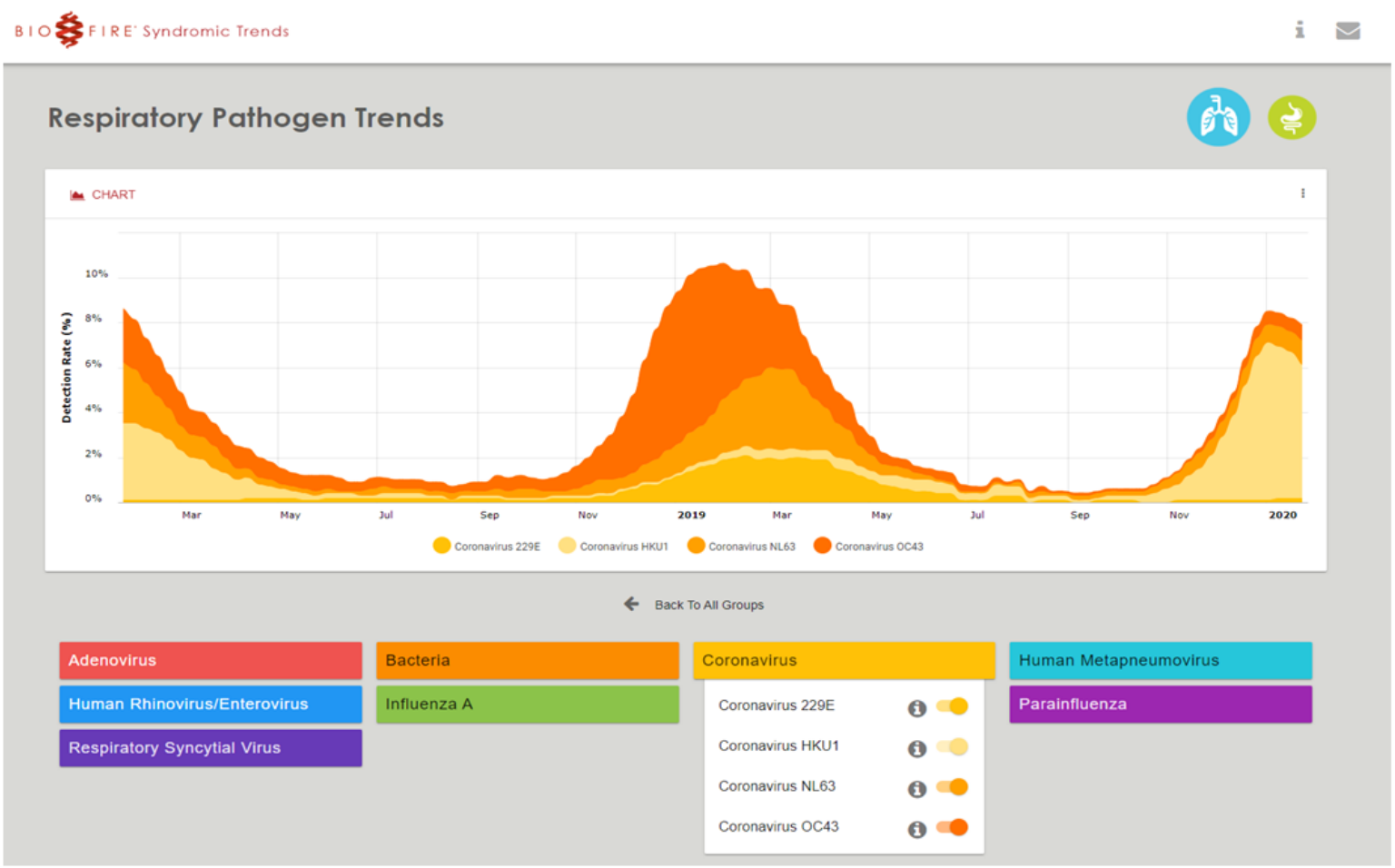
Evaluating and Reporting PUIs*

- Clinicians should use their judgment to determine if a patient has signs and symptoms compatible with COVID-19 and whether the patient should be tested.
- Decisions on which patients receive testing should be based on the local epidemiology of COVID-19, as well as the clinical course of illness.
- Most patients with confirmed COVID-19 have developed fever[1] and/or symptoms of acute respiratory illness (e.g., cough, difficulty breathing). Clinicians are strongly encouraged to test for other causes of respiratory illness, including infections such as influenza.
- *March 4, 2020

Viral Respiratory Panel Detections at VMC - Oct 2019-Present



Biofire Respiratory Virus Trends in US: 2019-2020



How do you protect yourself when evaluating or transporting a PUI?

- Patients with a cough should be given a surgical mask to wear upon entry to a healthcare facility or transport
- Obtain a travel history – ask about recent travel to China, South Korea, Italy or Iran, or exposure to a traveler under investigation, in the last 14 days

If a candidate patient presents from the airport or via referral:

- If positive for a cough and history, place the patient into an airborne isolation room, and healthcare workers should wear an N-95 respirator, a face shield, and observe Standard, Contact and Airborne Precautions (ie, gloves and gown)

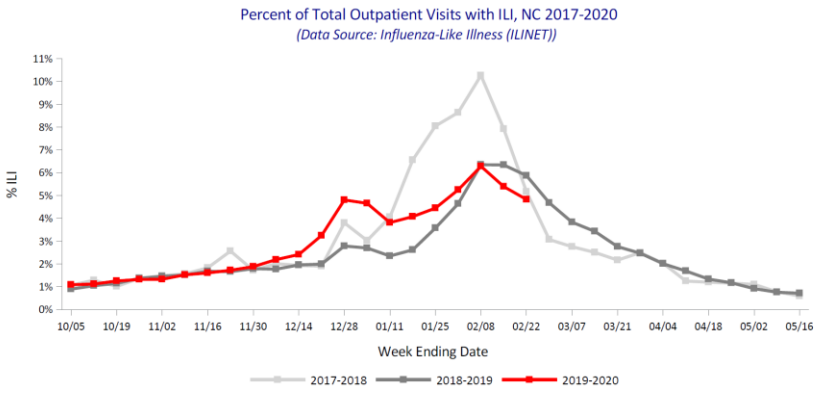
- Inform Infection Control, who will contact the local Health Department to determine if a sample should be sent to the State Health Dept en route to CDC

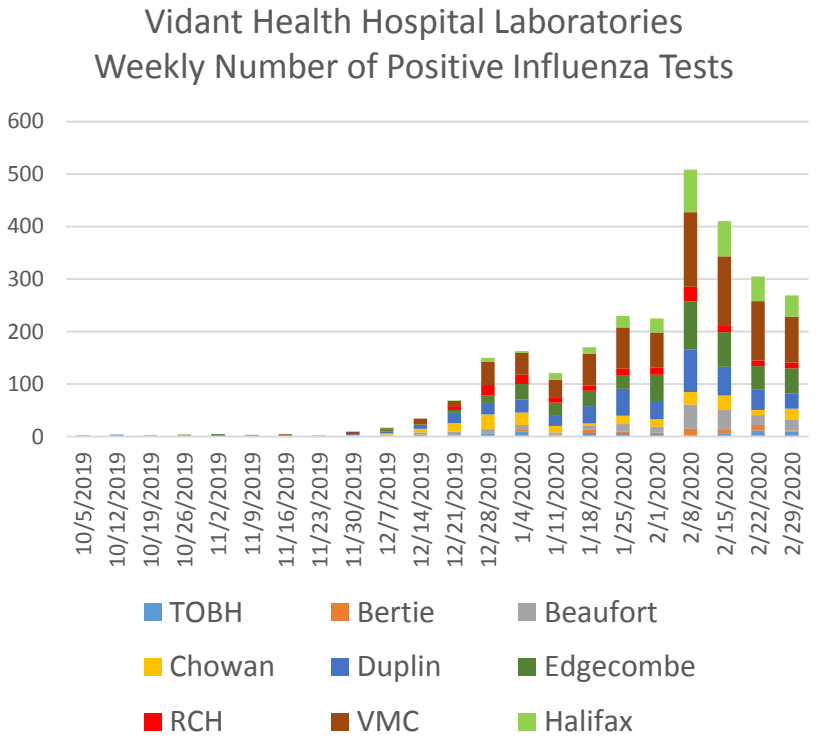
https://www.cdc.gov/coronavirus/2019-ncov/infection-control.html

CDC Guidance for Exposed HCW

- Like the patient in Wake County and his family, a healthcare worker exposed (without PPE) to a presumed positive case (by testing) should be place into self-quarantine for 14 days, and monitor as outlined earlier

Influenza Season 2019-2020



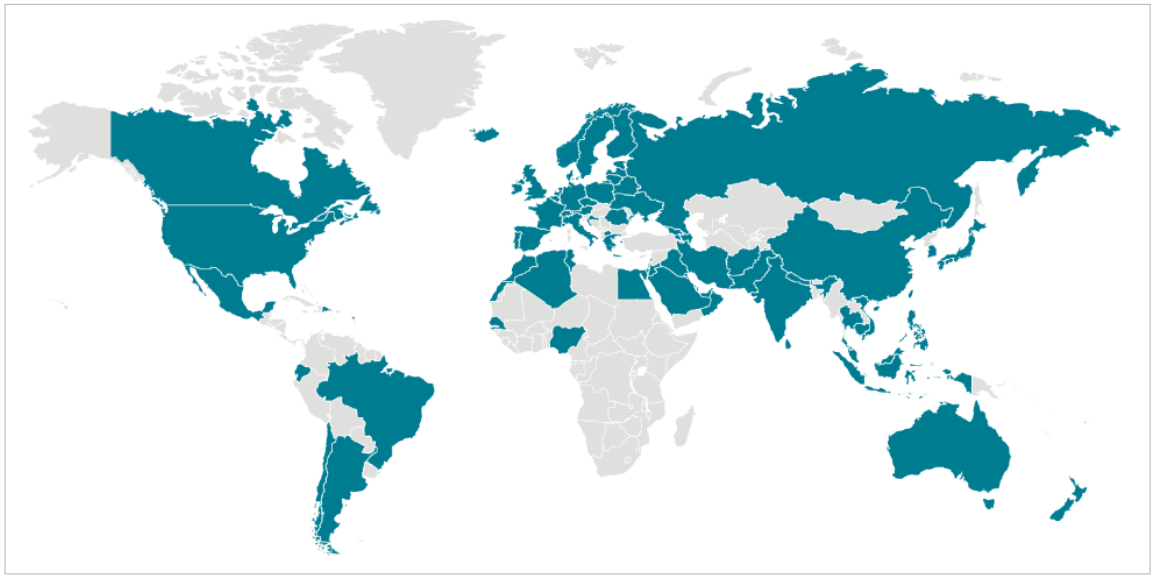


COVID-19 Global Map:* ? Pandemic

Locations with Confirmed COVID-19 Cases

Global Map

As of 11:00 a.m. ET March 4, 2020



Global case numbers are reported by the World Health Organization (WHO) in their coronavirus disease 2019 (COVID-19) situation report. For U.S. information, visit CDC's COVID-19 in the U.S.

*As of 3-4-2020

https://www.cdc.gov/coronavirus/2019-ncov/locations-confirmed-cases.html#map

Treatment of and Vaccines for COVID-19

Treatment of COVID-19

- Supportive
- Corticosteroids
- An HIV drug, Kaletra used in Vietnamese case.
- IV Remdesivir (nucleoside analogue) used in Washington State Case

Holshue ML, et al. NEJM. Jan 31, 2020

Vaccine Prospects

- When might a vaccine become available?
- Dr. Anthony Fauci, Head of the NIAID in Bethesda, says it will take a year
- Private Industry sources say 3-4 months

Ramsey's Conclusions

- Vidant and ECU policies and practices toward patients with respiratory symptoms are sound.
- Vigilance and compliance with our practices should reduce if not prevent staff exposures.
- If we do have cases in the US, with both a lower R_0 value of 2.2 for infectivity and a lower mortality rate of 2-3% than SARS' rate of 10-15%, they will be less spread and with a lower mortality.
- This COVID-19 will likely run it's course, giving us a 2nd "Flu season," and then decrease and disappear in the summer months as did SARS

Perspectives on COVID-19 and Flu

- Deaths due to Coronavirus: 3249
- Deaths due to Seasonal Flu: 84,470

- Current population of China: 1,436,768,070
- # Confirmed with COVID-19: 80,282
- % Confirmed with COVID-19: 0.00055877

  or 1/20th of 1%

Pretest on Coronavirus Lecture

- What is the new WHO designation for 2019-nCoV?
- What is the death rate of 2019-nCoV?
- What isolation methods will protect you from 2019-nCoV?

- COVID-19, for Novel Coronavirus Disease 19
- 2-2.4% among tens of thousands of cases; may be up to 3.4%
- Airborne + Contact Precautions

Novel Coronavirus from China: Epidemiology and Clinical Presentations

- Thank you for your attendance!
- Questions?

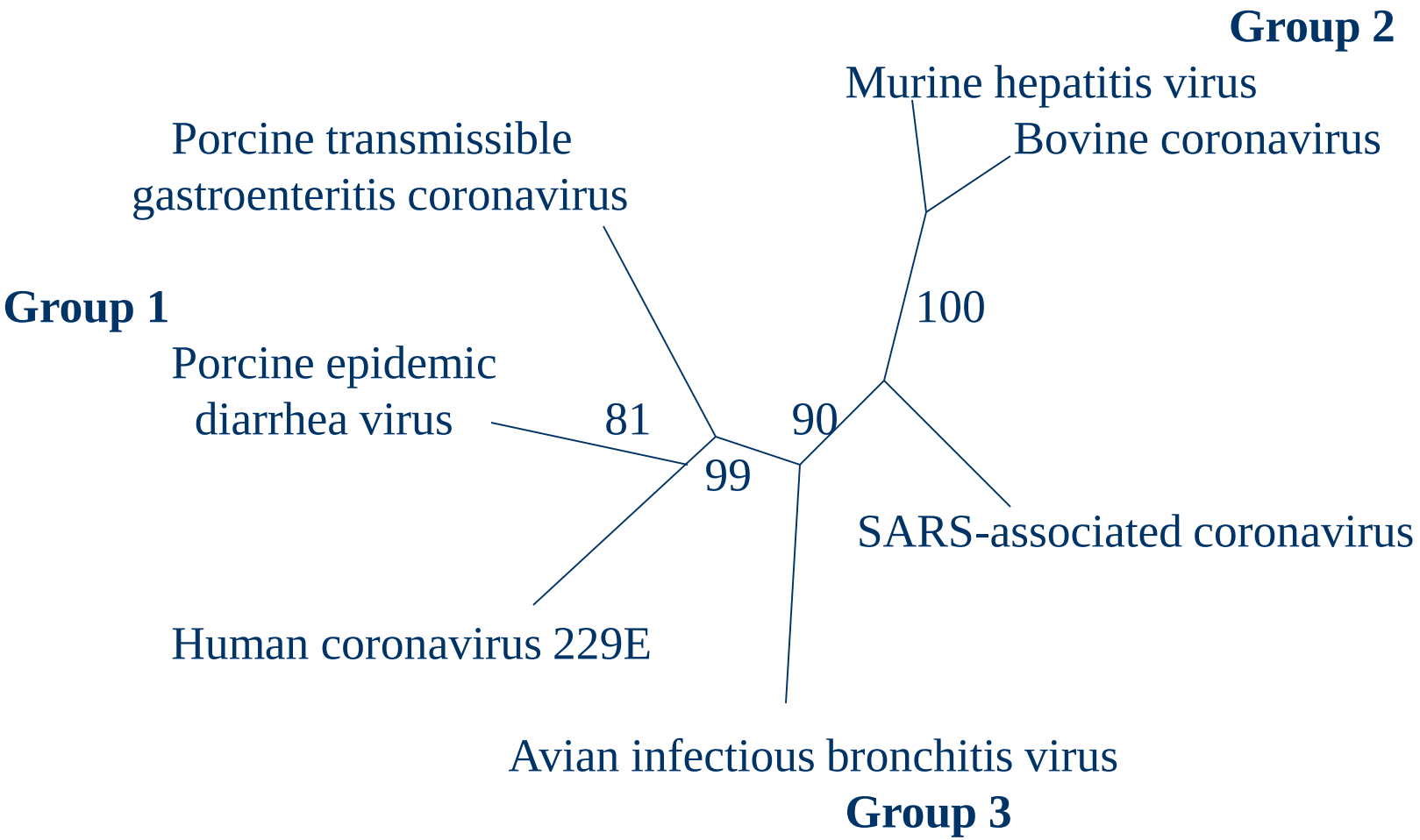
20 VMC Hospital Functions for our Plan

1. Surveillance
   Bill Cleve, Jacci Thomas
2. Information Systems IS
   Karen Bolen
3. Education
   Tracy Langston
4. Infection Control and EVS
   Dr. Ramsey, Kathy Cochran, Jamie Hall; Robert White, EVS
5. Communications
   Brian Wudkwych, Jason Lowery
6. Facility Access – visitation
   Julie Oehlert
7. Facility Security
   Gary Askew
8. Human Resources, Employee Illness
   Janet McKinney
9. Pharmacy
   Jim Worden
10. Triage
    Dr. Patterson, Dr. Bennett, Christine Walden, Michelle Kent
11. Medical Care & Respiratory
    Dr. Paul Bolin, Dr. Dalzell, Dr. Paul Cook, Dr. Obi, Skip Bangley,
    Mike Coogan
12. Laboratory
    Dr. John Fallon, Rick Ross, Heather Duncan, Chris Miller
13. Transfer Center
    Dr. Tracy Eskra
14. Surge Capacity
    Brian Floyd, Van Smith, Dr. Paul Camnitz, Kiplan Clemmons, Chris Starbuck
15. Bed Capacity and Bed Control
    Melanie Porter
16. Staffing
    Linda Hofler
17. Consumable Supplies and Equipment
    Ricky Vandiford, Jamie Hall
18. Postmortem Care
    Dr. Karen Kelly
19. COOP
    Linda Hofler, Melanie Porter, Vicki Phillips, Latasha Williams, Susan Fawcett
20. Disaster Management and EMS
    Dr. Kitch, Chris Starbuck, Murray Stroud

19 VMC Hospital Functions to Plan

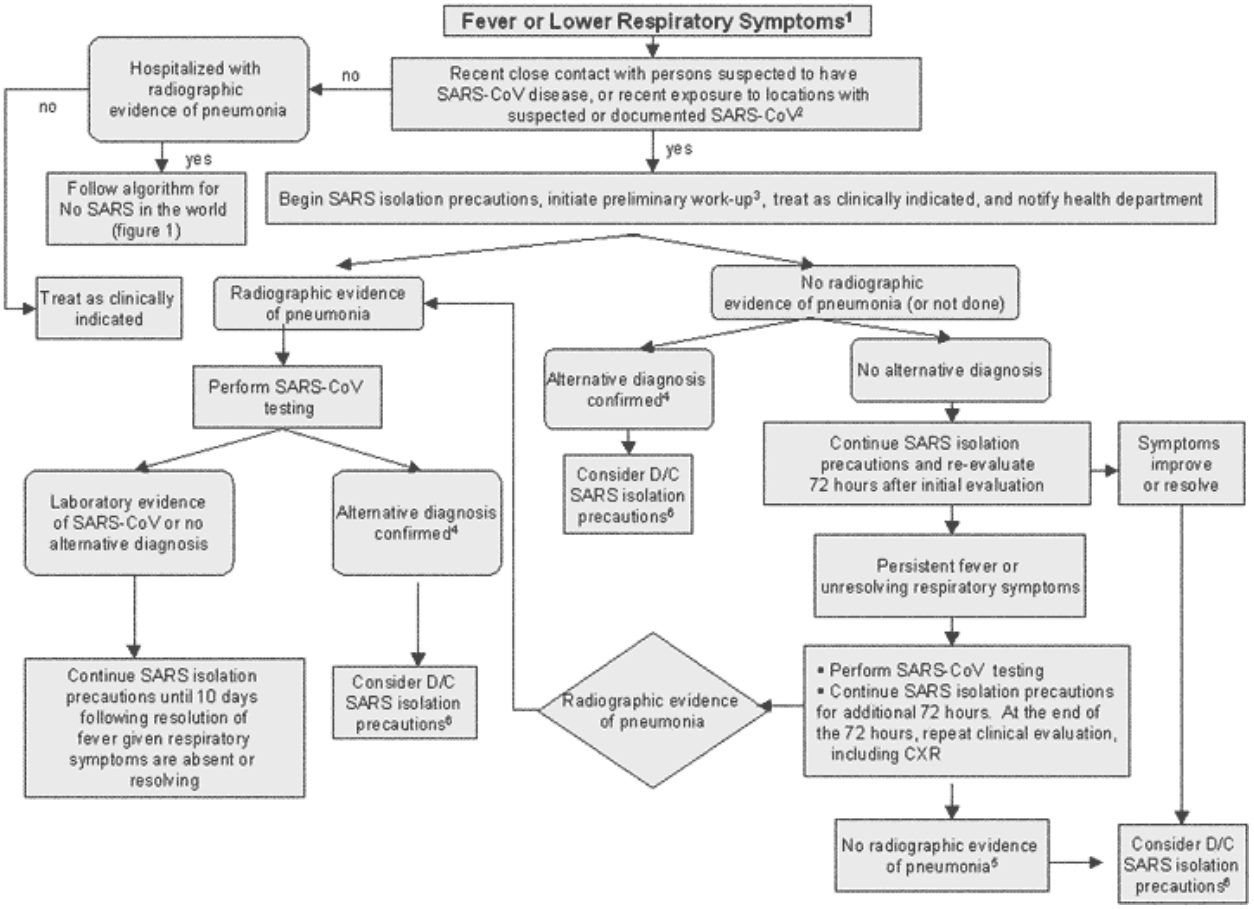
1. Surveillance
2. Information Systems IS
3. Education
4. Infection Control
5. Communications
6. Facility Access - visitation
7. Facility Security
8. Human Resources, Employee Illness
9. Pharmacy
10. Triage
11. Medical Care
12. Laboratory
13. Transfer Center
14. Surge Capacity
15. Bed Capacity and Bed Control
16. Staffing
17. Consumable Supplies and Equipment
18. Postmortem Care
19. COOP

A Novel Coronavirus in Patients with SARS



Algorithm for LRI when SARS-CoV person-to-person transmission is occurring in the world

Figure 2: Algorithm for management of fever or respiratory symptoms when SARS-CoV person-to-person transmission is occurring in the world



https://www.cdc.gov/sars/clinical/fig2.html

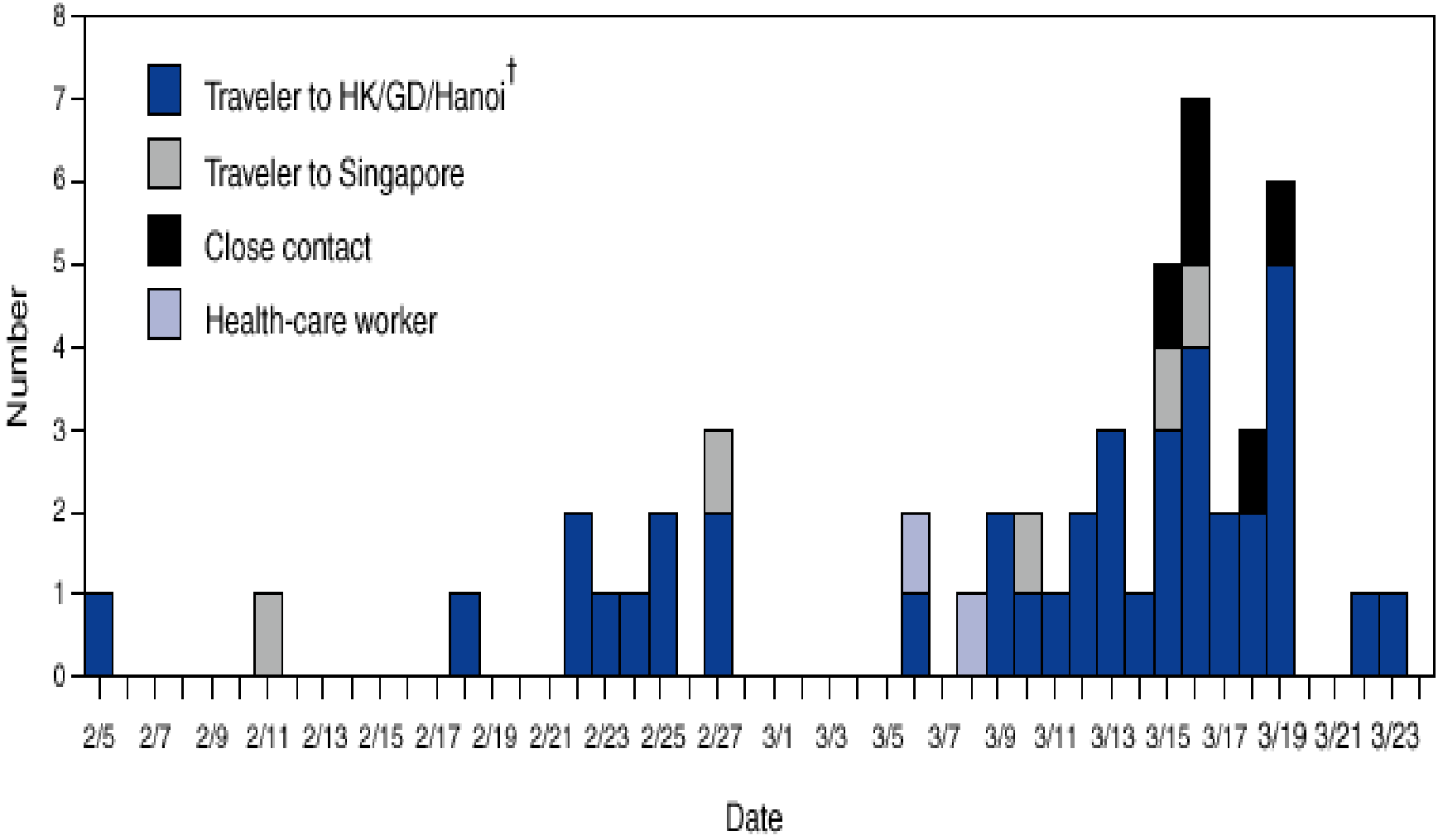
INTERIM CDC GUIDELINES

To Prevent Transmission of SARS

- Personal protective equipment appropriate for standard contact and airborne precautions
- Eye protection
- N95 Respirators
- Hand Hygiene

https://www.cdc.gov/sars/infection/index.html

FIGURE 2. Number of suspected cases* of severe acute respiratory syndrome, by exposure category and date of illness onset — United States, 2003



*N = 51.
†HK = Hong Kong Special Administrative Region, China; GD = Guangdong province, China; Hanoi = Hanoi, Vietnam.

Treatment of SARS

- Supportive
- ? Ribavirin
- ? Corticosteroids
- Some isolates of a related Coronavirus, Mouse Hepatitis Virus, are susceptible to Interferon alpha in vitro*

*Taguchi F, Siddell, S. Virology 1985;147:41-48

Clinical Features of the Canadian Patients with SARS at Presentation

Variable	# with results (%)
Investigations	
Aspartate aminotransferase (>1.5 x upper limit of normal)	7 / 9 (78)
Alanine aminotransferase (>1.5 x upper limit of normal)	5 / 9 (56)
Creatine kinase (above upper limit of normal)	5 / 9 (56)

Classification of Coronaviruses

- Group I: Hu Cov – 229E
- Group II: Hu CoV – Oc43
- Group III: SARS – CoV
- CVLPs
- Toroviruses

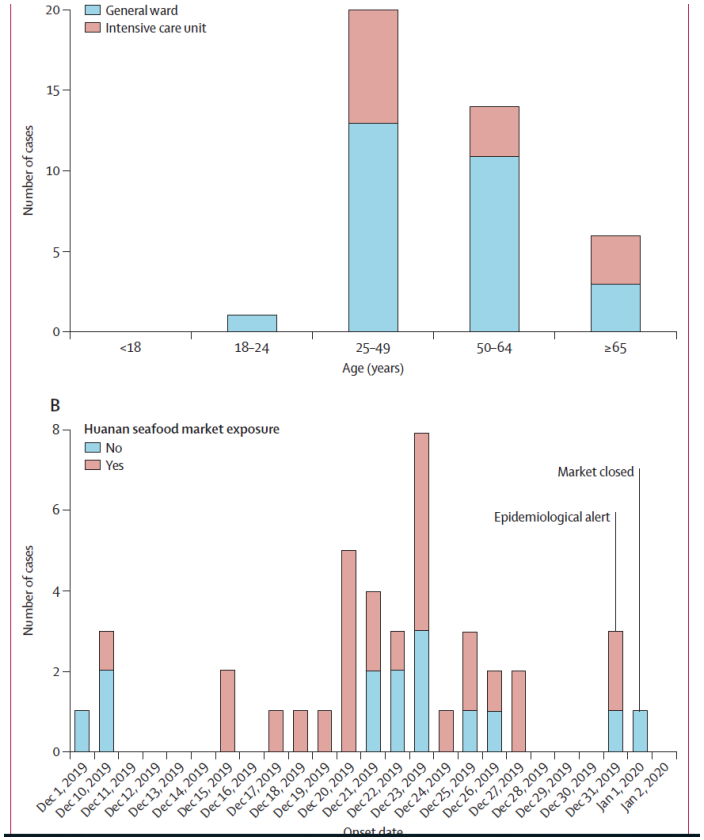
Clinical Features of the Canadian Patients with SARS at Presentation

Variable	# with results (%)
Symptoms	
Fever	10 / 10 (100)
Nonproductive cough	10 / 10 (100)
Dyspnea	8 / 10 (80)
Malaise	7 / 20 (70)
Diarrhea	5 / 10 (50)
Chest pain	3 / 10 (30)
Headache	3 / 10 (30)
Sore throat	3 / 10 (30)
Myalgias	2 / 10 (20)
Vomiting	1 / 10 (10)

Open Air Markets in Wuhan and other cities in China

NY Times 1-26-2020

Epidemiological Work-up of Unidentifed Pneumonia in China



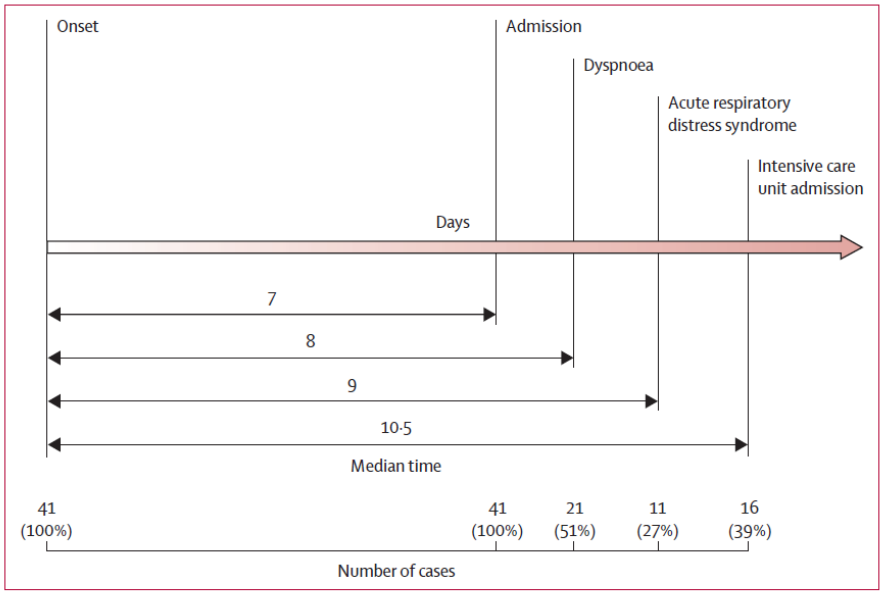
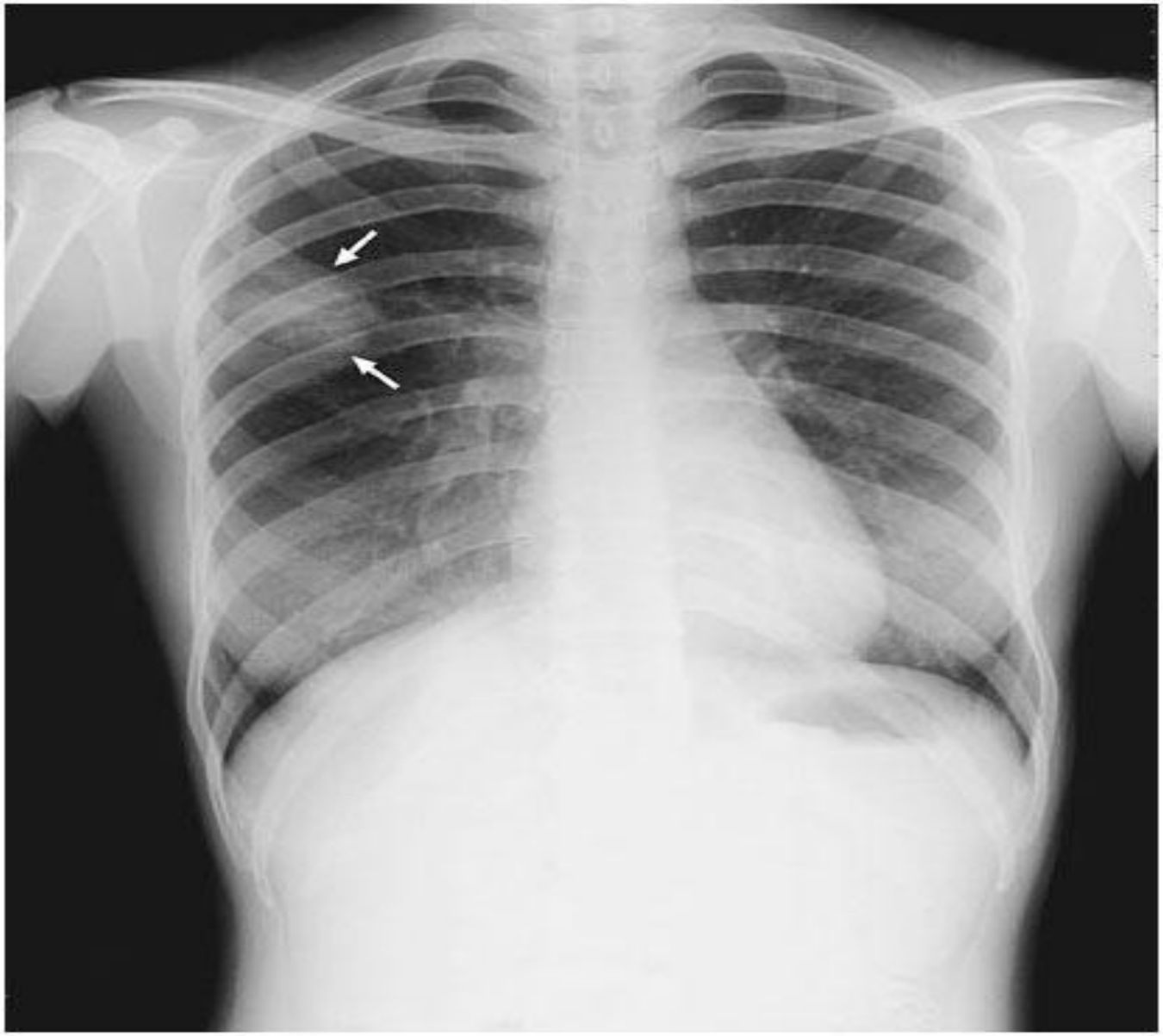


Figure 2: **Timeline of 2019-nCoV cases after onset of illness**

Huang C, et al. The Lancet. Jan 24, 2020



Clinical Features of the Canadian Patients with SARS at Presentation

Variable Investigations	# with results (%)
Infiltrate on chest radiography	9 / 9 (100)
Oxygen saturation on room air < 95%	7 / 9 (78)
Leukopenia (cell count <4 x 10^9 / liter)	2 / 9 (22)
Lymphopenia (cell count <1.5 x 10^9 / liter)	8 / 9 (89)
Thrombocytopenia (cell count <130 x 10^9 / liter)	3 / 9 (33)
Lactate dehydrogenase (above upper limit of normal)	4 / 5 (80)

Booth CM, Matukas LM. Tomlinson GA, et al. JAMA 2003; 289 (21): 2801-9.

Toronto, Canada / April 15-21, 2003

Characteristics of 11 Health-care workers who had symptoms of SARS following exposure to the index patient during the time of his intubation

HC Worker	Symptom onset date	Suspect or Probable SARS	Occupation
1	April 15	Suspect	Respiratory therapist*
2	April 16	Suspect	ICU Nurse assigned primarily to another pt*
3	April 16	Suspect	ICU Primary Nurse*
4	April 16	Suspect	Respiratory Therapist*
5	April 16	Probable	Ward Physician **
6	April 17	Probable	ICU Physician*
7	April 17	Suspect	ICU Charge Nurse*
8	April 18	Suspect	ICU Physician*
9	April 18	Suspect	Radiology Technician***
10	April 18	Not a case	ICU Nurse assigned primarily to another pt****
11	April 21	Not a case	ICU Physician****

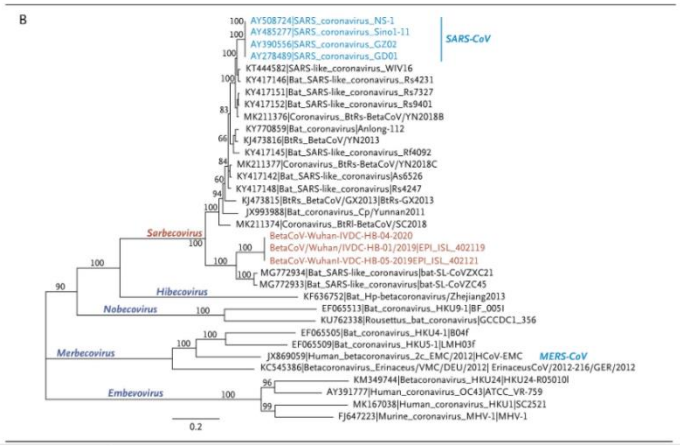
*Provided care before, during, & after intubation in ICU. **Examined pt on ward during morning of April 13. ***Performed Chest radiograph of pt on ward early am April 13

****Provided care before intubation in ICU

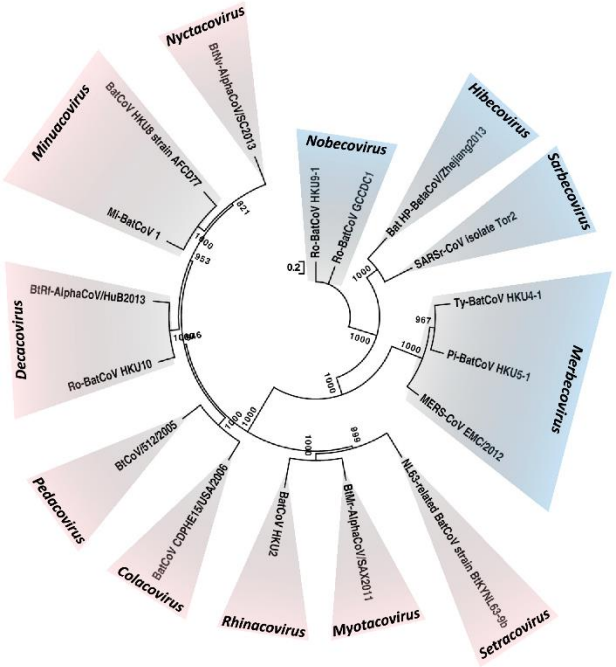
Booth CM, Matukas LM. Tomlinson GA, et al. JAMA 2003; 289 (21): 2801-9.

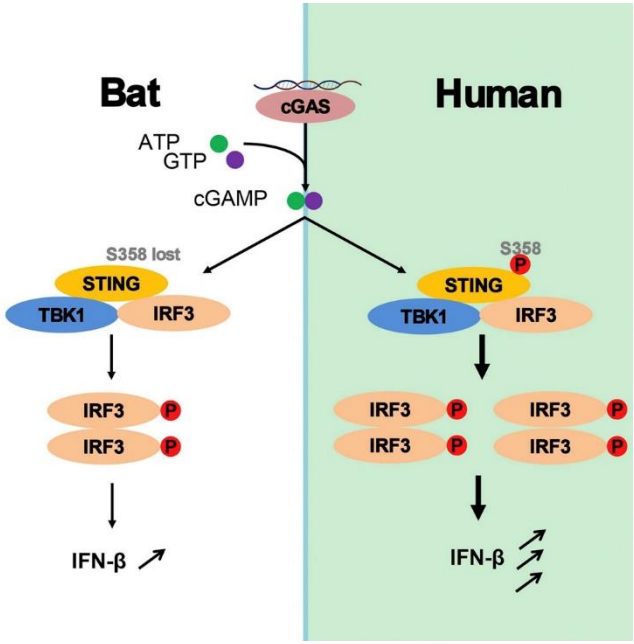
Phylogeny

Families of Bat Coronaviruses



2019-n-CoV Genetics and Possible Source(s)





Researchers have found that bats carry many coronaviruses; due to replacement of S358 sequence of STING, they have a deceased Interferon response to DNA antigens; thus they may be immunotolerant

Wong ACP et al. Global Epidemiology of Bat Coronaviruses. Viruses.2019;11:174
Xi J, et al. Cell Host and Microbe.2018; 27 (3): 297-301

Survival of human coronaviruses 229E and OC43 in suspension and after drying on surfaces: a possible source of hospital-acquired infections

J. Sizun, M. W. N. Yu and P. J. Talbot

Laboratory of Neuroimmunovirology, Human Health Research Center, INRS-Institut Armand-Frappier, University of Quebec, Laval, Québec, H7V 1B7, Canada

J Hosp Inf. 2000; 46:55-60

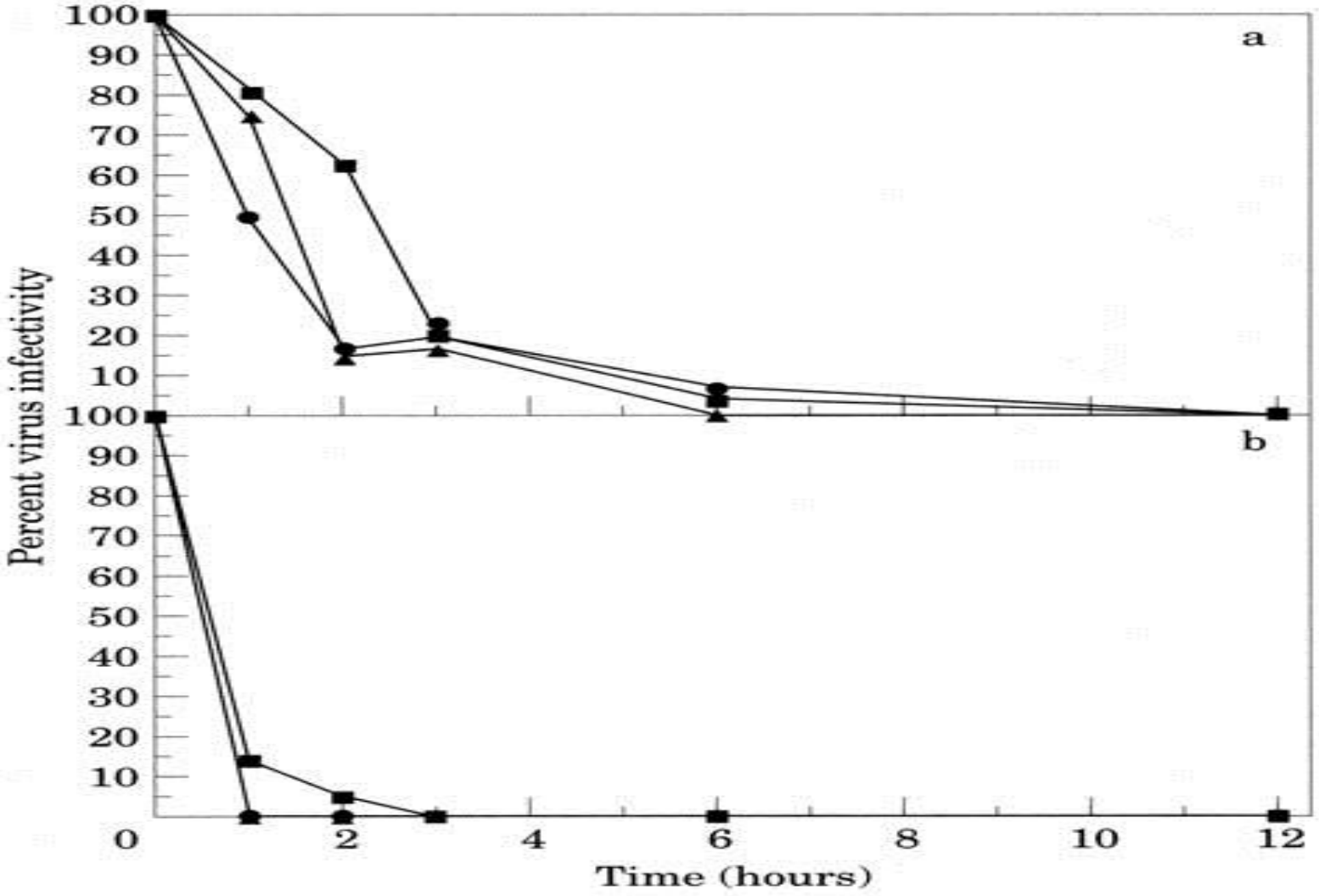


Figure 2 Infectivity of HCV-229E (a) and HCV-OC43 (b) after drying for various times on various surfaces: either aluminum (■), sterile sponges (●) or latex surgical gloves (▲).

Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia in Wuhan, China

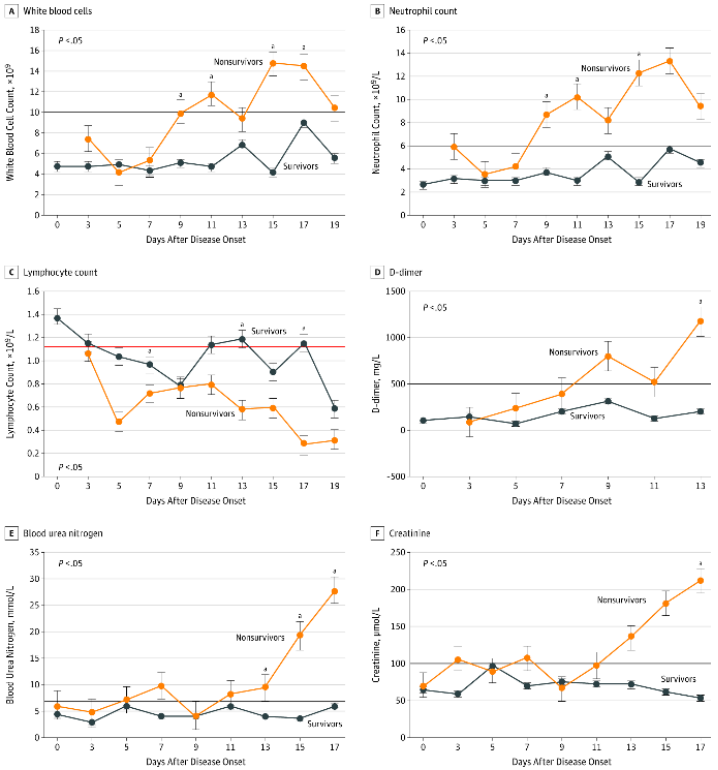


Figure Legend:

Dynamic Profile of Laboratory Parameters in 33 Patients With Novel Coronavirus–Infected Pneumonia (NCIP)Timeline charts illustrate the laboratory parameters in 33 patients with NCIP (5 nonsurvivors and 28 survivors) every other day based on the days after the onset of illness. The solid lines in black show the upper normal limit of each parameter, and the solid line in red shows the lower normal limit of lymphocyte count.

[a]P < .05 for nonsurvivors vs survivors.

JAMA. Published online February 07, 2020. doi:10.1001/jama.2020.1585

Lack of Intrauterine Transmission among Live Births in China

	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6	Patient 7	Patient 8	Patient 9	n (%)
Gestational age at delivery	37 weeks, 2 days	38 weeks, 3 days	36 weeks	36 weeks, 2 days	38 weeks, 1 day	36 weeks, 3 days	36 weeks, 2 days	38 weeks	39 weeks, 4 days	..
Birthweight (g)	2870	3730	3820	1880	2970	3040	2460	2800	3530	..
Low birthweight (<2500 g)	No	No	No	Yes	No	No	Yes	No	No	2 (22%)
Premature delivery	No	No	Yes	Yes	No	Yes	Yes	No	No	4 (44%)
Apgar score (1 min, 5 min)	8, 9	9, 10	9, 10	8, 9	9, 10	9, 10	9, 10	9, 10	8, 10	..
Severe neonatal asphyxia	No	No	No	No	No	No	No	No	No	0
Neonatal death	No	No	No	No	No	No	No	No	No	0
Fetal death or stillbirth	No	No	No	No	No	No	No	No	No	0

Table 2: **Neonatal outcomes**

- All deliveries via C-section in 3rd trimester.
- The presence of COVID-19 was tested in amniotic fluid, cord blood, neonatal throat swab, and breastmilk samples of 6 patients, all negative by pcr and nested RT-PCR

Chen H, Guo J, Wang C, et al. The Lancet.2020

Prognostic Indicators for first

CDC Travel Health Alert Notice (THAN)

https://www.cdc.gov/coronavirus/2019-ncov/travelers/communication-resources.html