COVID-19 Update

John Greene MD
March 10, 2020
COVID-19 Articles
What is our biggest obstacle with COVID-19?
Opinion: 5 reasons coronavirus fears are overblown — and 14 stocks to buy now

Published: Feb 1, 2020 11:27 a.m. ET

“We don’t expect these factors supporting investor confidence and consumer spending to change anytime soon’
Facts Vs. Fears: Five Things To Help Weigh Your Coronavirus Risk
What is the best way to not be fearful of COVID-19?

• 1) Knowledge
• Learn about COVID-19 strengths weaknesses

• 2) Preparation
• Are you ready for the first case of COVID-19

• 3) Teamwork
• Look out for each other and care for your patients as you would your self and family
Perfect love casts out all fear.

1 John 4:18
Who is most involved with COVID-19 MCC response?
What countries have been affected the most by COVID-19?
What states in the USA are most affected by COVID-19?
SOURCE Johns Hopkins University; WHO; CDC; USA TODAY; As of March 8, 2 p.m. EST
How COVID-19 was transmitted in the U.S.

Of the cases detected and tested within the United States – which does not include the Diamond Princess cases – most were exposed while traveling:

- **Travel related**
- **Person-to-person**
- **Under investigation**

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**Travel related**

- Orange circles

**Person-to-person**

- Light yellow circles

**Under investigation**

- Gray circles
COVID19 States

- Arizona: 6
  California: 100+ (includes Grand Princess, 1 death)
  Colorado: 12
  Connecticut: 2
  Florida: 15 (2 deaths)
  Georgia: 16
  Hawaii: 2
  Illinois: 11
  Indiana: 4
  Iowa: 8
  Kansas: 1
  Kentucky: 6
  Louisiana: 1
  Maryland/D.C.: 6
  Massachusetts: 24-28
  Minnesota: 2
  Missouri: 1

- Nebraska: 16
  Nevada: 4
  New Hampshire: 6
  New York: 142
  New Jersey: 11
  North Carolina: 7
  Ohio: 3
  Oklahoma: 1
  Oregon: 14
  Pennsylvania: 10
  Rhode Island: 3
  South Carolina: 7
  Tennessee: 3
  Texas: 24
  Utah: 2
  Vermont: 1
  Virginia: 5
  Washington: 128 (19 deaths)
  Wisconsin: 2
COVID-19 States

- New York: 142
- Washington: 128 (19 deaths)
- California: 100+ (includes Grand Princess, 1 death)
- Massachusetts: 24-28
- Texas: 24
- Georgia: 16
- Florida: 15 (2 deaths)
COVID19

• Scott Gottlieb, MD, former commissioner of the FDA "We're past the point of containment,“

• Health officials have announced a national shift to mitigation strategies, such as canceling large gatherings and having employees work from home.

• Anthony Fauci, MD the outbreak can no longer be prevented, and elderly or sick people should avoid traveling and crowds

• California, Florida, Maryland, New York, Oregon and Washington have all declared emergencies as local cases increase and 34 have reported COVID-19 cases
How has COVID-19 affected Florida?
Florida is reporting 18 cases of COVID-19, including 2 deaths. Of those cases, five were people who were repatriated. An additional 140 tests were negative, 111 rest results are pending. Three-hundred-and-two people are currently being monitored for COVID-19.

The two deaths occurred in men in their 70s who had traveled abroad, possibly to Israel or Egypt. One of those men had underlying health conditions. One of the men who died only tested positive posthumously. Florida has set up a hotline for coronavirus information: 1-866-779-6121.

email COVID-19@flhealth.gov with questions.
Where did COVID-19 come from?
Figure 1

A) Phylogenetic tree showing the evolutionary relationships between different coronaviruses, including SARS-CoV and 2019-nCoV. The tree is rooted with Bat SARS-CoV and Human SARS-CoV, with various intermediate hosts such as bat SARS-like CoV and SARS-like CoV identified.

B) Schematic diagram illustrating the potential pathways of transmission from the natural host to the human host, with bat acting as an intermediate host.

C) Detailed genetic analysis of different genotypes of 2019-nCoV, including Genotype I to VI, highlighting the diversity and evolution of the virus.
COVID-19 Origins

• There is likely an intermediate host between bats and humans, and preliminary data suggest it is the pangolin (a scaly anteater), an endangered and commonly trafficked mammal in which

• recombination of the bat and pangolin coronaviruses could have occurred.
Pangolin (a scaly anteater)
Why has COVID-19 caused so much fear?
The Psychology of Pandemics
The Psychology of Pandemics

- **Masks** were the first to go. Then, **hand sanitizers**.
- Now, novel coronavirus panic buyers are snatching up ... toilet paper?
- **1) People resort to extremes when they hear conflicting messages**
- The novel coronavirus scares people because it's new, and there's a lot about it that's still unknown.
- When people hear **conflicting messages** about the risk it poses and how seriously they should prepare for it, they tend to **resort to the extreme**
The Psychology of Pandemics

2) Reacting to the lack of a clear direction
"Unless people have seen ... official promises that everyone will be taken care of, they are left to guess at the probability of needing the extra toilet paper, sooner rather than later,"

3) Panic buying begets panic buying
"People, being social creatures, we look to each other for cues for what is safe and what is dangerous,"
"And when you see someone in the store, panic buying, that can cause a fear contagion effect."

Social media is a huge player in novel coronavirus fear-mongering,
The Psychology of Pandemics

4) It's natural to want to overprepare

"The novel coronavirus is engendering a sort of survivalist psychology, where we must live as much as possible at home and thus must 'stock up' on essentials, and that certainly includes toilet paper,“

"After all, if we run out of toilet paper, what do we replace it with?"
The Psychology of Pandemics

5) It allows some to feel a sense of control
The people who are stocking up on supplies are thinking about themselves and their family and what they need to do to prepare.
They are not thinking of healthcare workers, sick people or even regular folks who might run out of toilet paper sometime soon.
"It's all due to this wave of anticipatory anxiety," Taylor said. "People become anxious ahead of the actual infection.
They haven't thought about the bigger picture, like what are the consequences of stockpiling toilet paper."
But people only act that way out of fear. By preparing, even by purchasing toilet paper, returns a sense of control to what seems like a helpless situation.
Who is taking advantage of the fear of COVID-19 outbreak?
Beware of criminals pretending to be WHO

Criminals are disguising themselves as WHO to steal money or sensitive information. If you are contacted by a person or organization that appears to be from WHO, verify their authenticity before responding.

The World Health Organization will:

- never ask you to login to view safety information
- never email attachments you didn’t ask for
- never ask you to visit a link outside of www.who.int
- never charge money to apply for a job, register for a conference, or reserve a hotel
- never conduct lotteries or offer prizes, grants, certificates or funding through email
- never ask you to donate directly to emergency response plans or funding appeals.

Beware that criminals use email, websites, phone calls, text messages, and even fax messages for their scams.

You can verify if communication is legit by contacting WHO directly.
How does the economics of the COVID-19 outbreak effect the medical community?
Coronavirus and Oil Supply and Demand

• Asia, which is roiling from thousands of cases of coronavirus mainly in China and South Korea, no longer consumes as much energy as it did only a few months ago.
• China’s refineries, for example, cut their imports of foreign oil by about 20 percent last month.
• Russia wants prices to stay low to hurt the American shale oil industry or is gearing up to seize a bigger sliver of Asian and global oil demand for itself.
• Saudi Arabia didn’t take too kindly to the Kremlin’s decision and responded by slashing its export prices over the weekend to start a price war with Russia. That brought the price per barrel down by about $11 to $35 a barrel — the biggest one-day drop since 1991.
Managing the Commercial Impact of the Coronavirus: An Effective Supply Chain Response Plan

27 February 2020 | Blog
Authors: Ann Marie Uetz, Kathleen E. Wegrzyn, Vanessa L. Miller, Steven H. Hilfinger
Published To: Coronavirus Resource Center, Dashboard Insights

“We are in a phase of preparedness for potential pandemic... Let’s focus on what we can do and need to do, which is prepare.” (~ Dr. Mike Ryan, WHO Executive Director of Health Emergencies Programme, quoted during a press briefing this week)
What can we learn from other countries' response to COVID-19?
COVID19 and Germany

• Germany as of Monday afternoon, had 1,175 cases of the disease and zero deaths in the nation of 82 million people.
• Italy – which has a population of 59 million – has 9,200 cases and at least 463 deaths.
• France -- population 67 million – has 30 deaths,
• Spain -- population 46.7 million -- has lost 26 people.
• United States has encountered over 600 cases and some 22 fatalities.
COVID19 and Germany

• "Germany (is) working hard to retrace the steps of people who contracted the virus, and their methods of 'tracking of the infection chains' are helping in the reduction.

• All events with more than 1,000 participants are canceled

• Germany's actions had been "harsher and more stringent than those in Northern Italy where a rising death toll is occurring."
COVID19 and Italy

• "Italy has the oldest population in the world. “The average age rate of those who have died in Italy was 81, the majority of whom were already suffering underlying health problems."

• Italy is the European nation with the greatest number of air connections with China

• The outbreak in Italy has been evolving for longer than other places in Europe, and therefore more patients will have completed their final outcome and either been discharged or sadly passed away," she said.

• "Other European countries, which are earlier in the epidemic, may well begin to experience deaths in the coming days and weeks."
Will Warm Weather Slow Down the Coronavirus? Here's What Experts Think
COVID-19 and Weather

- "It really is behaving like a common cold-causing coronavirus ... I do think seasonality will play a role.
- As this outbreak unfolds and we approach spring and summer, I do think we will see some tapering off of cases."
- Citing studies that were conducted around the SARS outbreak from 2003 and previous years of coronavirus behavior, Nicholls said that if "history was any guide, then we could expect that this virus would no longer be as much of a threat as it is now in the summer."
- Nicholls is not the only expert predicting that the spread of the virus will begin fading with the arrival of spring. Zhong Nanshan, an epidemiologist and senior medical adviser to the Chinese government, that he believes the spread of COVID-19 will begin to wane in April.
- Zhong, based his prediction on mathematical modeling and government action. The 83-year-old doctor was a key player in reigning in the SARS outbreak of 2003 and said a major cause for concern is what's unknown about COVID-19."
How contagious or transmissible is COVID-19
Transmission

• Spreads mainly from person to person among close contacts, which is defined as about six feet, through respiratory droplets produced when an infected person coughs or sneezes
• Some spread may happen by touching contaminated surfaces and then touching the eyes, nose and mouth
• This virus does not last long on surfaces
• People are thought to be the most contagious when they are most symptomatic; that is when they are the sickest
• Some spread may happen before people show symptoms
• These last two forms of transmission are not the main driver of spread
COVID-19 Transmissibility

• The efficiency of transmission for any respiratory virus has important implications for containment and mitigation strategies.

• COVID-19 has an estimated basic reproduction number (R0) of 2.2, which means that, on average, each infected person spreads the infection to an additional two persons.

• Until this number falls below 1.0, it is likely that the outbreak will continue to spread.

• Recent reports of high titers of virus in the oropharynx early in the course of disease arouse concern about increased infectivity during the period of minimal symptoms.
COVID-19 Transmissibility

• given the efficiency of transmission, we should be prepared for Covid-19 to gain a foothold throughout the world, including in the United States.

• Community spread in the United States could require a shift from containment to mitigation strategies such as social distancing in order to reduce transmission.

• Such strategies could include isolating ill persons (including voluntary isolation at home), school closures, and telecommuting where possible.
COVID 19 Transmissibility

• basic reproduction number \( (R_0) \), defined as the number of additional people that is infections by 1 person over the course of their illness, is used to measure the transmissibility of a virus.

• A value of \( R_0 <1 \) is associated with a tapering pattern of infection, whereas a value \( >1 \) is linked to potential sustained transmission.
COVID 19 Transmissibility

• Earlier reports said that the World Health Organization estimated the R-0 as 1.4 to 2.5. By contrast, the R-0 for measles is 12-18, while the R-0 for seasonal influenza is a little over 1.

• Cases in China have had a reported mortality rate of around 2%, but experts stated that once more mild cases have been reported, that number was expected to go down. Outside of China, a mortality rate of about 0.8% has been reported.

• Chinese research among hospitalized patients suggested that the majority of cases (around 80%) have mild, non-severe disease. Around 6% met a composite outcome of severe outcomes and/or death, with 5% admitted to the ICU, 2.3% requiring ventilation, and 1.4% who died.
COVID 19 Transmissibility

• The influenza A(H1N1) virus that caused the swine flu pandemic, which originated in the United States in 2009, had $R_0$ values of 1.7 and was responsible for roughly 201,200 deaths across 120 countries.

• Not as severe as the influenza pandemic of 1968 (30-times higher mortality rate)

• Nor the 1918 pandemic (1000-times higher mortality rate).
COVID 19 Transmissibility

- SARS and MERS pandemics of 2003 and 2012 to the present, respectively, cause severe disease states.
- However, these infections were not as transmissible.
- Initial $R_0$ values were >2.0, which is indicative of near certain global transmission; however, there were a total of 8098 reported cases, and 774 deaths in 37 countries that were associated with SARS.
- This demonstrated a case-fatality rate of 9.6%.
- The rapidly severe course of illness as the cause of this low transmissibility because it allow simply and quick recognition and isolation of individuals with the infection.
- The course of the MERS pandemic has proven similar to SARS.
- Since 2012, there have been 2494 cases of MERS and 858 deaths across 27 countries related to the infection. This is a case-fatality rate of 34%, but an $R_0$ score of <1.
COVID 19 Transmissibility

• COVID-19 spreads less efficiently than flu, transmission does appear to be driven by people who are sick, it causes more severe illness than flu
• Unlike the flu there are not yet any vaccines or therapeutics, and it can be contained.
• With influenza, people who are infected but not yet sick are major drivers of transmission, which does not appear to be the case for COVID-19.
• Evidence from China shows that only 1% of reported cases do not have symptoms, and most of those cases develop symptoms within 2 days
How dangerous is COVID-19 compared to other viral infections?
COVID-19 Facts

• More than 80% of people affected have a mild form of COVID-19.
• Illness caused is milder than was seen during the SARS outbreak.
• Respiratory transmission of COVID-19 makes its spread very efficient.
• Severity of COVID-19 lies somewhere between a community-acquired coronavirus, such as OC43, HKU1, or NL63, and SARS.
• Likely to evolve much like H1N1, from a novel pandemic coronavirus strain to an endemic seasonal strain that causes about a quarter of cases of the common cold.
• "Like any respiratory illness, people of advanced age and those with other medical conditions get hit the hardest. That's where it's clustering.
• Because this is the first year of the virus, it will likely hit hard this year, "but it will be a mild pandemic.
<table>
<thead>
<tr>
<th>Virus</th>
<th>Case Fatality Rate (%)</th>
<th>Pandemic</th>
<th>Contained</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019-nCoV</td>
<td>Unknown*</td>
<td>Unknown</td>
<td>No, efforts ongoing</td>
<td></td>
</tr>
<tr>
<td>pH1N1</td>
<td>0.02–0.4</td>
<td>Yes</td>
<td>No, postpandemic circulation and establishment in human population</td>
<td></td>
</tr>
<tr>
<td>H7N9</td>
<td>39</td>
<td>No</td>
<td>No, eradication efforts in poultry reservoir ongoing</td>
<td></td>
</tr>
<tr>
<td>NL63</td>
<td>Unknown</td>
<td>Unknown</td>
<td>No, endemic in human population</td>
<td></td>
</tr>
<tr>
<td>SARS-CoV</td>
<td>9.5</td>
<td>Yes</td>
<td>Yes, eradicated from intermediate animal reservoir</td>
<td>58% of cases result from nosocomial transmission</td>
</tr>
<tr>
<td>MERS-CoV</td>
<td>34.4</td>
<td>No</td>
<td>No, continuous circulation in animal reservoir and zoonotic spillover</td>
<td>70% of cases result from nosocomial transmission</td>
</tr>
<tr>
<td>Ebola virus (West Africa)</td>
<td>63</td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

* Number will most likely continue to change until all infected persons recover.
Patients seek health care and can be diagnosed and isolated, and their contacts can be traced. A caveat is that coronaviruses have a propensity for nosocomial spread.

Patients do not seek health care, do not receive a diagnosis, and may spread the virus to contacts.

**Surveillance Pyramid and Its Relation to Outbreak Containment.**

The proportion of mild and asymptomatic cases versus severe and fatal cases is currently unknown for 2019-nCoV — a knowledge gap that hampers realistic assessment of the virus’s epidemic potential and complicates the outbreak response.
Covid-19 — Navigating the Uncharted

Anthony S. Fauci, M.D., H. Clifford Lane, M.D., and Robert R. Redfield, M.D.

The latest threat to global health is the ongoing outbreak of the respiratory disease that was recently given the name Coronavirus Disease 2019 (Covid-19). Covid-19 was recognized in December 2019. It was rapidly shown to be caused by a novel coronavirus that is structurally related to the virus that causes severe acute respiratory syndrome (SARS). As in two preceding instances of emergence of coronavirus disease in the past 18 years — SARS (2002 and 2003) and Middle East respiratory syndrome (MERS) (2012 to the present) — the Covid-19 outbreak has posed critical challenges for the public health, research, and medical communities.

In their Journal article, Li and colleagues provide a detailed clinical and epidemiologic description of the first 425 cases reported in the epicenter of the outbreak: the city of Wuhan in Hubei province, China. Although this information is critical in informing the appropriate response to this outbreak, as the authors point out, the study faces the limitation associated with reporting of a diagnosis of pneumonia, the currently reported case fatality rate is approximately 2%. In another article in the Journal, Guan et al. report mortality of 1.4% among 1099 patients with laboratory-confirmed Covid-19; these patients had a wide spectrum of disease severity. If one assumes that the number of asymptomatic or minimally symptomatic cases is several times as high as the number of reported cases, the case fatality rate may be considerably less than 1%. This suggests that the overall clinical consequences of Covid-19 may ultimately be more akin to those of a severe seasonal influenza (which has a case fatality rate of approximately 0.1%) or a pandemic influenza (similar to those in 1957 and 1968) rather than a disease similar to SARS or MERS, which have had case fatality rates of 9 to 10% and 36%, respectively.

The efficiency of transmission for any respiratory virus has important implications for containment and mitigation strategies. The current study indicates an estimated basic reproduction
COVID-19 Mortality

• One article had a case definition requiring a diagnosis of pneumonia, with a case fatality rate of 2%
• Guan et al report mortality of 1.4% among 1099 patients with laboratory-confirmed Covid-19; these patients had a wide spectrum of disease severity.
• If the number of asymptomatic or minimally symptomatic cases is several times as high as the number of reported cases, the case fatality rate may be considerably less than 1%.
• This suggests that the overall clinical consequences of Covid-19 may ultimately be more akin to those of a severe seasonal influenza (which has a case fatality rate of approximately 0.1%) or a pandemic influenza (similar to those in 1957 and 1968) rather than a disease similar to SARS or MERS, which have had case fatality rates of 9 to 10% and 36%, respectively.
COVID 19 FACTS

• Only 965 (2.2%) were under 20 years of age and there is just one recorded death (0.1%) in this age group.
• Most patients (77.8%) were aged 30 to 69 years.
• Patients aged over 80 years had a CFR of 14.8%.
• The CFR was highest in those with comorbidities including cardiovascular, diabetes, chronic respiratory disease, hypertension and cancer
<table>
<thead>
<tr>
<th></th>
<th>2019-nCoV*</th>
<th>MERS-CoV</th>
<th>SARS-CoV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>December, 2019</td>
<td>June, 2012</td>
<td>November, 2002</td>
</tr>
<tr>
<td>Location of first detection</td>
<td>Wuhan, China</td>
<td>Jeddah, Saudi Arabia</td>
<td>Guangdong, China</td>
</tr>
<tr>
<td>Age, years (range)</td>
<td>49 (21–76)</td>
<td>56 (14–94)</td>
<td>39.9 (1–91)</td>
</tr>
<tr>
<td>Male:female sex ratio</td>
<td>2.7:1</td>
<td>3.3:1</td>
<td>1:1.25</td>
</tr>
<tr>
<td>Confirmed cases</td>
<td>835†</td>
<td>2494</td>
<td>8096</td>
</tr>
<tr>
<td>Mortality</td>
<td>25† (2.9%)</td>
<td>858 (37%)</td>
<td>744 (10%)</td>
</tr>
<tr>
<td>Health-care workers</td>
<td>16‡</td>
<td>9.8%</td>
<td>23.1%</td>
</tr>
<tr>
<td><strong>Symptoms</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fever</td>
<td>40 (98%)</td>
<td>98%</td>
<td>99–100%</td>
</tr>
<tr>
<td>Dry cough</td>
<td>31 (76%)</td>
<td>47%</td>
<td>29–75%</td>
</tr>
<tr>
<td>Dyspnoea</td>
<td>22 (55%)</td>
<td>72%</td>
<td>40–42%</td>
</tr>
<tr>
<td>Diarrhoea</td>
<td>1 (3%)</td>
<td>26%</td>
<td>20–25%</td>
</tr>
<tr>
<td>Sore throat</td>
<td>0</td>
<td>21%</td>
<td>13–25%</td>
</tr>
<tr>
<td>Ventilatory support</td>
<td>9.8%</td>
<td>80%</td>
<td>14–20%</td>
</tr>
</tbody>
</table>

Data are n, age (range), or n (%) unless otherwise stated. 2019-nCoV=2019 novel coronavirus. MERS-CoV=Middle East respiratory syndrome coronavirus. SARS-CoV=severe acute respiratory syndrome coronavirus. *Demographics and symptoms for 2019-nCoV infection are based on data from the first 41 patients reported by Chaolin Huang and colleagues (admitted before Jan 2, 2020). Case numbers and mortalities are updated up to Jan 21, 2020) as disclosed by the Chinese Health Commission. †Data as of Jan 23, 2020. ‡Data as of Jan 21, 2020.

Table: Characteristics of patients who have been infected with 2019-nCoV, MERS-CoV, and SARS-CoV
How do those who die from COVID-19 differ from those who survive?
Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study

Fei Zhou*, Ting Yu*, Ronghui Du*, Guohui Fan*, Ying Liu*, Zhibo Liu*, Jie Xiang*, Yeming Wang, Bin Song, Xiaoqing Gu, Lulu Guan, Yuan Wei, Hui Li, Xudong Wu, Jiuyang Xu, Shengjin Tu, Yi Zhang, Hua Chen, Bin Cao

Summary

Background Since December, 2019, Wuhan, China, has experienced an outbreak of coronavirus disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Epidemiological and clinical characteristics of patients with COVID-19 have been reported but risk factors for mortality and a detailed clinical course of illness, including viral shedding, have not been well described.

Methods In this retrospective, multicentre cohort study, we included all adult inpatients (≥18 years old) with laboratory-confirmed COVID-19 from Jinyintan Hospital and Wuhan Pulmonary Hospital (Wuhan, China) who had been discharged or had died by Jan 31, 2020. Demographic, clinical, treatment, and laboratory data, including serial samples for viral RNA detection, were extracted from electronic medical records and compared between survivors and non-survivors. We used univariable and multivariable logistic regression methods to explore the risk factors associated with in-hospital death.

Findings 191 patients (135 from Jinyintan Hospital and 56 from Wuhan Pulmonary Hospital) were included in this study, of whom 137 were discharged and 54 died in hospital. 91 (48%) patients had a comorbidity, with hypertension being the most common (58 [30%] patients), followed by diabetes (36 [19%] patients) and coronary heart disease (15 [8%] patients). Multivariable regression showed increasing odds of in-hospital death associated with older age (odds ratio 1·10, 95% CI 1·03–1·17, per year increase; p=0·0043), higher Sequential Organ Failure Assessment (SOFA) score (5·65, 2·61–12·23; p<0·0001), and d-dimer greater than 1 μg/L (18·42, 2·64–128·55; p=0·0033) on admission. Median duration of viral shedding was 20·0 days (IQR 17·0–24·0) in survivors, but SARS-CoV-2 was detectable until death in non-survivors. The longest observed duration of viral shedding in survivors was 37 days.

Interpretation The potential risk factors of older age, high SOFA score, and d-dimer greater than 1 μg/L could help clinicians to identify patients with poor prognosis at an early stage. Prolonged viral shedding provides the rationale for a strategy of isolation of infected patients and optimal antiviral interventions in the future.

Funding Chinese Academy of Medical Sciences Innovation Fund for Medical Sciences; National Science Grant for Distinguished Young Scholars; National Key Research and Development Program of China; The Beijing Science and Technology Project; and Major Projects of National Science and Technology on New Drug Creation and Development.
COVID19 Nonsurvivors

- Older (odds ratio 1.10, 95% confidence interval [CI], 1.03 - 1.17, per year increase in age)
- Comorbidities 91 (48%) of the 191 patients
  - hypertension (30%)
  - diabetes (19%)
  - coronary heart disease (8%).
- Sequential Organ Failure Assessment (SOFA) score (5.65, 2.61 - 12.23; \( P < .0001 \))
- D-dimer level exceeding 1 μg/L on admission
- Signs of sepsis on admission
- Prolonged use of noninvasive ventilation
COVID19 Survivors and Nonsurvivors

• Nonsurvivors compared with survivors had higher frequencies of respiratory failure (98% vs 36%), sepsis (100%, vs 42%), and secondary infections (50% vs 1%)
• Average age of survivors was 52 years compared to 69 for those who died
• From the time of initial symptoms, median time to discharge from the hospital was 22 days
• Average time to death was 18.5 days.
COVID19 Survivors and Nonsurvivors

• Fever persisted for a median of 12 days among all patients
• Cough persisted for a median 19 days; 45% of the survivors were still coughing on discharge
• Shortness of breath improved after 13 days, but persisted until death in the others
• Viral shedding persisted for a median duration of 20 days in survivors, ranging from 8 to 37 days
• COVID19 was detectable in nonsurvivors until death
• Antiviral treatment did not curtail viral shedding
Figure 1: Clinical courses of major symptoms and outcomes and duration of viral shedding from illness onset in patients hospitalised with COVID-19.

Figure shows median duration of symptoms and onset of complications and outcomes. ICU=intensive care unit. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. ARDS=acute respiratory distress syndrome. COVID-19=coronavirus disease 2019.
How does COVID-19 compare with the flu this year?
• 26 million influenza illnesses
• 250,000 hospitalizations
• 14,000 deaths
• 41.9 per 100,000 population cumulative hospitalization rate
• highest rate was seen among adults aged 65 years and older (101.6 per 100,000 population)
• Children younger than 5 years (65.9)
• Adults aged 50 to 64 years (53.9)
• Adults aged 18 to 49 years (23.5)
• Children aged 5 to 17 years (17.3).
March 9 COVID19 FLU Stats

• CDC estimates flu has caused 34 million illnesses, 350,000 hospitalizations and 20,000 deaths this season

• Nationally, 607 COVID-19 cases have been confirmed in the U.S., with 22 related deaths as of 2:30 p.m., March 9.

• Worldwide, 113,579 COVID-19 cases have been reported.
Are HCW’s more likely to get the flu or COVID-19 at work or outside work?
Are healthcare personnel at higher risk of seasonal influenza than other working adults?

Brenda L. Coleman PhD\textsuperscript{1,2}, Stefan P. Kuster MD\textsuperscript{1,3}, Kevin Katz MD\textsuperscript{4}, Mark Loeb MD\textsuperscript{5}, Shelly A. McNeil MD\textsuperscript{6,7}, Matthew P. Muller MD, PhD\textsuperscript{2,8}, Jeff Powis MD\textsuperscript{9}, Andrew Simor MD\textsuperscript{10}, Kristy K. L. Coleman MSc\textsuperscript{1,11}, Todd Hatchette MD\textsuperscript{7} and Allison McGeer MD\textsuperscript{1,2} for the Canadian Healthcare Worker Study Group

\textsuperscript{1}Sinai Health System, Toronto, Ontario, Canada, \textsuperscript{2}University of Toronto, Toronto, Ontario, Canada, \textsuperscript{3}Universitätsspital Zürich, Zurich, Switzerland, \textsuperscript{4}North York General Hospital, Toronto, Ontario, Canada, \textsuperscript{5}McMaster University, Hamilton, Ontario, Canada, \textsuperscript{6}QEH Hospital, Halifax, Nova Scotia, Canada, \textsuperscript{7}Dalhousie University, Halifax, Nova Scotia, Canada, \textsuperscript{8}St Michael's Hospital, Toronto, Ontario, Canada, \textsuperscript{9}Toronto East General Hospital, Toronto, Ontario, Canada, \textsuperscript{10}Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada and \textsuperscript{11}Parkwood Institute, St Joseph's Healthcare Centre, London, Ontario, Canada

Abstract

Background: Adults are at risk of being exposed to influenza from many sources. Healthcare personnel (HCP) have the additional risk of being exposed to ill patients.

Objective: To determine whether HCP were at higher risk than adults working in nonhealthcare roles (non-HCP).

Design: Prospective cohort study.

Setting: Acute-care hospitals and other businesses in Toronto, Ontario, Canada.

Methods: Adults aged 18–69 years were enrolled for 1 or more of the 2010/2011, 2011/2012, and 2012/2013 influenza seasons. Swabs collected during acute respiratory illnesses were tested for influenza and pre- and postseason blood samples were tested for influenza-specific immune response.

Results: The adjusted odds of influenza were similar for HCP and non-HCP (odds ratio [OR], 1.29; 95% confidence interval [CI], 0.63–2.63). Older adults and those vaccinated against influenza had lower odds, and those who shared their workspace and who used corrective eyewear had higher odds of influenza.

Conclusions: HCP and other working adults are at similar risk of influenza infection.

(Received 11 September 2019; accepted 2 November 2019; electronically published 5 December 2019)
How does COVID-19 compare with SARS and MERS?
Figure 2. Geographic Distribution of the Middle East Respiratory Syndrome.
Data are from the World Health Organization (www.who.int/emergencies/mers-cov/mers-summary-2016.pdf) and were collected through December 2, 2016. At that time, the total number of cases was 1841.
SARS and MERS

• SARS outbreak infected more than 8,000 people in 26 countries in 2002 and 2003
• MERS infected nearly 2,500 people in 27 countries since 2012
COVID-19 Misconceptions

• Wearing masks in public will prevent people from acquiring it.
• Most of the spread isn’t from somebody you pass in the grocery store— it’s going to be somebody close to you who gets sick and you have to take care of.
• COVID-19 is similar to SARS — although there are genetic similarities, “it’s milder than SARS.”
• SARS did not spread to the U.S.
• COVID-19 is “likely to cause less disease and death, but more likely to be transmitted,”.
COVID-19

• Unlike Severe Acute Respiratory Syndrome (SARS), which causes infections deep in the lower respiratory tract that can result in pneumonia
• Inhabits both the upper and lower respiratory tracts
• Capable of causing severe pneumonia, and spreading easily like flu or the common cold
What about children and COVID-19?
COVID-19 Children

- *JAMA* by Zhi-Jiang Zhang, MD, PhD, of Wuhan University
- 9 infants with COVID-19
- Illness is mild, and family clustering occurred for all infants, meaning all were from a household with at least one infected family member.
- "This shows that infants are getting infected, but at least in this [study], all had mild illness. Some had no symptoms,"
COVID FACTS

• Reports from China indicate disease is much more severe in older patients, with the highest mortality rate among adults age 80 and older.
• Patients with other comorbidities are also the most at risk.
• The disease appears to be less severe among younger patients.
• Children seem to acquire milder forms of the infection.
• There are no confirmed reports of the disease being transmissible via vertical transmission, from a pregnant woman to her baby during the third trimester of pregnancy.
• It is unclear whether or how often COVID-19 survivors will experience persistent pulmonary or other problems, or for how long.
What are the clinical findings of COVID-19?
Modes of transmission/incubation period

• **Modes of transmission**
  – Main- person to person via respiratory droplets when an infected person coughs or sneezes
  – Between people who are in close contact with one another (within about 6 feet)
  – Droplets can land in the mouths or noses of people who are nearby or possibly be inhaled into the lungs

• **Incubation period**
  – Median 5-6 days
  – Range 1-14 days
COVID19 Exposures That Become Sick

• Most will develop symptoms by day 11.5 of the infection, which is within the 14-day period of active monitoring (97.5% of patients)

• Estimated 101 out of 10,000 cases (1%) could become symptomatic after the end of the 14-day monitoring period

• Should you get any symptoms, immediately re quarantine yourself and seek medical care,
Clinical presentation

- Fever (83% - 98%)
- Dry cough (76%- 82%)
- SOB (31%)
- Fatigue, myalgias (11%- 44%)
- Other symptoms
  - headache, sore throat, abdominal pain, diarrhea
Clinical presentation

• Lab work
  – lymphopenia (70%)
  – Prolonged prothrombin time (58%)
  – high lactate dehydrogenase (40%)

• CXR
  – bilateral patchy infiltrates

• Chest CT
  – bilateral ground-glass infiltrates
Clinical Presentation

• Most- mild illness
• Older patients and patient with other co-morbidities- at higher risk for severe illness

• If hospitalized
  – ARDS developed in 17-29%
  – 25% require ICU care
  – 10% require mechanical ventilation
What are some radiologic findings of COVID-19 and are they different than the flu?
A Novel Coronavirus from Patients with Pneumonia in China, 2019

Na Zhu, Ph.D., Dingyu Zhang, M.D., Wenling Wang, Ph.D., Xingwang Li, M.D., Bo Yang, M.S., Jingdong Song, Ph.D., Xiang Zhao, Ph.D., Baoying Huang, Ph.D., Weifeng Shi, Ph.D., Roujian Lu, M.D., Peihua Niu, Ph.D., Faxian Zhan, Ph.D., Xuejun Ma, Ph.D., Dayan Wang, Ph.D., Wenbo Xu, M.D., Guizhen Wu, M.D., George F. Gao, D.Phil., and Wenjie Tan, M.D., Ph.D., for the China Novel Coronavirus Investigating and Research Team

SUMMARY

In December 2019, a cluster of patients with pneumonia of unknown cause was linked to a seafood wholesale market in Wuhan, China. A previously unknown betacoronavirus was discovered through the use of unbiased sequencing in samples from patients with pneumonia. Human airway epithelial cells were used to isolate a novel coronavirus, named 2019-nCoV, which formed a clade within the subgenus sarbecovirus, Orthocoronavirinae subfamily. Different from both MERS-CoV and SARS-CoV, 2019-nCoV is the seventh member of the family of coronaviruses that infect humans. Enhanced surveillance and further investigation are ongoing. (Funded by the National Key Research and Development Program of China and the National Major Project for Control and Prevention of Infectious Disease in China.)

Emerging and reemerging pathogens are global challenges for public health. Coronaviruses are enveloped RNA viruses that are distributed broadly among humans, other mammals, and birds and that cause respiratory, enteric, hepatic, and neurologic diseases. Six coronavirus species are known to cause human disease. Four viruses — 229E, OC43, NL63, and HKU1 — are prevalent and typically cause common cold symptoms in immunocompetent individuals. The two other strains — severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV) — are zoonotic in origin and have been linked to sometimes fatal illness. SARS-CoV was the causal agent of the severe acute respiratory syndrome outbreaks in 2002 and 2003 in Guangdong Province, China. MERS-CoV was the pathogen responsible for severe respiratory disease outbreaks in 2012 in the Middle East. Given the high prevalence and wide distribution of coronaviruses, the large genetic diversity and frequent recombination of their genomes, and increasing human–animal interface activities, novel coronaviruses are likely to emerge periodically in humans owing to frequent cross-species infections and occasional spillover events.

In late December 2019, several local health facilities reported clusters of patients with pneumonia of unknown cause that were epidemiologically linked to a seafood and wet animal wholesale market in Wuhan, Hubei Province, China. On December 31, 2019, the Chinese Center for Disease Control and Prevention (China CDC) dispatched a rapid response team to accompany Hubei provincial and Wuhan city health authorities and to conduct an epidemiologic and etiologic investigation. We report the results of this investigation, identifying the source of the pneumonia.
Figure 2. Cytopathic Effects in Human Airway Epithelial Cell Cultures after Inoculation with 2019-nCoV.
Figure 3. Visualization of 2019-nCoV with Transmission Electron Microscopy.

Negative-stained 2019-nCoV particles are shown in Panel A, and 2019-nCoV particles in the human airway epithelial cell ultrathin sections are shown in Panel B. Arrowheads indicate extracellular virus particles, arrows indicate inclusion bodies formed by virus components, and triangles indicate cilia.
Epidemiologic and Clinical Characteristics of Novel Coronavirus Infections Involving 13 Patients Outside Wuhan, China

In December 2019, cases of pneumonia appeared in Wuhan, China. The etiology of these infections was a novel coronavirus (2019-nCoV), possibly connected to zoonotic or environmental exposure from the seafood market in Wuhan. Human-to-human transmission has accounted for most of the infections, including among health care workers. The virus has spread to different parts of China and at least 26 other countries. A high number of men have been infected, and the reported mortality rate has been approximately 2%, which is lower than that reported from other coronavirus epidemics including severe acute respiratory syndrome (SARS; mortality rate, >40% in patients aged >60 years) and Middle East respiratory syndrome (MERS; mortality rate, 30%). However, little is known about the clinical manifestations of 2019-nCoV in healthy populations or cases outside Wuhan. We report early clinical features of 13 patients with confirmed 2019-nCoV infection admitted to hospitals in Beijing.
A, Chest radiograph from a 69-year-old man, showing scattered opacities in lower left lobe (arrowhead). B, Normal chest radiograph from a 32-year-old woman. C, Chest computed tomography (CT) scan from a 49-year-old woman, showing bilateral ground glass opacities (arrowheads). D, Normal chest CT scan from a 34-year-old man.
Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia in Wuhan, China

Dawei Wang, MD; Bo Hu, MD; Chang Hu, MD; Fangfang Zhu, MD; Xing Liu, MD; Jing Zhang, MD; Binbin Wang, MD; Hui Xiang, MD; Zhenshun Cheng, MD; Yong Xiong, MD; Yan Zhao, MD; Yirong Li, MD; Xinghuan Wang, MD; Zhiyong Peng, MD

**IMPORTANCE** In December 2019, novel coronavirus (2019-nCoV)–infected pneumonia (NCIP) occurred in Wuhan, China. The number of cases has increased rapidly but information on the clinical characteristics of affected patients is limited.

**OBJECTIVE** To describe the epidemiological and clinical characteristics of NCIP.

**DESIGN, SETTING, AND PARTICIPANTS** Retrospective, single-center case series of the 138 consecutive hospitalized patients with confirmed NCIP at Zhongnan Hospital of Wuhan University in Wuhan, China, from January 1 to January 28, 2020; final date of follow-up was February 3, 2020.

**EXPOSURES** Documented NCIP.

**MAIN OUTCOMES AND MEASURES** Epidemiological, demographic, clinical, laboratory, radiological, and treatment data were collected and analyzed. Outcomes of critically ill patients and noncritically ill patients were compared. Presumed hospital-related transmission was suspected if a cluster of health professionals or hospitalized patients in the same wards became infected and a possible source of infection could be tracked.

**RESULTS** Of 138 hospitalized patients with NCIP, the median age was 56 years (interquartile range, 42-68; range, 22-92 years) and 75 (54.3%) were men. Hospital-associated transmission was suspected as the presumed mechanism of infection for affected health professionals (40 [29%]) and hospitalized patients (17 [12.3%]). Common symptoms included fever (136 [98.6%]), fatigue (96 [69.6%]), and dry cough (82 [59.4%]). Lymphopenia (lymphocyte count, 0.8 × 10^9/L [interquartile range (IQR), 0.6-1.1]) occurred in 97 patients (70.3%), prolonged prothrombin time (13.0 seconds [IQR, 12.3-13.7]) in 80 patients (58%), and elevated lactate dehydrogenase (261 U/L [IQR, 182-403]) in 55 patients (39.9%). Chest computed tomographic scans showed bilateral patchy shadows or ground glass opacity in the lungs of all patients. Most patients received antiviral therapy (oseltamivir, 124 [89.9%]), and many received antibacterial therapy (moxifloxacin, 89 [64.4%]; ceftriaxone, 34 [24.6%]; azithromycin, 25 [18.1%]) and glucocorticoid therapy (62 [44.9%]). Thirty-six patients (26.1%) were transferred to the intensive care unit (ICU) because of complications, including acute respiratory distress syndrome (22 [61.1%]), arrhythmia (11 [30.6%]), and shock (11 [30.6%]). The median time from symptom to dyspnea was 5.0 days, to hospital admission was 7.0 days, and to ARDS was 8.0 days. Patients treated in the ICU (n = 36), compared with patients not treated in the ICU (n = 102), were older (median age, 66 years vs 51 years), were more likely to have underlying comorbidities (26 [72.2%] vs 38 [37.3%]), and were more likely to have dyspnea (23 [63.9%] vs 20 [19.6%]), and anorexia (24 [66.7%] vs 31 [30.4%]). Of the 36 cases in the ICU, 4 (11.1%) received high-flow oxygen therapy, 15 (41.7%) received noninvasive ventilation, and 17 (47.2%) received invasive ventilation (4 were switched to extracorporeal membrane oxygenation). As of February 3, 47 patients (34.1%) were discharged and 6 died (overall mortality, 4.3%), but the remaining patients are still hospitalized. Among those discharged alive (n = 47), the median hospital stay was 10 days (IQR, 7.0-14.0).

**CONCLUSIONS AND RELEVANCE** In this single-center case series of 138 hospitalized patients with confirmed NCIP in Wuhan, China, presumed hospital-related transmission of 2019-nCoV was suspected in 41% of patients, 26% of patients received ICU care, and mortality was 4.3%.

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Figure 1. Chest Computed Tomographic Images of a 52-Year-Old Patient Infected With 2019 Novel Coronavirus (2019-nCoV)

A  Computed tomography images on day 5 after symptom onset

A, Chest computed tomographic images obtained on January 7, 2020, show ground glass opacity in both lungs on day 5 after symptom onset.

B  Computed tomography images after treatment on day 19 after symptom onset

B, Images taken on January 21, 2020, show the absorption of bilateral ground glass opacity after the treatment of extracorporeal membrane oxygenation from January 7 to 12 in the intensive care unit.
<table>
<thead>
<tr>
<th>Complications</th>
<th>Total (N = 138)</th>
<th>ICU (n = 36)</th>
<th>Non-ICU (n = 102)</th>
<th>P Value&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
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<tbody>
<tr>
<td>Shock</td>
<td>12 (8.7)</td>
<td>11 (30.6)</td>
<td>1 (1.0)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Acute cardiac injury</td>
<td>10 (7.2)</td>
<td>8 (22.2)</td>
<td>2 (2.0)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Arrhythmia</td>
<td>23 (16.7)</td>
<td>16 (44.4)</td>
<td>7 (6.9)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>ARDS</td>
<td>27 (19.6)</td>
<td>22 (61.1)</td>
<td>5 (4.9)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>AKI</td>
<td>5 (3.6)</td>
<td>3 (8.3)</td>
<td>2 (2.0)</td>
<td>.11</td>
</tr>
</tbody>
</table>

| Treatment                     |                 |              |                   |                     |
| Antiviral therapy             | 124 (89.9)      | 34 (94.4)    | 90 (88.2)         | .36                 |
| Glucocorticoid therapy        | 62 (44.9)       | 26 (72.2)    | 36 (35.3)         | <.001               |
| CKRT                          | 2 (1.45)        | 2 (5.56)     | 0                 | >.99                |
| Oxygen inhalation             | 106 (76.81)     | 4 (11.11)    | 102 (100)         | <.001               |
| NIV                           | 15 (10.9)       | 15 (41.7)    | 0                 | <.001               |
| IMV                           | 17 (12.32)      | 17 (47.22)   | 0                 | <.001               |
| ECMO                          | 4 (2.9)         | 4 (11.1)     | 0                 | .004                |
CT Imaging Features of 2019 Novel Coronavirus (2019-nCoV)

Michael Chung, MD • Adam Bernheim, MD • Xueyan Mei, MS • Ning Zhang, MD • Mingqian Huang, MD • Xianjun Zeng, MD • Jiufa Cui, MD • Wenjian Xu, MD • Yang Yang, PhD • Zahi A. Fayad, PhD • Adam Jacobi, MD • Kunwei Li, MD • Shaolin Li, MD • Hong Shan, MD

From the Department of Diagnostic, Molecular, and Interventional Radiology (M.C., A.B., M.H., Z.A.F., A.J.) and BioMedical Engineering and Imaging Institute (X.M., Y.Y., Z.A.F.), Icahn School of Medicine at Mount Sinai, New York, NY; Department of Radiology, The First Affiliated Hospital of Nanchang University, Nanchang, China (N.Z., X.Z.); Department of Radiology, The Affiliated Hospital of Qingdao University, Qingdao, China (J.C., W.X.); and Guangdong Provincial Key Laboratory of Biomedical Imaging, Department of Radiology, The Fifth Affiliated Hospital, Sun Yat-sen University, 52 East Meihua Rd, New Xiangzhou, Zhuhai, Guangdong Province, China, 519000 (K.L., S.L., H.S.). Received January 28, 2020; revision requested and received January 31; accepted February 3. Address correspondence to H.S. (e-mail: Shanhong@mail.sysu.edu.cn).

Conflicts of interest are listed at the end of this article.

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In this retrospective case series, chest CT scans of 21 symptomatic patients from China infected with the 2019 novel coronavirus (2019-nCoV) were reviewed, with emphasis on identifying and characterizing the most common findings. Typical CT findings included bilateral pulmonary parenchymal ground-glass and consolidative pulmonary opacities, sometimes with a rounded morphology and a peripheral lung distribution. Notably, lung cavitiation, discrete pulmonary nodules, pleural effusions, and lymphadenopathy were absent. Follow-up imaging in a subset of patients during the study time window often demonstrated mild or moderate progression of disease, as manifested by increasing extent and density of lung opacities.
Key Results

- Of 21 patients with the 2019 novel coronavirus, 15 (71%) had involvement of more than two lobes at chest CT, 12 (57%) had ground-glass opacities, seven (33%) had opacities with a rounded morphology, seven (33%) had a peripheral distribution of disease, six (29%) had consolidation with ground-glass opacities, and four (19%) had crazy-paving pattern.

- Lung cavitation, discrete pulmonary nodules, pleural effusions, and lymphadenopathy were absent.

- Fourteen percent of patients (three of 21) presented with a normal CT scan.
Figure 1. Images in a 29-year-old man with unknown exposure history who presented with fever and cough ultimately requiring admission to intensive care unit. (a) Axial thin-section unenhanced CT scan shows diffuse bilateral confluent and patchy ground-glass (white arrows) and consolidative (black arrows) pulmonary opacities. (b) Axial unenhanced image shows that the disease in the right middle and lower lobes has a striking peripheral distribution (arrows).
Figure 4. Image in a 69-year-old man with history of recent travel to Wuhan who presented with fever. Axial thin-section unenhanced CT scan shows ground-glass opacities in the lower lobes with a pronounced peripheral distribution (arrows).
Figure 3. Image in a 66-year-old woman with history of recent travel to Wuhan who presented with fever and productive cough. Axial thin-section collimated unenhanced CT image shows a crazy-paving pattern, as manifested by right lower lobe ground-glass opacification and interlobular septal thickening (arrow) with intralobular lines.
Figure 2. Image in a 36-year-old man with history of recent travel to Wuhan who presented with fever, fatigue, and myalgias. Coronal thin-section unenhanced CT image shows ground-glass opacities with a rounded morphology in both upper lobes (arrows).
Figure 5. Images in a 43-year-old woman with a history of travel to Wuhan who presented with fever. (a) Axial thin-section unenhanced CT image obtained January 18, 2020, shows normal lung. (b) Follow-up CT image obtained January 21, 2020, shows a new solitary, rounded, peripheral ground-glass lesion in the right lower lobe (arrow).
<table>
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<tr>
<th>Feature</th>
<th>SARS</th>
<th>MERS</th>
<th>COVID-19</th>
</tr>
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<tbody>
<tr>
<td><strong>Clinical sign or symptom</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fever or chills</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Dyspnea</td>
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<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Malaise</td>
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<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
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<td>Yes</td>
<td>Yes</td>
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<td>Cough</td>
<td>Dry</td>
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<td>Dry</td>
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<td>Yes</td>
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</tr>
<tr>
<td>Nausea or vomiting</td>
<td>Yes</td>
<td>Yes</td>
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<td>Sore throat</td>
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<td>Uncommon</td>
<td>Uncommon</td>
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<td>Arthralgia</td>
<td>Yes</td>
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<td>Uncommon</td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Acute phase</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial imaging</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>15–20% of patients</td>
<td>17% of patients</td>
<td>15–20% of patients</td>
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<tr>
<td>Abnormalities</td>
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<tr>
<td>Common</td>
<td>Perihilar multifocal airspace opacities (GGO, consolidation, or both) on chest radiography and CT</td>
<td>Perihilar multifocal airspace opacities (GGO, consolidation, or both) on chest radiography and CT</td>
<td>Perihilar multifocal airspace opacities (GGO, consolidation, or both) on chest radiography and CT</td>
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<tr>
<td>Rare</td>
<td>Pneumothorax</td>
<td>Pneumothorax</td>
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<tr>
<td>Not seen</td>
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<td>Cavitation or lymphadenopathy</td>
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<td>Appearance</td>
<td>Unilateral, focal (50%); multifocal (40%); diffuse (10%)</td>
<td>Bilateral, multifocal basal airspace on chest radiography or CT (80%); isolated unilateral (20%)</td>
<td>Bilateral, multifocal, basal airspace; normal chest radiography findings (15%)</td>
</tr>
<tr>
<td>Follow-up imaging appearance</td>
<td>Unilateral, focal (25%); progressive (most common, can be unilateral and multifocal or bilateral with multifocal consolidation)</td>
<td>Extension into upper lobes or perihilar areas, pleural effusion (33%), interlobar septal thickening (26%)</td>
<td>Persistent or progressive airspace opacities</td>
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<tr>
<td>Indications of poor prognosis</td>
<td>Bilateral (like ARDS), four or more lung zones, progressive involvement after 12 d</td>
<td>Greater involvement of the lungs, pleural effusion, pneumothorax</td>
<td>Consolidation (vs GGO)</td>
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<td></td>
<td></td>
<td></td>
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<td>Transient reticular opacities</td>
<td>Yes</td>
<td>Yes</td>
<td>Not yet reported</td>
</tr>
<tr>
<td>Airtrapping</td>
<td>Common (usually persistent)</td>
<td>Yes</td>
<td></td>
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<tr>
<td>Fibrosis</td>
<td>Rare</td>
<td>One-third of patients</td>
<td>Not yet reported</td>
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What are the unique pathology findings of COVID-19 in the lung?
Pulmonary pathology of early phase 2019 novel coronavirus (COVID-19) pneumonia in two patients with lung cancer

Sufang Tian¹*, Weidong Hu²*, Li Niu¹, Huan Liu¹, Haibo Xu³, Shu-Yuan Xiao¹,4**

1. Department of Pathology, Zhongnan Hospital of Wuhan University, Wuhan, China
2. Department of Thoracic Surgery, Zhongnan Hospital of Wuhan University, Wuhan, China
3. Department of Radiology, Zhongnan Hospital of Wuhan University, Wuhan, China
4. Department of Pathology, University of Chicago Medicine, Chicago, IL 60637
COVID19 Pathology

- **Figure 2.** Histological changes from case #1. A. Proteinaceous exudates in alveolar spaces, with granules; B. Scattered large protein globules (arrows); C. Intraalveolar fibrin with early organization, with mononuclear inflammatory cells and multinucleated giant cells; D. Hyperplastic pneumocytes, some with suspected viral inclusions (arrow).
COVID19 Pathology

- Histological changes from case #1. A. Proteinaceous exudates in alveolar spaces, with granules
COVID-19 Pathology

• B. Scattered large protein globules (arrows)
COVID19 Pathology

- C. Intraalveolar fibrin
- with early organization, with mononuclear inflammatory cells and multinucleated giant cells
COVID19 Pathology

- D. Hyperplastic pneumocytes, some with suspected viral inclusions (arrow)
- **Figure 3.** Histologic changes of COVID-19 pneumonia in case #2. 
  
  **A.** Evident proteinaceous and fibrin exudate; 
  **B.** Diffuse expansion of alveolar walls and septa due to fibroblastic proliferations and type II pneumocytes hyperplasia, consistent with early diffuse alveolar damage (DAD) pattern; 
  **C.** Plugs of proliferating fibroblasts or “fibroblast balls” in the interstitium (arrow); 
  **D.** Abundant macrophages infiltrating airspaces and type II pneumocyte hyperplasia.
• **Figure 3.** Histologic changes of COVID-19 pneumonia in case #2.

**A.** Evident

• proteinaceous and fibrin exudate
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• diffuse alveolar damage (DAD) pattern;
• C. Plugs of proliferating fibroblasts or “fibroblast balls” in the interstitium (arrow)
• **D.** Abundant macrophages infiltrating airspaces and type II pneumocyte hyperplasia
What about COVID-19 in cancer patients?
Cancer patients in SARS-CoV-2 infection: a nationwide analysis in China

China and the rest of the world are experiencing an outbreak of a novel betacoronavirus known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).1 By Feb 12, 2020, the rapid spread of the virus had caused 42747 cases and 1017 deaths in China and cases have been reported in 25 countries, including the USA, Japan, and Spain. WHO has declared 2019 novel coronavirus disease (COVID-19), caused by SARS-CoV-2, a public health emergency of international concern. In contrast to severe acute respiratory system coronavirus and Middle East respiratory syndrome coronavirus, more deaths from COVID-19 have been caused by multiple organ dysfunction syndrome rather than respiratory failure,6 which might be attributable to the widespread distribution of angiotensin converting enzyme 2—the functional receptor for SARS-CoV-2—in multiple organs.34 Patients with cancer are more susceptible to infection than individuals without cancer because of their systemic immunosuppressive state caused by the malignancy and anticancer treatments, such as chemotherapy or surgery.58 Therefore, these patients might be at increased risk of COVID-19 and have a poorer prognosis.

We excluded 417 cases because of insufficient records of previous disease history.

18 (1%, 95% CI 0.61–1.65) of 1590 COVID-19 cases had a history of cancer, which seems to be higher than the incidence of cancer in the overall Chinese population (285.83 [0.29%] per 100 000 people, according to 2015 cancer epidemiology statistics9). Detailed information about the 18 patients with cancer with COVID-19 is summarised in the appendix (p 1). Lung cancer was the most frequent type (five [28%] of 18 patients). Four (25%) of 16 patients (two of the 18 patients had unknown treatment status) with cancer with COVID-19 had received chemotherapy or surgery within the past month, and the other 12 (75%) patients were cancer survivors in routine follow-up after primary resection. Compared with patients without cancer, patients with cancer were older (mean age 63.1 years [SD 12.1] vs 48.7 years [16.2]), more likely to have a history of smoking (four [22%] of 18 patients vs 107 [7%] of 1572 patients), had more polypnea (eight [47%] of 17 patients vs 323 [23%] of 1377 patients; some data were missing on polypnea), and more severe baseline CT manifestation (17 [94%] of 18 patients vs
Cancer status

B

- Patients without cancer
- Patients with cancer

Hazard ratio 3.56 (95% CI 1.65–7.69)

Probability of severe events (%)

Time after disease onset (days)
COVID-19 and Cancer

• Lung cancer was the most frequent type (five [28%] of 18 patients).

• Four (25%) of 16 patients with cancer with COVID-19 had received chemotherapy or surgery within the past month, and the other 12 (75%) patients were cancer survivors in routine followup after primary resection.
COVID-19 and Cancer

• Compared with patients without cancer, patients with cancer were older (mean age 63 vs 48),
• more likely to have a history of smoking (four [22%] of 18 patients vs 107 [7%] of 1572 patients),
• had more polypnea (eight [47%] of 17 patients vs 323 [23%] of 1377 patients; 
• more severe baseline CT manifestation (17 [94%] of 18 patients vs 1113 [71%] of 1572 patients),
• but had no significant differences in sex, other baseline symptoms, other comorbidities, or baseline severity of x-ray
COVID-19 and Cancer

- We propose three major strategies for patients with cancer in this COVID-19 crisis, and in future attacks of severe infectious diseases.
  1) An intentional postponing of adjuvant chemotherapy or elective surgery for stable cancer should be considered in endemic areas.
  2) Stronger personal protection provisions should be made for patients with cancer or cancer survivors.
  3) More intensive surveillance or treatment should be considered when patients with cancer are infected with SARS-CoV-2, especially in older patients or those with other comorbidities.
What about COVID-19 in BMT patients?
Clinical Significance of Human Coronavirus in Bronchoalveolar Lavage Samples From Hematopoietic Cell Transplant Recipients and Patients With Hematologic Malignancies

Chikara Ogimi,1,2,3 Alpana A. Waghmare,1,2,3 Jane M. Kuypers,1,4 Hu Xie,5 Cecilia C. Yeung,5,6 Wendy M. Leisenring,5,7 Sachiko Seo,1,8 Su-Mi Choi,9 Keith R. Jerome,1,4 Janet A. Englund,2,3 and Michael Boeckh1,5,10

1Vaccine and Infectious Disease Division, Fred Hutchinson Cancer Research Center, 2Department of Pediatrics, University of Washington, 3Pediatric Infectious Diseases Division, Seattle Children’s Hospital, 4Department of Laboratory Medicine, University of Washington, 5Clinical Research Division and 6Molecular Oncology Laboratory, Fred Hutchinson Cancer Research Center, and 7Department of Biostatistics, University of Washington, Seattle, Washington; 8Department of Hematology and Oncology, National Cancer Research Center East, Chiba, Japan; 9Department of Internal Medicine, College of Medicine, Catholic University of Korea, Seoul; and 10Department of Medicine, University of Washington, Seattle

Background. The possible role of human coronavirus (HCoV) in lower respiratory tract disease (LRTD) in hematopoietic cell transplant (HCT) recipients and patients with hematologic malignancies (HM) has not been well studied.

Methods. We conducted a retrospective review of HCT/HM patients with HCoV detected in bronchoalveolar lavage (BAL). HCoV strains were identified in BAL samples using strain-specific polymerase chain reaction. Mortality rates were compared among HCT recipients with LRTD caused by HCoV, respiratory syncytial virus (RSV), influenza virus, or parainfluenza virus (PIV) by multivariable Cox regression analysis.

Results. We identified 35 patients (37 episodes) with HCoV LRTD. Among 23 available BAL samples, 48% were strain OC43, 22% were NL63, 17% were 229E, and 13% were HKU1. Overall, 21 patients (60%) required oxygen therapy at diagnosis and 19 (54%) died within 90 days of diagnosis. Respiratory copathogens were detected in 21 episodes (57%), including viruses (n = 12), fungi (n = 10), and bacteria (n = 8). Mortality rates were not different between patients with and without copathogens (P = .65). In multivariable models, mortality associated with HCoV LRTD was similar to that seen with RSV, influenza, and PIV LRTD in HCT recipients (adjusted hazard ratio, 1.34 [95% confidence interval, .66–2.71], P = .41 vs RSV, adjusted for cell source, cytopenia, copathogens, oxygen use, and steroid use).

Conclusions. HCoV LRTD in patients with HCT or HM is associated with high rates of oxygen use and mortality. Mortality associated with HCoV LRTD in HCT recipients appears to be similar to that seen with RSV, influenza virus, and PIV.

Keywords. human coronavirus; bronchoalveolar lavage; lower respiratory tract disease; hematopoietic cell transplant; hematologic malignancy.
Figure 1.  A, Human coronavirus strain. Seasonal distribution of human coronavirus lower respiratory tract disease (LRTD). B, Respiratory copathogens in human coronaviruses.
How are severe cases of COVID-19 defined?
COVID 19 FACTS

• Severe cases are defined as tachypnea (≥30 breaths/ min) or oxygen saturation ≤93% at rest, or PaO2/FIO2 <300 mmHg.

• Critical cases are defined as respiratory failure requiring mechanical ventilation, shock or other organ failure that requires intensive care.

• About a quarter of severe and critical cases require mechanical ventilation while the remaining 75% require only oxygen supplementation.
Severe COVID-19 Criteria:

- Tachypnea (≥30 breaths/ min) or oxygen saturation ≤93% at rest, or PaO2/FIO2 <300 mmHg.
- Respiratory failure requiring mechanical ventilation, shock or other organ failure that requires intensive care.
What about testing for or diagnosing COVID-19?
The FilmArray* Respiratory Panel

Simultaneous detection of 21 targets:

**Viral:** Adenovirus, Bocavirus, Coronavirus 229E, Coronavirus HKU1, Coronavirus OC43, Coronavirus NL63, Enterovirus, Influenza A, Influenza A H1, Influenza A H1 2009, Influenza A H3, Influenza B, Metapneumovirus, Parainfluenza 1, Parainfluenza 2, Parainfluenza 3, Parainfluenza 4, Respiratory Syncytial Virus, and Rhinovirus.

**Bacterial:** *Bordetella pertussis,* *Chlamydia pneumoniae,* and *Mycoplasma pneumoniae.*

*Clinical trials for FDA clearance are currently underway.*
Criteria for testing

• **Symptoms compatible with COVID-19 PLUS 1 or 2 below:**
  1. Any person, including HCW, with close contact* with confirmed or suspected COVID-19 within 14 days of symptom onset
  2. History of travel from affected geographic area within 14 days of symptoms onset

OR

  3. Severe lower respiratory tract illness when no alternative etiology is identified and even if no exposure

Close contact*- being within 6 ft of a patient for a prolonged period of time or having direct contact with infected secretions while not wearing PPE
A. Person had close contact\textsuperscript{1,2} with a laboratory-confirmed\textsuperscript{3} COVID-19 case and fever\textsuperscript{4} or symptoms of lower respiratory illness (e.g., cough, shortness of breath).

B. Person is part of a non-household outbreak of suspected COVID-19.

C. Person hospitalized with unexplained respiratory illness or person who died from unexplained respiratory illness.

D. Person traveled to or from an affected geographic area\textsuperscript{5} with widespread community transmission and has fever\textsuperscript{4} or symptoms of lower respiratory illness (e.g., cough, shortness of breath).

E. Person had community contact (e.g., attended the same gathering or stayed on the same cruise ship) with a laboratory-confirmed\textsuperscript{3} COVID-19 case and fever\textsuperscript{4} or symptoms of lower respiratory illness (e.g., cough, shortness of breath).

F. Person is age $\geq$65 years, has chronic medical conditions, or is in an immunocompromised state and has fever\textsuperscript{4} or symptoms of lower respiratory illness (e.g., cough, shortness of breath).

This patient meets the criteria for testing at the Florida Department of Health Bureau of Public Health Laboratories. The Florida Department of Health asks that you immediately notify both infection control personnel at your health care facility and your county health department (FloridaHealth.gov/CHDEpiContact).

This patient does not meet the criteria for testing at the Florida Department of Health. Consider testing at a commercial laboratory.
How we make a diagnosis

• Test for other viruses to rule out alternative diagnosis

• **Test: PCR for SARS-CoV-2**
  – upper respiratory swab (both nasopharyngeal and oropharyngeal swabs) and
  – Lower respiratory tract (sputum, trach aspirate, BAL)- if possible
  – Perform collection under airborne precautions
  – Test performed at CDC or CDC-qualified lab
  – Retest if initial test negative but clinical suspicion remains
How we make a diagnosis

• **Test: PCR for SARS-CoV-2 - Upper respiratory swab (both nasopharyngeal and oropharyngeal swabs)**
  – Put in separate tubes of VTM (viral transport media)
  – Place swabs immediately into sterile tubes containing 2-3 ml of VTM
    • VTM available on floor or in General Stores (Lawson # 1110200)
    • Refrigerate specimen until transport
  – At MCC- order under Misc Lab as “COVID 19 PCR”
  – All testing must be approved by ID/IC
  – Micro will send to State Health Dept in Tampa (there is a form to fill out)
  – Testing now performed at
    • State Lab
    • CDC
    • LabCorp and Quest Diagnostics offering testing now as well
Patient Presents

Yes, mask the patient with a regular surgical mask. Lawson # 394290

Do you currently have cough, sneezing, shortness of breath or fever which might be a respiratory illness?

No

Place an orange sticker on the patient’s armband and proceed with registration as usual.

Yes

In the last 14 days, have you traveled from an affected geographic area OR had close contact with anyone confirmed of having Novel Coronavirus (COVID-19)?

Yes

Place in private room and notify nursing manager designee then page Dr. John Greene, Infectious Disease. Pager- 256-4887

*Note: 3/7-3/14 refer to Infectious Disease on call schedule in smart web.

No

Advise the patient to remain masked to minimize the risk of spreading infection. PAR is now complete in process.

Provider evaluate respiratory illness as usual.

Are the patient’s signs & symptoms of lower respiratory infection severe enough for Urgent Care referral or inpatient admission, with no other alternative explanatory diagnosis? Ex. RVP negative

Yes

No, continue regular patient care.

No
2019 Novel Coronavirus (COVID-19) Exposure Patient Questionnaire Procedure

1. Each patient should be asked the following question by the Patient Access Representative (PAR) at initial appointment check-in, “Do you currently have cough, sneezing, shortness of breath or fever which might be a respiratory illness?”
   A. If the patient responds “yes,” the PAR should ask the patient to apply a surgical mask to prevent the spread of respiratory illness in accordance with Respiratory Hygiene/Cough Etiquette Protocol and then proceed to step 2.
   B. If the patient responds “no”, proceed to step 3.

2. The patient should then be asked “In the last 14 days, have you traveled from an affected geographic area¹ OR had close contact² with anyone confirmed of having novel coronavirus (COVID-19)?”
   A. If the patient responds “yes”, the Medical Assistant should:
      i. Immediately escort the patient to a private room/exam room. (If the patient is not already wearing a surgical mask, provide a surgical mask as instructed above)
      ii. Notify the Nursing Manager or designee
      iii. Contact Dr. John Greene, Infectious Disease by paging 256-4887. From 3/7-3/14 contact the Infectious Disease physician on call (found on SmartWeb) for further evaluation. If ID assessment is negative, place orange sticker on armband.
   B. If the patient responds “no”:
      i. Place an orange sticker on the patient’s armband
      ii. Proceed to step 4.

3. The PAR should then place an orange sticker on the patient’s armband and proceed with registration as usual.

4. At this point, the provider should evaluate the patient for an upper respiratory infection as usual. Are the patient’s signs and symptoms severe enough (with no alternative explanatory diagnosis) for an Urgent Care referral?
   A. If the provider responds “yes”, the nurse should:
      i. Immediately escort the patient to a private room/exam room. (If the patient is not already wearing a surgical mask, provide a surgical mask as instructed above)
      ii. Notify the Nursing Manager or designee
      iii. Contact Dr. John Greene, Infectious Disease, by paging 256-4887. From 3/7-3/14 contact the Infectious Disease physician on call (found on SmartWeb) for further evaluation. If ID assessment is negative, place orange sticker on armband.
   B. If the provider responds “no”, place an orange sticker on patient’s armband and continue regular patient care.

Important facts:
- If the patient already has an orange sticker from a previous screening on his/her armband, they do not need to be questioned at each check-in for additional appointments. Only one screening per day is necessary.
- If a patient answers “yes” to one of the questions and refuses to wear a surgical mask, the Nurse Manager or designee for the department should be contacted.
- Family members/visitors with signs and symptoms of respiratory illness should be advised not to visit while ill. If the visit cannot be avoided, they should be advised to wear a mask and perform frequent hand hygiene while at the Center.
If we have a suspected case

• In the event of suspected COVID19, contact IC and Dr. Greene, ID team or whoever is covering for him
  • Infection Prevention/ID will contact Health Department as well
• “Person under investigation report”- filled out by Health Department
Human Infection with 2019 Novel Coronavirus
Person Under Investigation (PUI) and Case Report Form

Reporting jurisdiction: ____________________________
Reporting health department: ________________
Contact ID*: ________________________________
CDC 2019-nCoV ID: ________________
NNDSS loc. rec. ID/Case ID b: __________________

a. Only complete if case-patient is a known contact of prior source case-patient. Assign Contact ID using CDC 2019-nCoV ID and sequential contact ID, e.g., Confirmed case CA102034567 has contacts CA102034567-01 and CA102034567-02. b. For NNDSS reporters, use GenV2 or NETSS patient identifier.

Interviewer information
Name of interviewer: ____________________________
Affiliation/Organization: ____________________________
Telephone ____________ Email ____________

Basic information
What is the current status of this person? 
☐ PUI, testing pending*
☐ PUI, tested negative*
☐ Presumptive case (positive local test), confirmatory testing pending†
☐ Presumptive case (positive local test), confirmatory tested negative†
☐ Laboratory-confirmed case†

* Testing performed by state, local, or CDC lab.
† At this time, all confirmatory testing occurs at CDC
Report date of PUI to CDC (MM/DD/YYYY): __________/________/________
Report date of case to CDC (MM/DD/YYYY): __________/________/________
County of residence: ____________________________
State of residence: ____________________________

Ethnicity: 
☐ Hispanic/Latino
☐ Non-Hispanic/Latino
☐ Not specified

Sex: 
☐ Male
☐ Female
☐ Unknown

Date of first positive specimen collection (MM/DD/YYYY): __________/________/________

Was the patient hospitalized? 
☐ Yes ☐ No ☐ Unknown
If yes, admission date 1 __________/________/________
If yes, discharge date 1 __________/________/________
Was the patient admitted to an intensive care unit (ICU)? 
☐ Yes ☐ No ☐ Unknown

Did the patient develop pneumonia? 
☐ Yes ☐ No ☐ Unknown
Did the patient have acute respiratory distress syndrome? 
☐ Yes ☐ No ☐ Unknown
Did the patient have another diagnosis/etiology for their illness? 
☐ Yes ☐ No ☐ Unknown
Did the patient have an abnormal chest X-ray? 
☐ Yes ☐ No ☐ Unknown
Did the patient receive mechanical ventilation (MV)/intubation? 
☐ Yes ☐ No ☐ Unknown
If yes, total days with MV (days) __________
Did the patient receive ECMO? 
☐ Yes ☐ No ☐ Unknown

Race (check all that apply): 
☐ American Indian/Alaska Native
☐ Asian
☐ Black or African American
☐ Hispanic/Latino
☐ Other


What about treatment of COVID-19?
Treatment of COVID-19

• More than two dozen studies have already been registered on ClinicalTrials.gov, a website that tracks research
• Traditional Chinese medicine
• Vitamin C
• Stem cells
• Steroids
• Antivirals against the flu and HIV
• Combination of two HIV medications: lopinavir and ritonavir, brand-named Kaletra
• No animal model
• ECMO
Treatment of COVID 19

• Kaletra stops viruses by interfering with the enzymes they need to infect cells, called proteases.

• One study being done at the Guangzhou Eighth People's Hospital in China is testing Kaletra against Arbidol, an antiviral drug approved in China and Russia to treat the flu.

• Two groups of patients will take the medications along with standard care.

• A third group in the study will receive only standard care, typically supportive therapy.
Treatment of COVID 19

• Remdesivir originally tested against Ebola which didn’t work
• Shown to shut down COVID 19, at least in test tubes
• Also works against SARS and MERS in test tubes and animals
Remdesivir

- 35-year-old man in Everett, WA
- Developed pneumonia after being infected with the new coronavirus during a trip to see family in Wuhan, China, the epicenter of the outbreak.
- Rx with IV remdesivir on the evening of day 7 in the hospital.
- On day 8, he improved.
- He was well enough to stop using oxygen.
- Signs of pneumonia were gone.
- He got his appetite back.
- His case was recently published in The *New England Journal of Medicine*, igniting a firestorm of interest in the therapy.
IVIG

- Doctors in Shanghai are using hyperimmune globulin derived from plasma of patients who have recovered from the coronavirus to treat those still battling the infection, reporting some encouraging preliminary results.
- Screened for HIV hepatitis B and C.
- Proven "effective and life-saving" against other infectious diseases, including rabies and diphtheria.
Figure 3. Model for the different stages of SARS-CoV entry that are potential antiviral targets.
Ribavirin and interferon alfa-2a for severe Middle East respiratory syndrome coronavirus infection: a retrospective cohort study


Summary
Background Middle East respiratory syndrome coronavirus (MERS-CoV) infection is associated with high mortality and has no approved antiviral therapy. We aimed to compare ribavirin and interferon alfa-2a treatment for patients with severe MERS-CoV infection with a supportive therapy only.

Methods In this retrospective cohort study, we included adults (aged ≥16 years) with laboratory-confirmed MERS-CoV infection and pneumonia needing ventilation support, diagnosed between Oct 23, 2012, and May 1, 2014, at the Prince Sultan Military Medical City (Riyadh, Saudi Arabia). All patients received appropriate supportive care and regular clinical and laboratory monitoring, but patients diagnosed after Sept 16, 2013, were also given oral ribavirin (dose based on calculated creatinine clearance, for 8–10 days) and subcutaneous pegylated interferon alfa-2a (180 μg per week for 2 weeks). The primary endpoint was 14-day and 28-day survival from the date of MERS-CoV infection diagnosis. We used χ² and Fischer’s exact test to analyse categorical variables and the t test to analyse continuous variables.

Findings We analysed 20 patients who received ribavirin and interferon (treatment group; initiated a median of 3 days [range 0–8] after diagnosis) and 24 who did not (comparator group). Baseline clinical and laboratory characteristics were similar between groups, apart from baseline absolute neutrophil count, which was significantly lower in the comparator group (5·88×10⁹/L [SD 3·95] vs 9·88×10⁹/L [6·63]; p=0.023). 14 (70%) of 20 patients in the treatment group had survived after 14 days, compared with seven (29%) of 24 in the comparator group (p=0.004). After 28 days, six (30%) of 20 and four (17%) of 24, respectively, had survived (p=0.54). Adverse effects were similar between groups, apart from reduction in haemoglobin, which was significantly greater in the treatment group than in the comparator group (4·32 g/L [SD 2·47] vs 2·14 g/L [1·90]; p=0.002).

Interpretation In patients with severe MERS-CoV infection, ribavirin and interferon alfa-2a therapy is associated with significantly improved survival at 14 days, but not at 28 days. Further assessment in appropriately designed randomised trials is recommended.
COVID19 Treatment

• Lopinavir/ritonavir alone or in combination with antivirals produced certain benefits in the treatment of SARS and MERS, such as reducing the incidence or mortality of ARDS.

• Lopinavir/ritonavir’s anti-coronavirus effect was mainly seen in its early application, for reducing patient mortality and reduced glucocorticoid consumption. However, if the early treatment window is missed, there will be no significant effect in their late application.
COVID19 Treatment

- Routine use of corticosteroids should be avoided.
- Glucocorticoids can be used for a short time (3–5 days) according to the degree of dyspnea and the progress of chest imaging and the dose is no more than 1-2 mg/kg/day methylprednisone.
- Empirical antibacterial treatment in severe patients should cover all possible pathogens.
- Deescalating therapy once pathogenic bacteria are clarified.
Treatment for hospitalized patients with non-severe COVID-19 infection:

- **Supportive care**
  - Corticosteroid use is NOT routinely recommended (refer to table for details)

- Patients not responding to supportive care after 48 hours, consider antiviral therapy (refer to table for details).

- Consider earlier for patients ≥ 60 years of age, profound (ANC <100) or prolonged (>7 days) neutropenia and stem cell recipients deemed to have moderate or severe immunodeficiency (refer to BMT-G-124 Community Respiratory Virus (CRV) Infections Management and Treatment).
  - Lopinavir/ritonavir + Ribavirin
  - Hydroxychloroquine
Treatment for hospitalized patients with severe COVID-19 pneumonia:

• Supportive care
  – IVIG (refer to table for details)

• Antiviral therapy (refer to table for details)
  – Lopinavir/ritonavir + Ribavirin
  – Hydroxychloroquine
  – Consent patient for compassionate/emergency use Remdesivir
    • Once obtained, start Remdesivir stop other COVID-19 treatments
Dear Editor,

In December 2019, a novel pneumonia caused by a previously unknown pathogen emerged in Wuhan, a city of 11 million people in central China. The initial cases were linked to exposures in a seafood market in Wuhan. As of January 27, 2020, the Chinese authorities reported 2835 confirmed cases in mainland China, including 81 deaths. Additionally, 19 confirmed cases were identified in Hong Kong, Macao and Taiwan, and 39 imported cases were identified in Thailand, Japan, South Korea, United States, Vietnam, Singapore, Nepal, France, Australia and Canada. The pathogen was soon identified as a novel coronavirus (2019-nCoV), which is closely related to sever acute respiratory syndrome CoV (SARS-CoV). Currently, there is no specific treatment against the new virus. Therefore, identifying effective antiviral agents to combat the disease is urgently needed.

An efficient approach to drug discovery is to test whether the existing antiviral drugs are effective in treating related viral infections. The 2019-nCoV belongs to Betacoronavirus which also contains SARS-CoV and Middle East respiratory syndrome CoV (MERS-CoV). Several drugs, such as ribavirin, interferon, lopinavir-ritonavir, corticosteroids, have been used in to be 100% effective in protecting mice against Ebola virus challenge, although its EC$_{50}$ value in Vero E6 cells was as high as 67 μM, suggesting further in vivo studies are recommended to evaluate this antiviral nucleoside. Nafamostat, a potent inhibitor of MERS-CoV, which prevents membrane fusion, was inhibitive against the 2019-nCoV infection (EC$_{50}$ = 22.50 μM, CC$_{50}$ > 100 μM, SI > 4.44). Nitazoxanide, a commercial antiprotozoal agent with an antiviral potential against a broad range of viruses including human and animal coronaviruses, inhibited the 2019-nCoV at a low-micromolar concentration (EC$_{50}$ = 2.12 μM; CC$_{50}$ > 35.53 μM; SI > 16.76). Further in vivo evaluation of this drug against 2019-nCoV infection is recommended. Notably, two compounds remdesivir (EC$_{50}$ = 0.77 μM; CC$_{50}$ > 100 μM; SI > 129.87) and chloroquine (EC$_{50}$ = 1.13 μM; CC$_{50}$ > 100 μM, SI > 88.50) potently blocked virus infection at low-micromolar concentration and showed high SI (Fig. 1a, b).

Remdesivir has been recently recognized as a promising antiviral drug against a wide array of RNA viruses (including SARS/MERS-CoV) infection in cultured cells, mice and nonhuman primate (NHP) models. It is currently under clinical development for the treatment of Ebola virus infection. Remdesivir is an
What about travel with COVID-19?
MCC COVID-19 update on travel restriction (sent 3/4/20)

Planned Travel

- Effective immediately, Moffitt is prohibiting business travel to all destinations under a Level 3 or higher travel advisory by either the CDC or the State Department.
- A Level 3 advisory (CDC, State Department) is to **avoid nonessential travel** while a Level 4 advisory (State Department) is a **do not travel** advisory. At this time, business travel restrictions are in place for: China, Iran, Italy and South Korea.
- Moffitt recommends team members refrain from personal travel to the countries in Level 3 and above (CDC, State Department)
- If you or a household member choose to visit one of the restricted countries you will be required to contact Occupational Health and to self-quarantine for 14 days from the time of departure from that country.
- Domestic travel is not impacted at this time.

Recent Travel – You or a household member

- If you or a household member has traveled to one of these countries in the past 14 days, please contact Occupational Health for further instructions. You may be asked to self-quarantine for 14 days.
- You need to contact [Occupational Health](mailto:Occupational.Health@Moffitt.org) to be cleared before returning to campus or work. Team members can reach Occupational Health at 813-745-4276 or email Occupational.Health@Moffitt.org.
- Any quarantine-related absences will not be counted as occurrences in the attendance policy, in the same way as flu and flulike symptoms are treated during flu season. This will be in place for the duration of COVID-19’s designation as a national or state health emergency.
Search COVID-19 risk assessment by country.

Russia.

There are reported cases or a risk of community spread of COVID-19 in Russia.

If you travel to Russia:

- Avoid contact with sick people
- Clean your hands often by washing with soap and water for at least 20 seconds or using an alcohol-based hand sanitizer with 60%-95% alcohol
- Pay attention to your health for 14 days after returning to the US. Stay home and seek medical advice if you get sick with fever, cough, or difficulty breathing
- Avoid travelling if you are sick

Visit CDCs webpage for additional information about COVID-19.
What about prevention of COVID-19
Perspective

Isolation, quarantine, social distancing and community containment: pivotal role for old-style public health measures in the novel coronavirus (2019-nCoV) outbreak

A. Wilder-Smith MD¹,² and D.O. Freedman MD³

¹Department of Disease Control, London School of Hygiene and Tropical Medicine, Keppel St, Bloomsbury, London WC1E 7HT, UK, ²Heidelberg Institute of Global Health, University of Heidelberg, Seminarstraße 2, 69117 Heidelberg, Germany and ³University of Alabama, Tuscaloosa, AL 35487, USA

*To whom correspondence should be addressed.

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Abstract

Public health measures were decisive in controlling the SARS epidemic in 2003. Isolation is the separation of ill persons from non-infected persons. Quarantine is movement restriction, often with fever surveillance, of contacts when it is not evident whether they have been infected but are not yet symptomatic or have not been infected. Community containment includes measures that range from increasing social distancing to community-wide quarantine. Whether these measures will be sufficient to control 2019-nCoV depends on addressing some underlying issues...
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<td>Isolation</td>
<td>To interrupt transmission to non-infected persons</td>
<td>Effective for infectious diseases with high person-to-person transmission where peak transmission occurs when patients have symptoms</td>
<td>Early case detection is paramount</td>
<td>Largely ineffective for infectious diseases where asymptomatic or pre-symptomatic infections contribute to transmission</td>
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<td>Quarantine</td>
<td>To reduce potential transmission from exposed persons before symptoms occur</td>
<td>Quarantining is most successful in settings where detection of cases is prompt, contacts can be traced within a short time frame with prompt issuance of quarantine</td>
<td>Quarantined persons will need psychological support, food and water, and household and medical supplies</td>
<td>Financial compensation for work days lost should be considered Voluntary is preferred over mandatory quarantine, but law enforcement may need to be considered if quarantine violations occur frequently</td>
</tr>
<tr>
<td>Community containment</td>
<td>To reduce intermixing of unidentified infected persons with non-infected community members</td>
<td>Social distancing is particularly useful in settings where community transmission is substantial</td>
<td>Ethical principles and codes are needed to guide community containment practice and policy Community containment to protect the population’s health potentially conflicts with individual rights of liberty and self-determination</td>
<td>Law enforcement is needed in most settings. Therefore such restrictive interventions should be limited to the actual level of risk to the community</td>
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Questions?