i. Background

In December, China notified the World Health Organization (WHO) of several cases of human respiratory illness, which appeared to be linked to an open seafood and livestock market in the city of Wuhan. The infecting agent has since been identified as a novel coronavirus, previously known as 2019-nCoV and now called SAR-CoV-2; The new name of the disease has also been termed COVID-19, as of 11th February 2020. Although the virus is presumed zoonotic in origin, person-to-person spread is evident. Screening of travellers, travel bans and quarantine measures are being implemented in many countries. Despite these precautions, it is anticipated that more cases will be seen both inside China and internationally. The WHO declared the outbreak of COVID-19 constitutes a Public Health Emergency of International Concern on 30 January. On 11 March, 2020, WHO declared the coronavirus outbreak a pandemic as the global death toll rose above 4,600 and the number of confirmed cases topped 125,000. This report aims to update Global Risk Assessment, Global Epidemiology, Quarantine Orders, Travel Ban/Advisory by countries, WHO’s and CDC’s Guidance and Protocols and Scientific publication on a daily basis.
## ii. Global Risk Assessment

Table 1. Risk assessment of COVID-19 by WHO regions (Updated as of 23 Mar, 23:00 SG Time)

<table>
<thead>
<tr>
<th>Environmental Risk</th>
<th>Transmissibility^</th>
<th>Severity of Disease</th>
<th>Availability of Treatment/Vaccination</th>
<th>Overall Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global (n=197 countries/territories)</td>
<td></td>
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</tr>
<tr>
<td>High</td>
<td>High</td>
<td>Moderate</td>
<td>Limited</td>
<td></td>
</tr>
<tr>
<td>Globally, 196 (99.5%) countries/territories have reported the outbreak. As parts of China including Hubei have relaxed lockdown down measures; As of 23 March, 27 provinces/cities have de-escalated the COVID-19 response level from level one (highest in four-tier, government response system, separate from the three-tier risk rating system discussed above) to two or three, leaving four provinces/cities remaining at level one, including Beijing, Hebei, Hubei, and Tianjin.</td>
<td>Reproduction rate of COVID-19 is currently at 1.5-4.5.</td>
<td>Case fatality rate is currently at 4.1% globally. Most cases present as flu-like illness.</td>
<td>China &amp; the US have started 1st phase trials in the race to find a COVID-19 vaccine on 16th March. [1] Anti-viral drug Favilavir was approved as a therapeutic drug for treatment of COVID-19 by National Medical Products Administration of China on 18th February 2020. The drug has shown promise in treatment of patients, demonstrating its efficacy in several clinical trials in China [2]; Initial data from the clinical trials of lopinavir plus ritonavir from Abbvie, and remdisivir from Gilead is expected to be available in three weeks. Actemra (Tocilizumab), is now being used to treat serious coronavirus patients with lung damage in China as of 4th March 2020.</td>
<td>High</td>
</tr>
</tbody>
</table>
Recruitment commenced on 16th March 2020 [3].

### Western Pacific Region and South-East Asia Region (n=41 countries)

<table>
<thead>
<tr>
<th>High</th>
<th>High</th>
<th>Moderate</th>
<th>Limited</th>
</tr>
</thead>
<tbody>
<tr>
<td>27 (65.8%) countries have reported outbreaks; Malaysia, Nepal and Philippines have also declared lockdowns, while India has stopped all incoming international flights.</td>
<td>17 (41.5%) countries have local transmission. Estimated R0 for South Korea - 1.5 (95% CI: 1.4-1.6)</td>
<td>Case fatality rate is 4.08%.</td>
<td>Anti-viral drug Favilavir was approved as a therapeutic drug for treatment of COVID-19 by National Medical Products Administration of China on 18 February 2020. Actemra (Tocilizumab), used for rheumatoid arthritis is now being used to treat serious coronavirus patients with lung damage in China as of 4 March 2020. China has also approved the first clinical trial for a vaccine. Recruitment has commenced on 16th March 2020 [3]. Takeda Pharmaceutical is aiming to roll out an antibody treatment for COVID-19 as early as this year - a concentration of antibodies taken from patients who have recovered from COVID-19 [4].</td>
</tr>
</tbody>
</table>
## European Region (n=53 countries)

<table>
<thead>
<tr>
<th>High</th>
<th>High</th>
<th>High</th>
<th>Absent</th>
</tr>
</thead>
<tbody>
<tr>
<td>51 (96.2%) countries have reported with outbreaks; Lombardy and 14 provinces in four other regions in Northern Italy are in lockdown putting around 16 million Italians in quarantine at least till 3rd April, 2020. This has been extended to the entire country. Austria, Belgium, Czech Republic, Denmark, France, Greece, Ireland, UK and Spain have also joined Italy in the lockdown.</td>
<td>40 (75.5%) countries have local transmission.</td>
<td>Case fatality rate is 4.51%.</td>
<td>CureVac (unlisted German company) aims to start testing an experimental vaccine on humans by summer of 2020. [5]</td>
</tr>
</tbody>
</table>

## Eastern Mediterranean Region (n=22 countries)

<table>
<thead>
<tr>
<th>High</th>
<th>High</th>
<th>High</th>
<th>Absent</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 (86.4%) countries have reported with outbreak; 6 countries have imported cases; 11 countries have travel ban for China, 10 for Korea, 8 for Japan, 9 for Italy and 10 for Iran.</td>
<td>12 (54.6%) countries (including Palestine) have local transmission.</td>
<td>Case fatality rate is 5.93%</td>
<td></td>
</tr>
</tbody>
</table>

## Region of the Americas (n=35 countries)

<table>
<thead>
<tr>
<th>High</th>
<th>High</th>
<th>Moderate</th>
<th>Absent</th>
</tr>
</thead>
<tbody>
<tr>
<td>33 (94.3%) countries have reported with outbreak; 12 countries have imported cases; 11 countries have travel ban for China, 10 for Korea, 8 for Japan, 11 for Italy and 11 for Iran. Venezuela also declared a social quarantine.</td>
<td>16 (45.7%) countries have local transmission.</td>
<td>Case fatality rate is 1.52%.</td>
<td>On 19th March, an expedited regulatory process in the U.S was announced — President Donald Trump ordered the Food and Drug Administration to fast-track coronavirus drugs and vaccines to meet the pressing need. [1] The first clinical trial on a COVID-19 vaccine will begin in US the week of 23rd March 2020 [2].</td>
</tr>
</tbody>
</table>
### African Region (n=47 countries)

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>36 (76.6%) countries have reported outbreaks; The number of new countries with reported outbreaks &amp; local transmission has increased in the 3rd week of March.</td>
</tr>
<tr>
<td>High</td>
<td>9 (19.1%) country have local transmission.</td>
</tr>
<tr>
<td>Moderate</td>
<td>Case fatality rate is 2.25%.</td>
</tr>
<tr>
<td>Absent.</td>
<td></td>
</tr>
</tbody>
</table>

*Imported and local cases are based on [https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports](https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports)*

*Only WHO member states are included. Territories (with the exception of Palestine) are excluded from the tabulation of total countries affected/imported/local cases and case fatality rate. Refer to WHO situation reports or table 4 for information on territories.*

**The travel ban consists of both certain areas of China, Japan, Korea, Italy and Iran or the whole country**

### iii. Global Epidemiology

The following tables summarise the global distribution of COVID-19 cases and deaths since the beginning of the outbreak on 31st December 2019 in Wuhan, China [1-110].

**Table 2. Summary of COVID-19 cases & fatalities globally (Updated as of 23 Mar, 23:00 SG Time)**

<table>
<thead>
<tr>
<th>No. of Countries/Territories with Cases</th>
<th>Total Global Cases</th>
<th>Total Cases Outside Mainland China</th>
<th>Total Deaths</th>
<th>Case-Fatality Rate (%) [overall]</th>
<th>Case-Fatality Rate (%) [outside China]</th>
<th>Total Recovered</th>
<th>Countries (outside China) that reported local transmission</th>
<th>R0</th>
</tr>
</thead>
<tbody>
<tr>
<td>196</td>
<td>373,885</td>
<td>292,792</td>
<td>16,328</td>
<td>4.37%</td>
<td>5.58%</td>
<td>101,520</td>
<td>114*</td>
<td>1.5-4.5^</td>
</tr>
</tbody>
</table>

*Based on 12th Feb analysis conducted by LSTHM, available at [https://cmmid.github.io/ncov/wuhan_early_dynamics/index.html](https://cmmid.github.io/ncov/wuhan_early_dynamics/index.html)*

*Based on WHO situation report on countries with local transmission

**Table 3. Comparison with other viruses**

<table>
<thead>
<tr>
<th>Virus</th>
<th>Incubation Period (Days)</th>
<th>Death Rate (%)</th>
<th>R0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SARS-CoV-2</td>
<td>2-14 0-24*</td>
<td>4.09</td>
<td>1.5-4.5</td>
</tr>
<tr>
<td>SARS-CoV</td>
<td>2-7</td>
<td>9.6</td>
<td>2.0</td>
</tr>
<tr>
<td>MERS-CoV</td>
<td>5 (2-14)</td>
<td>34</td>
<td>&lt;1 (higher in health care setting)</td>
</tr>
<tr>
<td>Swine Flu</td>
<td>1-4</td>
<td>0.02</td>
<td>1.2-1.6</td>
</tr>
</tbody>
</table>

*Data on 1099 patients from 552 hospitals in 31 provinces of China*
Figure 1. Growth Factor of Daily New Cases (Mainland China+ Other countries)

Growth Factor = every day's cases/cases on previous day. A growth factor above 1 indicates an increase, whereas one between 0 and 1 it is a sign of decline, with the quantity eventually becoming zero. A growth factor below 1 (or above 1 but trending downward) is a positive sign, whereas a growth factor constantly above 1 is the sign of exponential growth.

*Huge jump in cases on Feb. 12 is attributed to the change in diagnostic criteria in China.

Figure 2. Growth Factor excluding mainland China

Figure 3. Growth Factor of Novel Coronavirus Daily Deaths (Mainland China + Other Countries)
Growth Factor = every day’s cases/cases on previous day. A growth factor above 1 indicates an increase, whereas one between 0 and 1 it is a sign of decline, with the quantity eventually becoming zero. A growth factor below 1 (or above 1 but trending downward) is a positive sign, whereas a growth factor constantly above 1 is the sign of exponential growth.

Source: https://www.worldometers.info/coronavirus/coronavirus-cases/
Case Breakdown by Countries

Live update of COVID-19 global cases can be seen at https://storymaps.arcgis.com/stories/a1746ada9bf48c09ef76e5a788b5910

Table 4. Breakdown of COVID-19 confirmed cases and deaths (Updated as of 23 Mar, 23:00 SG Time)

<table>
<thead>
<tr>
<th>Country</th>
<th>Total Cases</th>
<th>Change</th>
<th>Total Deaths</th>
<th>Change</th>
<th>Total Recovered</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 China</td>
<td>81,093</td>
<td>39</td>
<td>3270</td>
<td>9</td>
<td>72703</td>
<td>WPRO</td>
</tr>
<tr>
<td>2 Italy</td>
<td>63,927</td>
<td>4789</td>
<td>6077</td>
<td>601</td>
<td>7432</td>
<td>EURO</td>
</tr>
<tr>
<td>3 USA</td>
<td>42,032</td>
<td>8486</td>
<td>508</td>
<td>89</td>
<td>187</td>
<td>Americas</td>
</tr>
<tr>
<td>4 Spain</td>
<td>33,089</td>
<td>4321</td>
<td>2207</td>
<td>435</td>
<td>3355</td>
<td>EURO</td>
</tr>
<tr>
<td>5 Germany</td>
<td>29,056</td>
<td>4183</td>
<td>118</td>
<td>24</td>
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<tr>
<td>6 Iran</td>
<td>23,049</td>
<td>1411</td>
<td>1812</td>
<td>127</td>
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<tr>
<td>7 France</td>
<td>19,856</td>
<td>3838</td>
<td>860</td>
<td>186</td>
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<tr>
<td>8 S. Korea</td>
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<td>64</td>
<td>111</td>
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<tr>
<td>9 Switzerland</td>
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<td>1073</td>
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<td>10 UK</td>
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<td>Iraq</td>
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Figure 4. Areas with reported confirmed cases of COVID-19, 23 March 2020

Source: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports
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Source: [https://ncov.dxy.cn/ncovh5/view/pneumonia](https://ncov.dxy.cn/ncovh5/view/pneumonia)
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<td>110</td>
<td>Venezuela</td>
</tr>
<tr>
<td>111</td>
<td>Vietnam</td>
</tr>
</tbody>
</table>

Main source: [https://early-alert.maps.arcgis.com/apps/opsdashboard/index.html#/20bfbf89c8e74c0494c90b1ae0fa7b78](https://early-alert.maps.arcgis.com/apps/opsdashboard/index.html#/20bfbf89c8e74c0494c90b1ae0fa7b78)
iv. Travel Ban/Advisory & Quarantine Orders

Global Updates

Lockdowns:
- In the **UK**, the country will go into full lockdown from Monday evening (30th March) with the British public only allowed to leave their homes to buy food, medicine, or do essential work.
- In **Greece**, the authorities have announced a nationwide lockdown from 06.00 (local time) on 23 March until further notice. People are only allowed to go out for essential work, health reasons, short walks or to acquire essential supplies.
- In **Jakarta**, all entertainment venues in Jakarta would be closed following closure of tourist attractions, schools and places of worship last week. Mass gatherings have also been banned from 15-29 March.
- In **Romania**, a curfew is in place between 22.00 and 06.00, gatherings larger than three people are banned.
- In **Saudi Arabia**, a night curfew between 19.00 and 06.00 will be imposed for 21 days starting from 23 March.
- In **South Africa**, The National Coronavirus Command Council has decided to enforce a Nationwide lockdown for 21 days with effect from midnight on Thursday 26 March, ending on April 16th, 2020.

Travel Restrictions:
- In **Beijing**, the government announced that starting from 00.00 on 23 March, all international flights to Beijing will not land directly at Beijing Capital International Airport (PEK), and will be diverted first to other domestic airports.
- In **Croatia**, a ban on intercity travel will be instated starting on 23 March.
- In **Gambia**, Authorities announced they will close land borders with Senegal and will suspend all flights from 00.01, 23 March. Cargo and medical flights are exempt from this measure.
- In **Tonga**, Effective 23 March, borders are closed, including international flights, cruise ships and yachts for 14 days
- In **Uzbekistan**, all borders have been indefinitely closed from 00:01 on March 23 to people movement, with the exceptions of foreign nationals who wish to leave the country.
- In **Cuba**, all borders will be closed from 24 March to 24 April. Only Cuban citizens and permanent residents will be permitted entrance and must undergo 14 days of quarantine.
<table>
<thead>
<tr>
<th>Country</th>
<th>Travel advisory/bans &amp; Visa suspension (for Singapore)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bhutan</strong></td>
<td>On March 6th it had banned the entry of tourists for two weeks.</td>
</tr>
<tr>
<td><strong>Canada</strong></td>
<td>Travel health notice was issued on 24 February to travellers going to Singapore to “practice usual precautions”.</td>
</tr>
<tr>
<td><strong>China, Guangzhou</strong></td>
<td>All incoming personnel who have travel history to the critical areas (including Singapore &amp; at least 15 other countries) impacted by the pandemic need to undertake self/group quarantine for 14 days.</td>
</tr>
<tr>
<td><strong>Croatia</strong></td>
<td>All travellers who have travel history to Singapore and numerous other countries will be subject to self-isolation for 14 days.</td>
</tr>
<tr>
<td><strong>India</strong></td>
<td>Travel advisory for citizens to “avoid all non-essential travel” to Singapore released on 22 February 2020. The advisory issued 11th March evening, &quot;All existing visas, except diplomatic, official, UN/International Organisations, employment, project visas, stands suspended till 15 April, 2020. This will come into effect from 1200 GMT on 13 March 2020 at the port of departure”.</td>
</tr>
<tr>
<td><strong>Indonesia</strong></td>
<td>On 8th February, Indonesia raised the travel alert for Singapore to level Yellow.</td>
</tr>
<tr>
<td><strong>Iraq</strong></td>
<td>Extended the travel ban on travellers arriving from or transiting through China, Iran, Thailand, South Korea, Japan, Italy and Singapore indefinitely from 25 February 2020</td>
</tr>
<tr>
<td><strong>Israel</strong></td>
<td>On 11th February, Israel advised to avoid non-essential travel to Singapore. As of 18th February, Israel is banning all foreign travellers who have been to Singapore, Thailand, Macau and Hong Kong for the past 14 days. This excludes permanent residents.</td>
</tr>
<tr>
<td><strong>Jamaica</strong></td>
<td>On 27 February, Jamaica has imposed travel restrictions to Italy, South Korea, Singapore and Iran. Travellers who had visited these counties in the last 14 days and do not have permanent residency or marriage exemption in Jamaica will not gain entry.</td>
</tr>
<tr>
<td><strong>Kuwait</strong></td>
<td>On 7th February, Kuwait urged its citizens who are in Singapore to leave immediately. Citizens advised to delay travel to Singapore.</td>
</tr>
<tr>
<td><strong>North Korea</strong></td>
<td>North Korea announced it would ban foreign tourists starting from 22nd January, with the restriction to last until a vaccine could be developed.</td>
</tr>
<tr>
<td><strong>Palestine</strong></td>
<td>On 8th March 2020, Palestinian Authority bars all foreign tourists for two weeks.</td>
</tr>
<tr>
<td><strong>Papua New Guinea</strong></td>
<td>As of 29th January, all travellers from Asian air &amp; sea ports are banned from entering the country. Residents returning from Asian countries will be held in quarantine for at least 20 days, before entry into country may be determined.</td>
</tr>
</tbody>
</table>
Qatar
On 9th February, Embassy of the State of Qatar in Singapore advised all Qatari citizens to avoid unnecessary travel to Singapore.

Republic of Trinidad and Tobago
On 27th February, travel ban was imposed where travellers from Singapore will not be allowed in Trinidad and Tobago within 14 days of their departure.

Samoa
Travellers with a travel history (including transits) to countries including Singapore, must spend 14 days at their country of last port, and undergo medical clearance within 3 days before entering the territory.

Saudi Arabia
On 28th February, Saudi Arabia has suspended the issuance of visa to Singapore travellers.

South Korea
On 11th February, South Korean authorities advised citizens to reduce travelling to Singapore, China, Vietnam, Japan, Malaysia, Taiwan & Thailand.

Taiwan
On 11th February, Taiwan’s CDC raised its travel advisories for Hong Kong, Macau, Singapore & Thailand.

v. Lockdown

Table 7: Lockdowns (Full/Partial) Imposed Globally

<table>
<thead>
<tr>
<th>Country</th>
<th>Details</th>
<th>Effective Date [Reference]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Austria</td>
<td>All non-essential shops have been ordered to shut indefinitely starting 16th March 2020. All public places such as playgrounds, sports venues and cinemas will be closed alongside restaurants, bars and cafes. Citizens can only leave home in the circumstance whereby job cannot be done from home or postponed, to get supplies or to render help to the more needy. The civil militia has been drafted to support the measures.</td>
<td>[1] 16 March 2020</td>
</tr>
<tr>
<td>2 Belgium</td>
<td>A lockdown that is to last for 18 days till 5th April has been declared in Belgium, with effect from midday 18th March 2020. All non-essentials shops will be closed, with only banks, pharmacies, news agents, food shops and supermarkets allowed to be open. People will only be allowed to leave their homes for food shopping, doctor or work if it is impossible to work from home.</td>
<td>[2] 18 March 2020</td>
</tr>
<tr>
<td>3 Czech Republic</td>
<td>A nationwide quarantine until 24th March 2020 was declared on 16th March. Citizens are only allowed to go to work, hospitals or purchase basic needs.</td>
<td>[3] 16 March 2020</td>
</tr>
<tr>
<td>4 Denmark</td>
<td>All employees and students are to work from home as much as possible. All schools, public and private, and daycare facilities will be closed from 16th March 2020. All</td>
<td>[4] 13 March 2020</td>
</tr>
<tr>
<td>Country</td>
<td>Measures</td>
<td>Date(s)</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------------------------------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>5 El Salvador</td>
<td>indoor cultural institutions, libraries and leisure facilities are also to be closed for at least 2 weeks. The orange alert implemented measures include a national quarantine on the country’s 6.4 million citizens. Schools are closed for three weeks, and Salvadorans returning home from abroad must undergo a 30-day quarantine. The move also bars foreigners from entering the country.</td>
<td>[5] 14 March 2020</td>
</tr>
<tr>
<td>6 France</td>
<td>All non-essential businesses are to be closed, applying to restaurants, bars, cafes, movie theatres and nightclubs. Grocery stores, gas stations and pharmacies are allowed to stay in operation. All citizens and residents are urged to stay home as much as possible. From midday 17th March 2020, citizens are required to stay at home for at least 15 days. All journeys outside the home will be banned unless justified for essential professional or health reason.</td>
<td>[6] 14 March 2020 [7] 17 March 2020</td>
</tr>
<tr>
<td>7 Germany</td>
<td>The authorities on 22 March announced a ban on gatherings of more than two people outside work and the home, for at least two weeks.</td>
<td>[8] 22 March</td>
</tr>
<tr>
<td>8 Greece</td>
<td>All establishments, including entertainment and sporting facilities are ordered to close with the exception of supermarkets, bakeries, takeaway food services and pharmacies.</td>
<td>[9] 18 March 2020</td>
</tr>
<tr>
<td>9 Ireland</td>
<td>All schools, colleges, childcare facilities and cultural institutions will be closed and large scale indoor gatherings of more than 100 people and outdoor gatherings of more than 500 people are banned.</td>
<td>[10] 12 March 2020</td>
</tr>
<tr>
<td>10 Italy</td>
<td>A nationwide lockdown was imposed on 60 million Italians. Limited travel is allowed with police permission and most shops and establishments have limited opening hours. Almost all establishments except grocery stores and pharmacies are shut down. Major gatherings are put on hold till 3rd April 2020.</td>
<td>[11] 12 March 2020</td>
</tr>
<tr>
<td>11 Jordon</td>
<td>A nationwide lockdown was declared from 18th March 2020 for 2 weeks. The private section, excluding the health and vital sectors will be shut down. Citizens are only allowed to leave their homes in extreme cases. Domestic travel will be restricted and public transportation will be suspended. The government of Jordan announced that individuals will be banned from movement, except for emergencies, starting from 7:00 (5:00 GMT) on 21st March until further notice. The government will announce on Tuesday 24 March certain times when citizens will be allowed to run errands.</td>
<td>[12] 18 March 2020 [13] 21 March 2020</td>
</tr>
<tr>
<td>12</td>
<td>Malaysia</td>
<td>A 2-week lock down from 18th March to 31st March 2020 has been declared in Malaysia. All institutions and establishments are to be closed with the exception of supermarkets, banks, gas stations and pharmacies.</td>
</tr>
<tr>
<td>14</td>
<td>Poland</td>
<td>Polish Prime Minister Mateusz Morawiecki announced on 20th February that the country was banning foreigners from entering the country as well as shutting all restaurants, bars, and casinos. People from abroad entering the country will be subject to a mandatory 14-day quarantine.</td>
</tr>
<tr>
<td>15</td>
<td>Philippines</td>
<td>A community quarantine was declared in Manila on 12th March 2020. All domestic air, land and sea access to the 17 districts of Metro Manila would be suspended from 15th March to 14th April 2020. A curfew from 8am-5pm would also be enforced.</td>
</tr>
<tr>
<td>16</td>
<td>Saudi Arabia</td>
<td>Saudi Arabia suspended all domestic flights, buses, taxis and trains for 14 days on March 21st</td>
</tr>
<tr>
<td>17</td>
<td>Spain</td>
<td>Spain has put its 47 million inhabitants under a partial lockdown for 15 days on 14th March 2020 (Saturday). All Spaniards are required to stay home except to buy food, medicines, go to work or the hospital, or for emergencies with immediate effect. Only establishments selling food and staples are allowed to stay in operation. Domestic transport will be curtailed from 16th March 2020.</td>
</tr>
<tr>
<td>18</td>
<td>United Kingdom</td>
<td>U.K. Prime Minister Boris Johnson announced nationwide lockdown measures on 20th February, telling cafes, bars and restaurants to close.</td>
</tr>
<tr>
<td>19</td>
<td>Venezuela</td>
<td>A social quarantine has been imposed in Venezuela with effect from 16th March 2020. Businesses are to be closed and citizens have to remains in their homes. This applies to 6 states and the capital Caracas. Exceptions to the quarantine will be made to allow functioning of transport, health and food delivery.</td>
</tr>
</tbody>
</table>
vi. Military Surveillance

2 Senior Officials from Egyptian Armed Forces Die after COVID-19 infection

Two senior members of the Egyptian armed forces have died after being infected with the novel coronavirus, according to an army statement, as the country grapples with a daily rise in new cases. According to a statement cited by pro-government media, Major General Shafea Abdel Halim Dawoud died from Covid-19 on Monday and Major General Khaled Shaltout died from the disease on Sunday “while taking part in efforts to contain the outbreak”. The report also mentioned that the deceased’s driver and three senior officers had tested positive for Covid-19.

Sources:

First US Military-related COVID-19 Fatality

A defence contractor has died after being infected by the novel coronavirus, marking it the first US military-related death due to the virus. The Arlington-based contractor, who worked at the Defense Security Cooperation Agency (DSCA), passed away on Saturday, the Pentagon said in a statement.

Sources:

vii. WHO Guidance & Protocols

The following protocol was published on 20th March 2020:

- Maintaining a safe and adequate blood supply during the pandemic outbreak of coronavirus disease (COVID-19)

This document provides interim guidance on the management of the blood supply in response to the pandemic outbreak of coronavirus disease (COVID-19). It is intended for blood services, national health authorities, and others responsible for the provision of blood and blood components and integration of the blood system within the public health system.


US CDC

No new updates were published by US CDC as of 23rd March 2020.

EU CDC

No new updates were published by EU CDC as of 23rd March 2020.
viii. Scientific Publications/News Articles with Epidemiology and Clinical Focus

Only abstracts of new publications will be included in this section. Refer to annex B for past abstracts.

A Comparative Study on the Clinical Features of COVID-19 Pneumonia to Other Pneumonias [81]

Abstract

Background: A novel coronavirus (2019-nCoV) has raised world concern since it emerged in Wuhan Hubei China in December, 2019. The infection may result into severe pneumonia with clusters illness onsets. Its impacts on public health make it paramount to clarify the clinical features with other pneumonias.

Methods: Nineteen 2019-nCoV pneumonia (NCOVID-19) and fifteen other pneumonia patients (NON-NCOVID-19) in out of Hubei places were involved in this study. Both NCOVID-19 and NON-NCOVID-19 patients were confirmed to be infected in throat swabs or/and sputa with or without 2019-nCoV by real-time RT-PCR. We analyzed the demographic, epidemiological, clinical, and radiological features from those patients, and compared the difference between NCOVID-19 and NON-NCOVID-19.

Results: All patients had a history of exposure to confirmed case of 2019-nCoV or travel to Hubei before illness. The median duration, respectively, was 8 (IQR:6~11) and 5 (IQR:4~11) days from exposure to onset in NCOVID-19 and NON-NCOVID-19. The clinical symptoms were similar between NCOVID-19 and NON-NCOVID-19. The most common symptoms were fever and cough. Fifteen (78.95%) NCOVID-19 but 4 (26.67%) NON-NCOVID-19 patients had bilateral involvement while 17 (89.47%) NCOVID-19 but 1 (6.67%) NON-NCOVID-19 patients had multiple mottling and ground-glass opacity of chest CT images. Compared to NON-NCOVID-19, NCOVID-19 present remarkably more abnormal laboratory tests including AST, ALT, γ-GT, LDH and α-HBDH.

Conclusion: The 2019-nCoV infection caused similar onsets to other pneumonias. CT scan may be a reliable test for screening NCOVID-19 cases. Liver function damage is more frequent in NCOVID-19 than NON-NCOVID-19 patients. LDH and α-HBDH may be considerable markers for evaluation of NCOVID-19.
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Annex A

WHO Guidance & Protocols

- Surveillance case definitions for human infection with novel coronavirus (2019-nCoV)  

- Laboratory testing for 2019 novel coronavirus (2019-nCoV) in suspected human cases
  
  i. Interim guidance for laboratory testing  
  
  ii. Molecular assays to diagnose 2019-nCoV  
  
  iii. WHO appointed 2019-nCoV referral laboratories  

- Clinical management of severe acute respiratory infection when novel coronavirus (2019-nCoV) infection is suspected  

- Home care for patients with suspected novel coronavirus (2019-nCoV) infection presenting with mild symptoms and management of contacts  

- Global 2019-nCoV Clinical Characterization Case Record Form  

- Household transmission investigation protocol for 2019-novel coronavirus (2019-nCoV) infection  

- The First Few X (FFX) Cases and contact investigation protocol for 2019-novel coronavirus (2019-nCoV) infection  

- Risk communication and community engagement (RCCE) readiness and response to the 2019 novel coronavirus (2019-nCoV)
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- **Novel Coronavirus (2019-nCoV) advice for the public**

- **Global Surveillance for human infection with novel coronavirus (2019-nCoV)**

- **Disease commodity package - Novel Coronavirus (2019-nCoV)**


- **WHO recommendations to reduce risk of transmission of emerging pathogens from animals to humans in live animal markets**

- **Diagnostic knowledge gaps**

- **WHO launches new data platform for anonymized 2019-nCoV clinical data**
  https://www.who.int/publications-detail/operational-considerations-for-managing-covid-19-cases-outbreak-on-board-ships

- **The WHO has developed and delivered 2 online trainings to support the response to the 2019-nCoV outbreak that are available on the open learning platform, OpenWHO.org.**
  https://openwho.org/courses/introduction-to-ncov

- **New Coronavirus Disease Officially Named COVID-19 By The World Health Organization**

- **Operational considerations for managing COVID-19 cases/outbreak on board ships**
  https://www.who.int/publications-detail/operational-considerations-for-managing-covid-19-cases-outbreak-on-board-ships

- **Travel advice**
  27 January https://www.who.int/ith/2019-nCoV_advice_for_international_traffic/en/

- The COVID-19 Risk Communication Package For Healthcare Facilities https://iris.wpro.who.int/handle/10665.1/14482


US CDC Guidance & Protocols


- Interim Guidance for Preventing 2019 Novel Coronavirus (2019-nCoV) from Spreading to Others in Homes and Communities

- Interim Clinical Guidance for Management of Patients with Confirmed 2019 Novel Coronavirus (2019-nCoV) Infection

- Flowchart to Identify and Assess 2019 Novel Coronavirus

- Recommendations for Reporting, Testing, and Specimen Collection

- Interim Infection Prevention and Control Recommendations for Patients with Known or Patients Under Investigation for 2019 Novel Coronavirus (2019-nCoV) in a Healthcare Setting


- Webinar on “Strategies for Ensuring Healthcare Systems Preparedness and Optimizing N95 Supplies”
  https://www.youtube.com/watch?v=p_ILGsYMy3k&list=PLvrp9iOLTQaJa78zFQ0QgvShQ2HEwHxP&index=2&t=0s

- Resource for State Local and Territorial Health Departments

- Interim Guidance for Collection and Submission of Postmortem Specimens from Deceased Persons Under Investigation (PUI) for COVID-19, February 2020

- Healthcare Infection Prevention and Control FAQs for COVID-19

- CDC in Action: Preparing Communities for Potential Spread of COVID-19

- Frequently Asked Questions and Answers: Coronavirus Disease-2019 (COVID-19) and Children

- Frequently Asked Questions and Answers: Coronavirus Disease 2019 (COVID-19) and Pregnancy
• Stigma Related to COVID-19

• MMWR: Public Health Response to the Coronavirus Disease 2019 Outbreak — United States, February 24, 2020
  https://www.cdc.gov/mmwr/volumes/69/wr/mm6908e1.htm?s_cid=mm6908e1_e&deliveryName=USCDC_921-DM20815.

• Know the facts about coronavirus disease 2019 (COVID-19) and help stop the spread of rumors

• Evaluating and Reporting Persons Under Investigation (PUI)

• Steps Healthcare Facilities Can Take Now to Prepare for Coronavirus Disease 2019 (COVID-19)

• Interim Guidance for Healthcare Facilities: Preparing for Community Transmission of COVID-19 in the United States

• Strategies to Prevent the Spread of COVID-19 in Long-Term Care Facilities (LTCF)

• Strategies for Optimizing the Supply of N95 Respirators

• Interim Guidance: Public Health Communicators Get Your Community Ready for Coronavirus Disease 2019 (COVID-19)

• Preventing COVID-19 Spread in Communities

• Recommended Precautions for Preventing Spread of COVID-19 in Election Polling Locations, including Cleaning and Disinfection

• Interim Guidance: Get Your Mass Gatherings or Large Community Events Ready for Coronavirus Disease 2019 (COVID-19)
• Active Monitoring of Persons Exposed to Patients with Confirmed COVID-19 — United States, January–February 2020
  https://www.cdc.gov/mmwr/volumes/69/wr/mm6909e1.htm?s_cid=mm6909e1_w

• Evaluating and Reporting Persons Under Investigation (PUI)

• Interim Guidance for Public Health Professionals Managing People With COVID-19 in Home Care and Isolation Who Have Pets or Other Animals

• Check and Report Everyday Booklet – China

• What law enforcement personnel need to know about coronavirus disease 2019 (COVID-19)”

• “Resources for Institutes of Higher Education - Plan, prepare, and respond to coronavirus disease 2019”

• ” COVID-19 and Cruise Ship Travel”

• “Environmental Cleaning and Disinfection Recommendations - Interim Recommendations for US Community Facilities with Suspected/Confirmed Coronavirus Disease 2019

• “People at Risk for Serious Illness from COVID-19”

• “Communication Resources for Travelers”

• “Frequently Asked Questions on COVID-19 Testing at Laboratories”

• “Interim Additional Guidance for Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed COVID-19 in Outpatient Hemodialysis Facilities”
• “Keeping Workplaces, Homes, Schools, or Commercial Establishments Safe”

• “Disease commodity package - Novel Coronavirus (nCoV)”  https://www.who.int/publications-detail/disease-commodity-package---novel-coronavirus-(ncov)

• “Critical preparedness, readiness and response actions for COVID-19”

• “Responding to community spread of COVID-19”

• Interim Guidance for Public Health Personnel Evaluating Persons Under Investigation (PUIs) and Asymptomatic Close Contacts of Confirmed Cases at Their Home or Non-Home Residential Settings

• Resources for Large Community Events & Mass Gatherings

EU CDC Guidance & Protocols

• Case definition and European surveillance for human infection with novel coronavirus (2019 nCoV)

• Specimen type

• Testing Methodology

• Public health management of persons having had contact with novel coronavirus cases in the European Union

• Advice to healthcare workers: management of patients with 2019-nCoV infection

• Infection prevention and control for the care of patients with 2019-nCoV in healthcare settings

• Interim guidance for environmental cleaning in non-healthcare facilities exposed to SARS-CoV-2
Public health management of persons, including health care workers, having had contact with COVID-19 cases in the European Union

Checklist for hospitals preparing for the reception and care of coronavirus 2019 (COVID-19) patients

Guidance for wearing and removing personal protective equipment in healthcare settings for the care of patients with suspected or confirmed COVID-19

“Resource estimation for contact tracing, quarantine and monitoring activities for COVID-19 cases in the EU/EEA”


“Communicable disease threats report, 1-7 March 2020, week 10”

“Data on the geographic distribution of COVID-19 cases worldwide”

“Information leaflet template on COVID-19’

“Data on the geographic distribution of COVID-19 cases worldwide”

“Considerations relating to social distancing measures in response to the COVID-19 epidemic”

Infection prevention and control for COVID-19 in healthcare settings
Clinical management of severe acute respiratory infection when novel coronavirus (nCoV) infection is suspected

Guidance for health system contingency planning during widespread transmission of SARS-CoV-2 with high impact on healthcare services
Annex B

A Novel Coronavirus from Patients with Pneumonia in China, 2019 [1]

Background
The initial cases of novel coronavirus (2019-nCoV)–infected pneumonia (NCIP) occurred in Wuhan, Hubei Province, China, in December 2019 and January 2020. We analyzed data on the first 425 confirmed cases in Wuhan to determine the epidemiologic characteristics of NCIP.

Methods
We collected information on demographic characteristics, exposure history, and illness timelines of laboratory-confirmed cases of NCIP that had been reported by January 22, 2020. We described characteristics of the cases and estimated the key epidemiologic time-delay distributions. In the early period of exponential growth, we estimated the epidemic doubling time and the basic reproductive number.

Results
Among the first 425 patients with confirmed NCIP, the median age was 59 years and 56% were male. The majority of cases (55%) with onset before January 1, 2020, were linked to the Huanan Seafood Wholesale Market, as compared with 8.6% of the subsequent cases. The mean incubation period was 5.2 days (95% confidence interval [CI], 4.1 to 7.0), with the 95th percentile of the distribution at 12.5 days. In its early stages, the epidemic doubled in size every 7.4 days. With a mean serial interval of 7.5 days (95% CI, 5.3 to 19), the basic reproductive number was estimated to be 2.2 (95% CI, 1.4 to 3.9).

Conclusions
On the basis of this information, there is evidence that human-to-human transmission has occurred among close contacts since the middle of December 2019. Considerable efforts to reduce transmission will be required to control outbreaks if similar dynamics apply elsewhere. Measures to prevent or reduce transmission should be implemented in populations at risk. (Funded by the Ministry of Science and Technology of China and others.)


Background
In December, 2019, a pneumonia associated with the 2019 novel coronavirus (2019-nCoV) emerged in Wuhan, China. We aimed to further clarify the epidemiological and clinical characteristics of 2019-nCoV pneumonia.

Methods
In this retrospective, single-centre study, we included all confirmed cases of 2019-nCoV in Wuhan Jinyintan Hospital from Jan 1 to Jan 20, 2020. Cases were confirmed by real-time RT-PCR and were analysed for epidemiological, demographic, clinical, and radiological features and laboratory data. Outcomes were followed up until Jan 25, 2020.

Findings
Of the 99 patients with 2019-nCoV pneumonia, 49 (49%) had a history of exposure to the Huanan seafood market. The average age of the patients was 55.5 years (SD 13.1), including 67 men and 32 women. 2019-
nCoV was detected in all patients by real-time RT-PCR. 50 (51%) patients had chronic diseases. Patients had clinical manifestations of fever (82 [83%] patients), cough (81 [82%] patients), shortness of breath (31 [31%] patients), muscle ache (11 [11%] patients), confusion (nine [9%] patients), headache (eight [8%] patients), sore throat (five [5%] patients), rhinorrhea (four [4%] patients), chest pain (two [2%] patients), diarrhea (two [2%] patients), and nausea and vomiting (one [1%] patient). According to imaging examination, 74 (75%) patients showed bilateral pneumonia, 14 (14%) patients showed multiple mottling and ground-glass opacity, and one (1%) patient had pneumothorax. 17 (17%) patients developed acute respiratory distress syndrome and, among them, 11 (11%) patients worsened in a short period of time and died of multiple organ failure.

**Interpretation**

The 2019-nCoV infection was of clustering onset, is more likely to affect older males with comorbidities, and can result in severe and even fatal respiratory diseases such as acute respiratory distress syndrome. In general, characteristics of patients who died were in line with the MuLBSTA score, an early warning model for predicting mortality in viral pneumonia. Further investigation is needed to explore the applicability of the MuLBSTA score in predicting the risk of mortality in 2019-nCoV infection.

**Transmission of 2019-nCoV Infection from an Asymptomatic Contact in Germany [7]**

The article is reporting a case of 2019-nCoV infection acquired outside of Asia in which transmission appears to have occurred during the incubation period in the index patient. A 33-year-old otherwise healthy German businessman (Patient 1) became ill with a sore throat, chills, and myalgias on January 24, 2020. The following day, a fever of 39.1°C (102.4°F) developed, along with a productive cough. By the evening of the next day, he started feeling better and went back to work on January 27.

Before the onset of symptoms, he had attended meetings with a Chinese business partner at his company near Munich on January 20 and 21. The business partner, a Shanghai resident, had visited Germany between Jan. 19 and 22. During her stay, she had been well with no signs or symptoms of infection but had become ill on her flight back to China, where she tested positive for 2019-nCoV on January 26 (index patient in Figure 1).

On January 27, she informed the company about her illness. Contact tracing was started, and the above-mentioned colleague was sent to the Division of Infectious Diseases and Tropical Medicine in Munich for further assessment. At presentation, he was afebrile and well. He reported no previous or chronic illnesses and had no history of foreign travel within 14 days before the onset of symptoms. Two nasopharyngeal swabs and one sputum sample were obtained and were found to be positive for 2019-nCoV on quantitative reverse-transcriptase–polymerase-chain-reaction (qRT-PCR) assay.2 Follow-up qRT-PCR assay revealed a high viral load of 108 copies per milliliter in his sputum during the following days, with the last available result on January 29.

On January 28, three additional employees at the company tested positive for 2019-nCoV (Patients 2 through 4 in Figure 1). Of these patients, only Patient 2 had contact with the index patient; the other two patients had contact only with Patient 1. In accordance with the health authorities, all the patients with confirmed 2019-nCoV infection were admitted to a Munich infectious diseases unit for clinical monitoring and isolation. So far, none of the four confirmed patients show signs of severe clinical illness.

This case of 2019-nCoV infection was diagnosed in Germany and transmitted outside of Asia. However, it is notable that the infection appears to have been transmitted during the incubation period of the index patient, in whom the illness was brief and nonspecific. The fact that asymptomatic persons are potential sources of 2019-nCoV infection may warrant a reassessment of transmission dynamics of the current...
outbreak. In this context, the detection of 2019-nCoV and a high sputum viral load in a convalescent patient (Patient 1) arouse concern about prolonged shedding of 2019-nCoV after recovery. Yet, the viability of 2019-nCoV detected on qRT-PCR in this patient remains to be proved by means of viral culture.

Despite these concerns, all four patients who were seen in Munich have had mild cases and were hospitalized primarily for public health purposes. Since hospital capacities are limited — in particular, given the concurrent peak of the influenza season in the northern hemisphere — research is needed to determine whether such patients can be treated with appropriate guidance and oversight outside the hospital.

Figure 1. Timeline of Exposure to Index Patient with Asymptomatic 2019-CoV Infection in Germany

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**Updated understanding of the outbreak of 2019 novel coronavirus (2019-nCoV) in Wuhan, China [9]**

**Background**

To help health workers and the public recognize and deal with the 2019 novel coronavirus (2019-nCoV) quickly, effectively and calmly with an updated understanding.

**Methods**

A comprehensive search from Chinese and worldwide official websites and announcements was performed between 1 Dec 2019 to 9:30 am 26 Jan 2020 (Beijing time). A latest summary of 2019-nCoV and the current outbreak was drawn.

**Results**

Up to 24 pm 25 Jan 2020, a total 1,975 cases were confirmed infection of 2019-nCoV in China mainland with a total of 56 deaths occurred. The latest mortality was approximately 2.84% with a total 2,684 cases still suspected. The China National Health Commission reported the details of the first 17 deaths up to 24 pm 22 Jan 2020. The deaths included 13 males and 4 females. The median age of the deaths was 75 (range 48-89) years. Fever (64.7%) and cough (52.9%) were the most common first symptoms in deaths. The median days from first symptom to death were 14.0 (range 6-41) days, and tended to be shorter among
people of 70-year old or above (11.5 [range 6-19] days) than those with ages below 70-year old (20 [range 10-41] days, P=0.033).

Conclusion
The infection of 2019-nCoV is spreading and increasing nationwide. The first occurred deaths were majorly elderly people who might have faster disease progresses. The public should still be cautious in dealing with the virus and paying more attention to protect elderly people from the virus.


New findings from Chinese researchers in Shenzhen suggests the possibility of faecal-oral transmission of the novel coronavirus. Traces of coronavirus genetic materials have been detected in the feces and anal swab specimens of some infected patients. Scientists have since concluded that the virus could be transmitted “to a certain extent” via fecal-oral transmission. The new findings put additional outbreak measures on the list. Transmission of coronavirus through the feces means plausible vaporization of virus by the force of toilet flushing, calling for heightened protection measures for people in the same space. Disinfection and ventilation of toilets used by suspected patients and confirmed cases are required. Clinicians, especially gastroenterologists are advised to protect against vomitus and feces. Further investigations are required to prove this preliminary finding.

Nowcasting and forecasting the potential domestic and international spread of the 2019-nCoV outbreak originating in Wuhan, China: a modelling study [11]

Background
This study estimates the size of the epidemic in Wuhan based on the number of cases exported from Wuhan to cities outside mainland China and forecasts the extent of the domestic and global public health risks of epidemics, accounting for social and non-pharmaceutical prevention interventions. Methods Data on number of cases exported from Wuhan internationally (known days of symptom onset from Dec 25, 2019, to Jan 19, 2020) was used to infer the number of infections in Wuhan from Dec 1, 2019, to Jan 25, 2020 and domestic exports. We forecasted the national and global spread of 2019-nCoV, accounting for the effect of the metropolitan-wide quarantine of Wuhan and surrounding cities, which began Jan 23–24, 2020. Data on monthly flight bookings, human mobility across more than 300 prefecture-level cities in mainland China and confirmed cases were obtained from relevant organizations. Serial interval estimates from previous studies of severe acute respiratory syndrome coronavirus (SARS-CoV) was referenced. A susceptible-exposed-infectious-recovered metapopulation model was used to simulate the epidemics across all major cities in China. Finally, the basic reproductive number was estimated using Markov Chain Monte Carlo methods and presented using the resulting posterior mean and 95% credible interval (CrI).

Findings
In our baseline scenario, the basic reproductive number for 2019-nCoV was estimated to be 2.68 (95% CrI 2.47–2.86), with 75,815 individuals (95% CrI 37,304–130,330) infected in Wuhan as of Jan 25, 2020. The epidemic doubling time was 6.4 days (95% CrI 5.8–7.1). Chongqing, Beijing, Shanghai, Guangzhou, and Shenzhen would have had imported 461 (95% CrI 227–805), 113 (57–193), 98 (49–168), 111 (56–191), and 80 (40–139) infections from Wuhan, respectively. Suppose the transmissibility of 2019-nCoV were similar everywhere domestically and over time, we inferred that epidemics are already growing exponentially in multiple major cities of China with a lag time behind the Wuhan outbreak of about 1–2 weeks.

**Interpretation**

Given that 2019-nCoV is no longer contained within Wuhan, other major Chinese cities are probably sustaining localised outbreaks. Without substantial public health interventions at both the population and personal levels, and continued exportation of presymptomatic cases, large cities overseas with close transport links to China could also become outbreak epicentres with independent self-sustaining outbreaks. Preparedness plans and mitigation interventions should be assessed for quick deployment globally.

**First Case of 2019 Novel Coronavirus in the United States [12]**

An outbreak of novel coronavirus (2019-nCoV) that began in Wuhan, China, has spread rapidly, with cases now confirmed in multiple countries. We report the first case of 2019-nCoV infection confirmed in the United States and describe the identification, diagnosis, clinical course, and management of the case, including the patient’s initial mild symptoms at presentation with progression to pneumonia on day 9 of illness. This case highlights the importance of close coordination between clinicians and public health authorities at the local, state, and federal levels, as well as the need for rapid dissemination of clinical information related to the care of patients with this emerging infection.

**Figure 1. Risk of spread outside Wuhan**

(A) Cumulative number of confirmed cases of 2019 novel coronavirus as of Jan 28, 2020, in Wuhan, in mainland China (including Wuhan), and outside mainland China. (B) Major routes of outbound air and train travel originating from Wuhan during chunyun, 2019. Darker and thicker edges represent greater numbers of passengers. International outbound air travel (yellow) constituted 13.5% of all outbound air travel, and the top 40 domestic (red) outbound air routes constituted 81.3%. Islands in the South China Sea are not shown.

**Figure 1. Symptoms and Maximum Body Temperatures According to Day of Illness and Day of Hospitalization, January 16 to January 30, 2020.**

**Preliminary Estimation of the Basic Reproduction Number of Novel Coronavirus (2019-nCoV) in China, From 2019 to 2020: A Data-Driven Analysis in the Early Phase of the Outbreak [13]**
**Backgrounds:** An ongoing outbreak of a novel coronavirus (2019-nCoV) pneumonia hit a major city of China, Wuhan, December 2019 and subsequently reached other provinces/regions of China and countries. We present estimates of the basic reproduction number, $R_0$, of 2019-nCoV in the early phase of the outbreak.

**Methods:** Accounting for the impact of the variations in disease reporting rate, we modelled the epidemic curve of 2019-nCoV cases time series, in mainland China from January 10 to January 24, 2020, through the exponential growth. With the estimated intrinsic growth rate ($\gamma$), we estimated $R_0$ by using the serial intervals (SI) of two other well-known coronavirus diseases, MERS and SARS, as approximations for the true unknown SI.

**Findings:** The early outbreak data largely follows the exponential growth. We estimated that the mean $R_0$ ranges from 2.24 (95%CI: 1.96-2.55) to 3.58 (95%CI: 2.89-4.39) associated with 8-fold to 2-fold increase in the reporting rate. We demonstrated that changes in reporting rate substantially affect estimates of $R_0$. CONCLUSION: The mean estimate of $R_0$ for the 2019-nCoV ranges from 2.24 to 3.58, and significantly larger than 1. Our findings indicate the potential of 2019-nCoV to cause outbreaks.

**Evidence and characteristics of human-to-human transmission of 2019-nCoV** [14]

**Background**
On December 31, 2019, an outbreak of 2019-nCoV in humans was reported in Wuhan, China. We analysed data from field investigations and genetic sequencing to provide evidence and characteristics of human-to-human transmission.

**Methods**
A confirmed case of 2019-nCoV was defined if a suspected case was verified with positive of 2019-nCoV in throat swabs, nasal swabs, bronchoalveolar lavage fluid (BALF), or endotracheal aspirates by real-time reverse transcriptase polymerase chain reaction assay (RT-PCR) or genetic sequencing. Field investigations were conducted for each confirmed case. Clinical and demographic data of the confirmed cases were collected from their medical records. Exposure and travel history were obtained by interviewing confirmed cases.

**Results**
A total of 188 confirmed cases were identified from January 1 to 27, 2020 in Guangdong Province, China. Of them, 84 (44.6%) cases were from 31 cluster infections. Thirty cases (16.0%) were identified as secondary cases, in which 25 and 9 cases were identified in cluster infections and family cluster infections, respectively. 2019-nCoV were detected in three cases with mild respiratory symptoms, and in two asymptomatic cases. The whole viral genomes within the same family cluster infections were exactly the same, and presented a few unique single nucleotide variants (SNVs) compared with 2019-nCoVs identified in Wuhan on December 2019.

**Conclusions**
We observed increasing human-to-human transmissions of 2019-nCoV in Guangdong, China, and most of them were identified in cluster infections. Our findings indicate that prevention strategies of containing the person-to-person transmission of 2019-nCoV in households, hospitals and communities are urgently needed.

**Early epidemiological analysis of the 2019-nCoV outbreak based on a crowdsourced data** [15]

As the outbreak of novel 2019 coronavirus (2019-nCoV) progresses within China and beyond, there is a need for rapidly available epidemiological data to guide situational awareness and intervention strategies.
Here we present an effort to compile epidemiological information on 2019-nCoV from media news reports and a physician community website (dxy.cn) between Jan 20, 2020 and Jan 30, 2020, as the outbreak entered its 7th week. We compiled a line list of patients reported in China and internationally and daily case counts by Chinese province. We describe the demographics, hospitalization and reporting delays for 288 patients, over time and geographically. We find a decrease in case detection lags in provinces outside of Wuhan and internationally, compared to Wuhan, and after Jan 18, 2020, as outbreak awareness increased. The rapid progression of reported cases in different provinces of China is consistent with local transmission beyond Wuhan. The age profile of cases points at a deficit among children under 15 years of age, possibly related to prior immunity with related coronavirus or behavioral differences. Overall, our datasets, which have been publicly available since Jan 21, 2020, align with official reports from Chinese authorities published more than a week later. Availability of publicly available datasets in the early stages of an outbreak is important to encourage disease modeling efforts by independent academic modelling teams and provide robust evidence to guide interventions.

**Pangolins likely host of coronavirus, say Chinese researchers [17]**

The Chinese researchers from South China Agricultural University revealed that pangolins could have served as host of the new coronavirus. They found that the genome sequence of the virus strain obtained from pangolins was 99% similar to that from infected people, reported Xinhua. Initially, the researchers observed a 70% positive rate of Betacoronavirus in pangolins when tested using molecular biological detection method. They determined similarity after isolating the virus further and observing its structure using an electron microscope. However, the results of the study need further validation.

**Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia in Wuhan, China [16]**

**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 (16 [44.4%]), and shock (11 [30.6%]). The median time from first 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 = 102), compared with patients not treated in the ICU (n = 36), 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%.

The Outbreak Cases with the Novel Coronavirus Suggest Upgraded Quarantine and Isolation in Korea [17]

On January 31, 2020, the WHO declared the outbreak of novel coronavirus 2019 (2019-nCoV) a public health emergency over the world but did not restrict international transportation of human and trade. However, many countries began to limit immigrants from China after the declaration. In Korea, a total of 24 patients of pneumonia or respiratory infection by 2019-nCoV have been confirmed by the Korea Center for Disease Control and Prevention (KCDC) by February 7, 2020 (Table 1). The KCDC is closely and actively monitoring clinical patients and contacted persons by the known patients. The Patient 1 had pneumonia as early as three days after the symptom onset, although her condition was stable. During the first 3 days, she did not develop any clinical features suggesting pneumonia. If an early high-resolution computed tomography scan of the lungs had not been taken, the pneumonia would not have been diagnosed. This suggests that the possibility of 2019-nCoV pneumonia cannot be excluded based only on the clinical clues. The Patient 3 was meaningful in that he caused a secondary infection to the Patient 6 in Korea for the first time. The Patient 6 then infected two of his family members, Patient 10 and 11 to establish a tertiary infection. This raises the concern that the 2019-nCoV could spread significantly into the community in the near future. The Patient 12 contracted a secondary infection in Japan and had never been to Wuhan. Therefore, he easily entered Korea without strict screening at the airport, and lived his daily life for more than ten days without any restriction until 2019-nCoV infection was confirmed. Many patients shared common exposure and family transmission.
Family transmission continues during home isolation. However, the real problem is that the Patients 7, 8, 12, and 23 were not on the list of active monitoring by the KCDC suggesting that there are more possible patients although the KCDC is actively monitoring all of the people on the list of direct or indirect contacts with the confirmed patients. At this point, we must doubt whether the present defenses thus far have been successful.

Serious consideration should be given to the temporary ban on visitors or to the high-level quarantine of all entrants from China. No one can estimate how many patients may appear in the near future because thousands of patients and several tens of deaths are added every day. This is a serious health security emergency in Korea as well as in the world. The government must discern this security agenda and decide how to upgrade enforcing the present national strategy against the 2019-nCoV outbreak as soon as possible. Quarantine at the immigration for asymptomatic visitors from epidemic areas is an effective preventive method that has been historically proven and should be actively applied. However, this way looks not enough to end the present outbreak. Perhaps this is the last chance for us to contain further spread of the disease. If it spreads further, we have no way to stop the virus.


In December 2019, an outbreak of acute respiratory illness caused by a novel coronavirus (2019-nCoV) was detected in mainland China. Cases have been reported in 26 additional locations, including the United States. Nine of the first 11 U.S. 2019-nCoV patients were exposed in Wuhan, China. CDC expects more U.S. cases. CDC, multiple other federal agencies, state and local health departments, and other partners are implementing aggressive measures to substantially slow U.S. transmission of 2019-nCoV, including identification of U.S. cases and contacts and managing travelers arriving from mainland China to the United States.

On January 21, 2020, the first person in the United States with diagnosed 2019-nCoV infection was reported. As of February 4, a total of 293 persons from 36 states, the District of Columbia, and the U.S. Virgin Islands were under investigation based on current patient under investigation and also included those being evaluated because they are close contacts. Of these PUIs, 11 patients have confirmed 2019-nCoV infection using a real-time reverse transcription–polymerase chain reaction (RT-PCR) assay developed by CDC. These 11 cases were diagnosed in the following states: Arizona (one), California (six), Illinois (two), Massachusetts (one), and Washington (one) (Table). Nine cases were in travelers from Wuhan. Eight of these nine cases were identified as a result of patients seeking clinical care for symptoms and clinicians connecting with the appropriate public health systems. Two cases (one each in California and Illinois) occurred in close contacts of two confirmed cases and were diagnosed as part of routine monitoring of case contacts. All patients are being monitored closely for progressing illness. No deaths have been reported in the United States.

Chinese health officials posted the full 2019-nCoV genome sequence on January 10, 2020, to inform the development of specific diagnostic tests for this emergent coronavirus (1). Within a week, CDC developed a Clinical Laboratory Improvement Amendments–approved real-time RT-PCR test that can diagnose 2019-nCoV respiratory samples from clinical specimens. To date, this test has been limited to use at CDC laboratories. This authorization allows the use of the test at any CDC-qualified lab across the country. CDC is working closely with FDA and public health partners, including the American Public Health Laboratories, to rapidly share these tests domestically and internationally through CDC’s International Reagent Resource. Once isolated, the virus will be made available to assist research efforts.

Persons Evaluated for 2019 Novel Coronavirus — United States, January 2020 [19]

Summary
As of January 31, 2020, CDC had responded to clinical inquiries from public health officials and health care providers to assist in evaluating approximately 650 persons thought to be at risk for 2019-nCoV infection. Guided by CDC criteria for the evaluation of persons under investigation (PUIs), 210 symptomatic persons were tested for 2019-nCoV; among these persons, 148 (70%) had travel-related risk only, 42 (20%) had close contact with an ill laboratory-confirmed 2019-nCoV patient or PUI, and 18 (9%) had both travel- and contact-related risks. Eleven of these persons had laboratory-confirmed 2019-nCoV infection. Recognizing persons at risk for 2019-nCoV is critical to identifying cases and preventing further transmission.

During January 2020, approximately 30 CDC physicians and nurses responded to inquiries regarding approximately 650 persons. Testing was recommended for 256 persons (Figure) across 34 jurisdictions and was completed for 210 persons. Testing of PUIs was not always per-formed because alternative diagnoses were made, or symptoms resolved. Among inquiries resulting in testing, six (3%) persons were identified through airport screening, 178 (85%) in a health care setting, and 26 (12%) through contact tracing. Among 178 persons identified in a health care setting, the type of setting was reported for 125 (70%), including 79 (63%) who were evaluated at an emergency department or hospital, 22 (18%) at a student clinic, and 24 (19%) in other outpatient care settings. A total of 115 (55%) persons tested were male, and median age was 29 years (interquartile range = 21–49 years). Seventeen (8%) were health care workers, and 48 of 129 persons with available information were reported to be college students. All 210 persons who were tested were symptomatic: 143 (68%) had subjective fever or a measured temperature ≥100.4°F (≥38°C), and 189 (90%) had cough or shortness of breath. Thirty persons were reported to test positive for another respiratory viral pathogen, including influenza or respiratory syncytial virus. Travel-related risk was identified for 148 (70%) persons, 42 (20%) had close contact with ill patients with laboratory-confirmed 2019-nCoV infection or PUIs, 18 (9%) had both travel- and contact-related risks, and two (<1%) had possible contact with a laboratory-confirmed 2019-nCoV patient and were therefore tested. Among the 210 persons tested, 11 (5%) were found to have 2019-nCoV infection. Nine of these persons had travelled to Wuhan City; two persons had not travelled but had been in close contact with patients with laboratory-confirmed 2019-nCoV in the United States. All were symptomatic with fever (subjective or measured) or cough.

Discussion: Quickly identifying persons at risk for 2019-nCoV is critical to slowing the potential spread of 2019-nCoV in the United States. This report describes CDC’s current approach to facilitating recommended diagnostic testing of persons who might have 2019-nCoV infection. In response to the emergence of 2019-nCoV in China during a time of rapidly evolving understanding of the epidemiology and clinical presentation of 2019-nCoV infection, CDC has provided consultation regarding persons suspected of being at risk for 2019-nCoV to public health officials and health care providers throughout the United States.

Epidemiologic and Clinical Characteristics of Novel Coronavirus Infections Involving 13 Patients Outside Wuhan, China [20]

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.
Methods: Data were obtained from 3 hospitals in Beijing, China (Beijing Tsinghua Changgung Hospital, School of Medicine, Tsinghua University [8 patients], Beijing Anzhen Hospital, Capital Medical University [4 patients], and College of Respiratory and Critical Care Medicine, Chinese PLA General Hospital [1 patient]). Patients were hospitalized from January 16, 2020, to January 29, 2020, with final follow-up for this report on February 4, 2020. Patients with possible 2019-nCoV were admitted and quarantined, and throat swab samples were collected and sent to the Chinese Center for Disease Control and Prevention for detection of 2019-nCoV using a quantitative polymerase chain reaction assay. Chest radiography or computed tomography was performed. Data were obtained as part of standard care. Patients were transferred to a specialized hospital after diagnosis.

Results: The median age of the patients was 34 years (25th-75th percentile, 34-48 years); 2 patients were children (aged 2 years and 15 years), and 10 (77%) were male. Twelve patients either visited Wuhan, including a family (parents and son), or had family members (grandparents of the 2-year-old child) who visited Wuhan after the onset of the 2019-nCoV epidemic (mean stay, 2.5 days). One patient did not have any known contact with Wuhan. Twelve patients reported fever (mean, 1.6 days) before hospitalization. Symptoms included cough (46.3%), upper airway congestion (61.5%), myalgia (23.1%), and headache (23.1%). No patient required respiratory support before being transferred to the specialty hospital after a mean of 2 days. The youngest patient (aged 2 years) had intermittent fever for 1 week and persistent cough for 13 days before 2019-nCoV diagnosis. Levels of inflammatory markers such as C-reactive protein were elevated, and numbers of lymphocytes were marginally elevated. Four patients had chest radiographs and 9 had computed tomography. Five images did not demonstrate any consolidation or scarring. One chest radiograph demonstrated scattered opacities in the left lower lung; in 6 patients, ground glass opacity was observed in the right or both lungs. As of February 4, 2020, all the patients recovered, but 12 were still being quarantined in the hospital.

Discussion: The current coronavirus outbreak in China is the third epidemic caused by coronavirus in the 21st century, already surpassing SARS and MERS in the number of individuals infected. The higher number of infections may be attributable to late identification of the etiologic agent and the ability of the host to shed the infection while asymptomatic, rather than to greater infectivity of the virus compared with SARS. This case series provides information on the epidemiology of the disease outside Wuhan. Most patients visited or came in close contact with individuals from Wuhan, but 1 patient did not, suggesting possible active viral transmission in Beijing. Close monitoring will be needed to prevent large-scale spread of the virus to other cities in China. Most of the infected patients were healthy adults; only 1 patient was older than 50 years and 1 younger than 5 years. This might be related to limited travel by younger and older patients rather than decreased susceptibility of these populations. Recovery of all patients suggests milder infections. The study is limited by lack of detailed data after transfer. These data contribute information to understanding the early clinical manifestations of 2019-nCoV.

Key diagnostic test might be missing many coronavirus cases [21]

A key test used to confirm new cases is failing to catch large numbers of people with the disease. Problems with so-called nucleic acid tests (NATS) widely used to identify the presence of the previously unknown pneumonia-causing virus make it likely that many infections are going uncounted even as the number of confirmed cases continues to spiral. But there is growing concern that those NATs are producing large numbers of false negatives.

NATs are by nature an imperfect mechanism for determining the presence of a given organism. For instance, because the genetic material they test for usually only exists in tiny amounts, many NATs include a step called amplification, which makes many copies of it. A shortcoming of amplification is that it also copies any contaminating DNA in the sample, potentially causing misleading results. Health officials have also recommended the use of gene sequencing to confirm coronavirus infections. But that method has its
own problems. Although gene sequencing is comparatively accurate, it is also expensive, and not all affected hospitals have the necessary facilities.

The NHC on 4 Feb 2020 relaxed the clinical criteria for reporting suspected coronavirus cases. Outside the stricken province, medical professionals should now suspect coronavirus infection in patients with radiographic evidence of pneumonia, fever, and/or breathing problems, and a low-to-normal white blood cell count or a low lymphocyte count. Within Hubei, only 2 of the 3 criteria are required.

**Persistence of coronaviruses on inanimate surfaces and its inactivation with biocidal agents [22]**

Currently, the emergence of a novel human coronavirus, temporarily named 2019-nCoV, has become a global health concern causing severe respiratory tract infections in humans. Human-to-human transmissions have been described with incubation times between 2-10 days, facilitating its spread via droplets, contaminated hands or surfaces. We therefore reviewed the literature on all available information about the persistence of human and veterinary coronaviruses on inanimate surfaces as well as inactivation strategies with biocidal agents used for chemical disinfection, e.g. in healthcare facilities. The analysis of 22 studies reveals that human coronaviruses such as Severe Acute Respiratory Syndrome (SARS) coronavirus, Middle East Respiratory Syndrome (MERS) coronavirus or endemic human coronaviruses (HCoV) can persist on inanimate surfaces like metal, glass or plastic for up to 9 days, but can be efficiently inactivated by surface disinfection procedures with 62-71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite within 1 minute. Other biocidal agents such as 0.05-0.2% benzalkonium chloride or 0.02% chlorhexidine digluconate are less effective. As no specific therapies are available for 2019-nCoV, early containment and prevention of further spread will be crucial to stop the ongoing outbreak and to control this novel infectious thread.

**Retrospective Clinical Analysis on Treatment of Novel Coronavirus-infected Pneumonia with Traditional Chinese Medicine Lianhua Qingwen [23]**

Objective: To analyze the clinical effect of traditional Chinese medicine Lianhua Qingwen in the treatment of novel coronavirus-infected pneumonia (NCIP) and provide the basis for medication guides through a retrospective study in a cohort of NCIP confirmed patients.

Method: A retrospective analysis of clinical records was conducted in NCIP confirmed patients at The Ninth Hospital of Wuhan and CR&WISCO General Hospital including the treatment group (21 patients, basic treatment in combination with Lianhua Qingwen granules, 1 packet/time, 3 times/day) and the control group (21 patients, basic treatment). Comparison between the two groups was made in terms of the disappearance rates of cardinal symptoms (fever, cough and weakness), duration of fever, and disappearance rates of other symptoms (muscle pain, expectoration, nasal obstruction, running nose, dry throat, pharyngalgia, shortness of breath, chest distress, dyspnea, dizziness, headache, nausea, vomiting, loss of appetite and diarrhea).

Result: The baseline data were similar between the two groups. When compared with the control group, patients in the treatment group had the higher clinical effect, including the disappearance rate of fever (85.7% vs 57.1%, \( \chi^2=4.200, P=0.040 \)), the disappearance rate of cough (46.7% vs 5.6%, \( P=0.012 \)).

**Emerging Coronavirus 2019-nCoV Pneumonia [24]**

Background: The chest CT findings of patients with coronavirus 2019-nCoV pneumonia have not previously been described in detail.
Purpose: To investigate the clinical, laboratory, and imaging findings of emerging coronavirus 2019-nCoV pneumonia in humans.

Materials and Methods: Fifty-one patients (25 men and 26 women, 16-76 years old) with 2019-nCoV pneumonia confirmed with the positive new coronavirus nucleic acid antibody underwent thin-section CT. The imaging findings, clinical and laboratory data were evaluated.

Results: Fifty of 51 patients (98%) had a history of the endemic center Wuhan contact. Fever (49/51, 6%) and cough (24/51, 47%) were the most common symptoms. Most patients had a normal white blood cell count (37/51, 73%), neutrophil count (44/51, 86.3%) and normal (17/51, 35.3%) or reduced (33/51, 64.7%) lymphocyte count. CT images showed pure ground glass opacity (GGO) in 39/51 (77%) patients, GGO with reticular and/or interlobular septal thickening in 38/51 (75%) patients. GGO with consolidation was present in 30/51 (59%) and pure consolidation in 28/51 (55%) patients. 44/51 (86%) patients had bilateral lung involvement, while 41/51 (80%) involved the posterior part of the lungs and 44/51 (86%) were peripheral. There were more consolidated lung lesions in patients 5 or more days from disease onset to CT scan versus 4 or fewer days (431/712 lesions vs. 129/612 lesions, p < 0.001). Patients more than 50 years old had more consolidated lung lesions than those 50 years or younger (212/470 vs. 198/854, p < 0.001). Follow up CT in 13 patients showed improvement in 7 (54%) patients and progression in 4 (31%) patients.

Conclusions: Patients with fever and/or cough and with conspicuous ground grass opacity lesions in the peripheral and posterior lungs on CT images combined with normal or decreased white blood cells and a history of epidemic exposure are highly suspected of 2019-nCoV pneumonia.

Analysis of Chinese Medical Clinic Characteristics of 50 patients with 2019-nCoV-infected pneumonia [25]

No evidence of transmission through aerosol [26] [27]

MOH has looked into reports that 2019-nCOV could be transmitted through aerosol. Based on evidence available in China, an expert from the Chinese Center for Disease Control and Prevention has said that there is currently no evidence that the virus can be transmitted through aerosol. The currently known transmission routes of the virus are via respiratory droplets and physical contact. An aerosol refers to a suspension of fine solid or liquid particles in gas. Aerosol transmission refers to the mixing of the virus with droplets in the air to form aerosols, which causes infection after inhalation.

Clinical characteristics of 2019 novel coronavirus infection in China [28]
Background: Since December 2019, acute respiratory disease (ARD) due to 2019 novel coronavirus (2019-nCoV) emerged in Wuhan city and rapidly spread throughout China. We sought to delineate the clinical characteristics of these cases.

Methods: We extracted the data on 1,099 patients with laboratory-confirmed 2019-nCoV ARD from 552 hospitals in 31 provinces/provincial municipalities through January 29th, 2020.

Results: The median age was 47.0 years, and 41.90% were females. Only 1.18% of patients had a direct contact with wildlife, whereas 31.30% had been to Wuhan and 71.80% had contacted with people from Wuhan. Fever (87.9%) and cough (67.7%) were the most common symptoms. Diarrhea was uncommon. The median incubation period was 3.0 days (range, 0 to 24.0 days). On admission, ground-glass opacity was the typical radiological finding on chest computed tomography (50.00%). Significantly more severe cases were diagnosed by symptoms plus reverse-transcriptase polymerase-chain-reaction without abnormal radiological findings than non-severe cases (23.87% vs. 5.20%, P<0.001). Lymphopenia was observed in 82.1% of patients. 55 patients (5.00%) were admitted to intensive care unit and 15 (1.36%) succumbed. Severe pneumonia was independently associated with either the admission to intensive care unit, mechanical ventilation, or death in multivariate competing-risk model (sub-distribution hazards ratio, 9.80; 95% confidence interval, 4.06 to 23.67). Conclusions: The 2019-nCoV epidemic spreads rapidly by human-to-human transmission. Normal radiologic findings are present among some patients with 2019-nCoV infection. The disease severity (including oxygen saturation, respiratory rate, blood leukocyte/lymphocyte count and chest X-ray/CT manifestations) predict poor clinical outcomes.

Clinical evidence does not support corticosteroid treatment for 2019-nCoV lung injury [29]

A commentary in the Lancet claims that no unique reason exists to expect that patients with 2019-nCoV infection will benefit from corticosteroids, and they might be more likely to be harmed with such treatment. We conclude that corticosteroid treatment should not be used for the treatment of 2019-nCoV-induced lung injury or shock outside of a clinical trial.


A viewpoint in Swiss Medical Weekly alerts estimating Case Fatality Rate of 2019-nCov virus. It says The higher case fatality rate reported from Wuhan may be overestimated. The lower case fatality rates outside Wuhan may be underestimated. Case fatality rates may truly differ among different regions of the world.

Severe acute respiratory syndrome-related coronavirus – The species and its viruses, a statement of the Coronavirus Study Group [31]

The present outbreak of lower respiratory tract infections, including respiratory distress syndrome, is the third spillover, in only two decades, of an animal coronavirus to humans resulting in a major epidemic. Here, the Coronavirus Study Group (CSG) of the International Committee on Taxonomy of Viruses, which is responsible for developing the official classification of viruses and taxa naming (taxonomy) of the Coronaviridae family, assessed the novelty of the human pathogen tentatively named 2019-nCoV. Based on phylogeny, taxonomy and established practice, the CSG formally recognizes this virus as a sister to severe acute respiratory syndrome coronaviruses (SARS-CoVs) of the species Severe acute respiratory syndrome-related coronavirus and designates it as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). To facilitate communication, the CSG further proposes to use the following naming convention for individual isolates: SARS-CoV-2/Isolate/Host/Date/Location. The spectrum of clinical manifestations associated with SARS-CoV-2 infections in humans remains to be determined.
independent zoonotic transmission of SARS-CoV and SARS-CoV-2 highlights the need for studying the entire (virus) species to complement research focused on individual pathogenic viruses of immediate significance. This research will improve our understanding of virus-host interactions in an ever-changing environment and enhance our preparedness for future outbreaks.

COVID-19 the disease, SARS-CoV-2 the virus [32]

There are 2 new names associated with the epidemic unfolding in China and in 2 dozen countries around the world. The "novel coronavirus" will be designated "severe acute respiratory syndrome coronavirus 2," or more simply "SARS-CoV-2." The disease it causes is "COVID-19." "It will be like HIV and AIDS -- different names for virus and disease."

Hundreds of health workers infected in Wuhan [33]

At least 500 healthcare workers were diagnosed as having COVID-19 by the middle of January, the South China Morning Post (SCMP) reported today. So far, China had just acknowledged one cluster of 14 or 15 cases in a Wuhan hospital. On February 7, Chinese scientists in an overview of 138 patients at Zhongnan Hospital in Wuhan revealed that hospital-related transmission was responsible for 41% of the illnesses, which include 40 healthcare workers and 17 patients. Doctors and nurses were told not to make public the number of healthcare worker infections in Wuhan hospitals.

Epidemiologic characteristics of early cases with 2019 novel coronavirus (2019-nCoV) disease in Republic of Korea [34]

Since the first case of 2019 novel coronavirus (2019-nCoV) in South Korea was confirmed on January 20, 2020, there have been 24 confirmed cases of 2019-nCoV. The majority of these cases (58.3%; n=14) were male, with a median age of 42 years (range, 21-62 years). Of the confirmed cases, 15 were index cases (63%), six were first-generation patients (24%), and three were second-generation patients (12.5%). All the first- and second-generation patients were family members or close acquaintances of index cases. All the index cases entered the South Korea from January 19 to 24, 2020. The average incubation period was 3.6 days (median, 4 days) and the reproduction number (R0) was calculated as 0.5. Two of the confirmed cases were asymptomatic. As of February 8, 22 patients with 2019-nCoV are hospitalized in South Korea, and 2 have been discharged from the hospital. The epidemiological indicators will be revised as new information becomes available in the future. Sharing epidemiological information among researchers around the world is essential for efficient preparations and responses to new infectious diseases.

2019-novel coronavirus infection in a three-month-old baby [35]

The patient from Xiaogan, Hubei, was hospitalized for 4 hours with fever, and the peripheral white blood cells were not high. A chest X-ray film showed a slightly thickened right lung texture, which seemed to be a little patchy. (2019-nCoV) The nucleic acid test was positive, and the 2019-nCoV infection diagnosis was established, which is consistent with the ordinary type. He was discharged after 15 days of active treatment. The child’s respiratory symptoms appeared later and were milder. The parents of the children tested positive for 2019-nCoV 7 days after the onset of the disease, suggesting that intra-family transmission is an important transmission route for 2019-nCoV infection. Although the patient’s throat swabs turned negative for 3 consecutive times, 2019-nCoV nucleic acid was still detected in the sputum and feces over the same period. The mother of the child had no fever and respiratory symptoms, but chest CT revealed exudative lesions of the left and right upper lungs, suggesting that pulmonary lesions can be seen in asymptomatic 2019-nCoV infection.
The First Case of 2019 Novel Coronavirus Pneumonia Imported into Korea from Wuhan, China: Implication for Infection Prevention and Control Measures [36]

In December 2019, a viral pneumonia outbreak caused by a novel betacoronavirus, the 2019 novel coronavirus (2019-nCoV), began in Wuhan, China. We report the epidemiological and clinical features of the first patient with 2019-nCoV pneumonia imported into Korea from Wuhan. This report suggests that in the early phase of 2019-nCoV pneumonia, chest radiography would miss patients with pneumonia and highlights taking travel history is of paramount importance for early detection and isolation of 2019-nCoV cases.

Clinical characteristics of novel coronavirus cases in tertiary hospitals in Hubei Province [37]

Background: A novel coronavirus (2019-nCoV) causing an outbreak of pneumonia in Wuhan, Hubei province of China was isolated in January 2020. This study aims to investigate its epidemiological history, and analyzed the clinical characteristics, treatment regimens and prognosis of patients infected with 2019-nCoV during this outbreak.

Methods: Clinical data from 137 2019-nCoV-infected patients admitted to the respiratory departments of nine tertiary hospitals in Hubei province from December 30, 2019 to January 24, 2020 were collected, including general status, clinical manifestations, laboratory test results, imaging characteristics, and treatment regimens.

Results: None of the 137 patients (61 males, 76 females, aged 20–83 years, mean age 55 ± 16 years) had a definite history of exposure to Huanan Seafood Wholesale Market. Major initial symptoms included fever (112/137, 81.8%), coughing (66/137, 48.2%), and muscle pain or fatigue (44/137, 32.1%), with other, less typical initial symptoms observed at low frequency, including heart palpitations, diarrhea, and headache. Nearly 80% of the patients had normal or decreased white blood cell counts, and 72.3% (99/137) had lymphocytopenia. Lung involvement was present in all cases, with most chest computed tomography scans showing lesions in multiple lung lobes, some of which were dense; ground-glass opacity co-existed with consolidation shadows or cord-like shadows. Given the lack of effective drugs, treatment focused on symptomatic and respiratory support. Immunoglobulin G was delivered to some critically ill patients according to their condition. Systemic corticosteroid treatment did not show significant benefits. Notably, early respiratory support facilitated disease recovery and improved prognosis. The risk of death was primarily associated with age, underlying chronic diseases, and median interval from the appearance of initial symptoms to dyspnea.

Conclusions: The majority of patients with 2019-nCoV coronavirus pneumonia present with fever as the first symptom, and most of them still showed typical manifestations of viral pneumonia on chest imaging. Middle-aged and elderly patients with underlying comorbidities are susceptible to respiratory failure and may have a poorer prognosis.

The first 2019 novel coronavirus case in Nepal [38]

On Jan 13, 2020, a 32-year-old man, a Nepalese student at Wuhan University of Technology, Wuhan, China, with no history of comorbidities, returned to Nepal. He presented at the outpatient department of Sukraraj Tropical and Infectious Disease Hospital, Kathmandu, with a cough. He had become ill on Jan 3, 6 days before he flew to Nepal. He indicated no exposure to the so-called wet market in Wuhan. Throat swabs obtained from the patient tested positive for 2019-nCoV on realtime RT-PCR assays at the WHO laboratory in Hong Kong. On admission to hospital in Kathmandu, his temperature was 37.2°C (99°F), with throat congestion, but with no other relevant signs or symptoms. He was isolated and treated with broad-
spectrum antibiotics and supportive therapies. After 6 h, he complained of mild breathing difficulty and had decreased oxygen saturation (SpO2 87% on room air). Chest radiographs obtained on admission showed an infiltrate in the upper lobe of the left lung (figure). On Jan 14, his temperature rose to 38.9°C (102°F) and the next day he had breathing difficulties while in the supine position, with crepitations in the right lower lung field. His fever was no longer present on Jan 16, and his clinical condition improved. He was discharged the next day and instructed to self-quarantine at home. Laboratory tests showed no abnormalities. Real-time RT-PCR assays for influenza A and B viruses, and NS1 antigen rapid tests for dengue viruses, scrub typhus, and Brucella spp were negative. Follow-up assessments on Jan 29 and Jan 31 gave an RT-PCR negative throat swab for 2019-nCoV.

**First case of severe childhood novel coronavirus pneumonia in China [39]**

The main complaint of the patient was "intermittent diarrhea, vomiting for 6 days, fever with shortness of breath for half a day". The child was admitted to the Department of Intensive Medicine of Wuhan Children's Hospital and diagnosed with a severe neonatal coronavirus pneumonia (NCP). Relevant databases such as China Knowledge Net, Weipu, Wanfang and other related databases were searched with the keywords of "new coronavirus pneumonia", "children", and "critical severity" as of February 8, 2020. No reports have been reported. This case is the first child with severe NCP in China. It started with gastrointestinal symptoms, early respiratory symptoms were not obvious, and rapidly progressed to acute respiratory distress syndrome, septic shock, and acute renal failure. The patient was negative for nucleic acid test of 2019 new-type coronavirus (2019-nCoV) for 2 consecutive throat swabs. For severe suspected cases, it is recommended to take samples of the lower respiratory tract or repeat samples of the upper respiratory tract for testing. Continuous blood purification technology can be applied to the treatment of children with severe NCP as early as possible.

**A Locally Transmitted Case of SARS-CoV-2 Infection in Taiwan [40]**

Since December 2019, an outbreak of infection with the novel coronavirus (SARS-CoV-2) has developed in Wuhan, China, and has spread to several countries, typically by travelers returning from China.1,2 Of the 3 million Taiwanese persons who work in China, 2000 work in Wuhan, so the risk of imported SARS-CoV-2 infection to Taiwan from China is high. As of January 29, there were 7 confirmed imported cases of infection with SARS-CoV-2 to Taiwan. We identified a case of locally transmitted infection in Taiwan from a wife to her husband.

On January 25, 2020, a 52-year-old woman with a history of type 2 diabetes presented with fever to an emergency department in central Taiwan. She was admitted to the hospital because of suspicion of pneumonia associated with SARS-CoV-2 infection. She had lived in Wuhan from October 21, 2019, to January 20, 2020. She returned to Taiwan from Wuhan on January 20 on an airplane. On the same day, a throat swab was obtained from another passenger on that flight; that passenger was confirmed to have the first known imported case of SARS-CoV-2 infection in Taiwan when the swab was found to be positive for the virus on January 21.

**Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records [41]**

**Background**

Previous studies on the pneumonia outbreak caused by the 2019 novel coronavirus disease (COVID-19) were based on information from the general population. Limited data are available for pregnant women with COVID-19 pneumonia. This study aimed to evaluate the clinical characteristics of COVID-19 in pregnancy and the intrauterine vertical transmission potential of COVID-19 infection.

**Methods**
Clinical records, laboratory results, and chest CT scans were retrospectively reviewed for nine pregnant women with laboratory-confirmed COVID-19 pneumonia (ie, with maternal throat swab samples that were positive for severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2]) who were admitted to Zhongnan Hospital of Wuhan University, Wuhan, China, from Jan 20 to Jan 31, 2020. Evidence of intrauterine vertical transmission was assessed by testing for the presence of SARS-CoV-2 in amniotic fluid, cord blood, and neonatal throat swab samples. Breastmilk samples were also collected and tested from patients after the first lactation.

Findings
All nine patients had a caesarean section in their third trimester. Seven patients presented with a fever. Other symptoms, including cough (in four of nine patients), myalgia (in three), sore throat (in two), and malaise (in two), were also observed. Fetal distress was monitored in two cases. Five of nine patients had lymphopenia (<1·0 × 10⁹ cells per L). Three patients had increased aminotransferase concentrations. None of the patients developed severe COVID-19 pneumonia or died, as of Feb 4, 2020. Nine livebirths were recorded. No neonatal asphyxia was observed in newborn babies. All nine livebirths had a 1-min Apgar score of 8–9 and a 5-min Apgar score of 9–10. Amniotic fluid, cord blood, neonatal throat swab, and breastmilk samples from six patients were tested for SARS-CoV-2, and all samples tested negative for the virus.

Interpretation
The clinical characteristics of COVID-19 pneumonia in pregnant women were similar to those reported for non-pregnant adult patients who developed COVID-19 pneumonia. Findings from this small group of cases suggest that there is currently no evidence for intrauterine infection caused by vertical transmission in women who develop COVID-19 pneumonia in late pregnancy.

Novel Coronavirus Infection in Hospitalized Infants Under 1 Year of Age in China [42]

Previous studies suggest that COVID-19 is more likely to infect older adult men, particularly those with chronic comorbidities. For this retrospective study, we identified all hospitalized infants diagnosed with COVID-19 infection between December 8, 2019, and February 6, 2020, in China. The summary number and geographic location of new COVID-19 infections, released daily by the central government, were screened to identify infants (aged 28 days to 1 year).

Nine infected infants were identified between December 8, 2019, and February 6, 2020 (Table). All patients were hospitalized. Seven patients were female. The youngest was aged 1 month and the oldest was 11 months. There were 2 patients from Beijing, 2 from Hainan, and 1 each from Guangdong, Anhui, Shanghai, Zhejiang, and Guizhou. Four patients were reported to have fever, 2 had mild upper respiratory tract symptoms, 1 had no symptoms but tested positive for COVID-19 in a designated screening because of exposure to infected family members, and 2 had no information on symptoms available. The time between admission and diagnosis was 1 to 3 days. Families of all 9 infants had at least 1 infected family member, with the infant’s infection occurring after the family members’ infection. Seven infants were reported to be either living in Wuhan or having family members who visited Wuhan, 1 had no direct linkage to Wuhan, and 1 had no information available. None of the 9 infants required intensive care or mechanical ventilation or had any severe complications.
Given the number of infections reported, the number of infected infants identified was small. However, this study showed that infants can be infected by COVID-19; the earlier stage of the COVID-19 epidemic primarily involved adults older than 15 years.

The study was limited by small sample size, inclusion only of infants who were hospitalized, and lack of inclusion of asymptomatic patients. Although a systematic and comprehensive search was made for relevant infections in infants, the epidemic is spreading rapidly and incomplete identification of cases is possible. Because infants younger than 1 year cannot wear masks, they require specific protective measures. Adult caretakers should wear masks, wash hands before close contact with infants, and sterilize the infants’ toys and tableware regularly.

**Case of the Index Patient Who Caused Tertiary Transmission of Coronavirus Disease 2019 in Korea: the Application of Lopinavir/Ritonavir for the Treatment of COVID-19 Pneumonia Monitored by Quantitative RT-PCR [43]**

Since mid-December of 2019, coronavirus disease 2019 (COVID-19) has been spreading from Wuhan, China. The confirmed COVID-19 patients in South Korea are those who came from or visited China. As secondary transmissions have occurred and the speed of transmission is accelerating, there are rising concerns about community infections. The 54-year old male is the third patient diagnosed with COVID-19 in Korea. He is a worker for a clothing business and had mild respiratory symptoms and intermittent fever in the beginning of hospitalization, and pneumonia symptoms on chest computerized tomography scan on day 6 of admission. This patient caused one case of secondary transmission and three cases of tertiary transmission. Hereby, we report the clinical findings of the index patient who was the first to cause tertiary transmission outside China. Interestingly, after lopinavir/ritonavir (Kaletra, AbbVie) was administered, β-coronavirus viral loads significantly decreased and no or little coronavirus titers were observed.

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

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Patient 1</th>
<th>Patient 2</th>
<th>Patient 3</th>
<th>Patient 4</th>
<th>Patient 5</th>
<th>Patient 6</th>
<th>Patient 7</th>
<th>Patient 8</th>
<th>Patient 9</th>
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<tbody>
<tr>
<td>Demographics</td>
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<td></td>
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<tr>
<td>Age</td>
<td>9 mo</td>
<td>11 mo</td>
<td>8 mo</td>
<td>10 mo</td>
<td>7 mo</td>
<td>1 mo 26 d</td>
<td>3 mo</td>
<td>3 mo 22 d</td>
<td>6 mo</td>
</tr>
<tr>
<td>Sex</td>
<td>Female</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td>Female</td>
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<td>Female</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Symptoms at onset</td>
<td>Fever, peaking at 38.9 °C</td>
<td>Mild fever</td>
<td>None</td>
<td>NA</td>
<td>Fever</td>
<td>Runny nose; cough</td>
<td>Cough; sputum production</td>
<td>Fever</td>
<td>NA</td>
</tr>
<tr>
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Abbreviation: NA, not available.
The first Vietnamese case of COVID-19 acquired from China [44]

This letter describes the first Vietnamese case of coronavirus disease 2019 (COVID-19) acquired from China.
A 25-year-old Vietnamese woman who had been in Wuhan for a 2-month business trip returned to Vietnam on Jan 17, 2020. In Wuhan, she lived with two Vietnamese colleagues. They did not visit the Huanan market, which was located 20 km away, and cannot recall contact with anyone who had influenza-like symptoms. All three individuals returned to Vietnam on the same flight. On January 23, the patient presented with coughing, sneezing, fever, and chest pain. After an initial visit to a district hospital, she was transferred to Thanh Hoa General Hospital with suspected severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection and the Thanh Hoa Provincial Center for another hospital, where they tested positive for SARS-CoV-2.

First imported case of 2019 novel coronavirus in Canada, presenting as mild pneumonia [45]

A 56-year-old man presented to our Emergency Department in Toronto, ON, Canada, with fever and non-productive cough, 1 day after returning from a 3-month visit to Wuhan, China. Given this travel history, the transferring ambulance and receiving hospital personnel used appropriate personal protective equipment. He had a medical history of well controlled hypertension. On examination, his maximum temperature was 38.6°C, oxygen saturation was 97% on room air, and respiratory rate was 22 breaths per min—without any signs of respiratory distress. Laboratory investigations showed mild thrombocytopenia (113 × 109 per L, normal 150–400), haemoglobin concentration 146 g/L (normal 130–180), white blood cell count 7.4 × 109 per L (normal 4–11), creatinine concentration 81 μmol/L, alanine aminotransferase 29 IU/L (normal <40), and lactate concentration 1.1 mmol/L (normal 0.5–2.0). A chest x-ray showed patchy bilateral, peribronchovascular, ill-defined opacities in all lung zones.

Abnormal Coagulation parameters are associated with poor prognosis in patients with novel coronavirus pneumonia [46]

Background

In the recent outbreak of novel coronavirus infection in Wuhan, China, significantly abnormal coagulation parameters in severe novel coronavirus pneumonia (NCP) cases were a concern.
Objectives
To describe the coagulation feature of patients with NCP.

Methods
Conventional coagulation results and outcomes of consecutive 183 patients with confirmed NCP in Tongji hospital were retrospectively analysed.

Results
The overall mortality was 11.5%, the non-survivors revealed significantly higher D-dimer and fibrin degradation product (FDP) levels, longer prothrombin time and activated partial thromboplastin time compared to survivors on admission (P<0.05). 71.4% of non-survivors and 0.6% survivors met the criteria of disseminated intravascular coagulation during their hospital stay.

Conclusions
The present study shows that abnormal coagulation results, especially markedly elevated D-dimer and FDP are common in deaths with NCP.

Antibodies to Coronaviruses Are Higher in Older Compared with Younger Adults and Binding Antibodies Are More Sensitive than Neutralizing Antibodies in Identifying Coronavirus-Associated Illnesses. [47]

PROBLEM
Human coronaviruses (HCoV) are common causes of respiratory illnesses (RI) despite pre-existing humoral immunity.

METHODS
Sera were obtained near onset of RI and 3 to 4 weeks later as part of a prospective study of 200 subjects evaluated for RI from 2009 to 2013. Antibodies against common HCoV strains were measured by enzyme-linked immunosorbent assay (ELISA) and neutralization assay comparing older adults with cardiopulmonary diseases (99 subjects) to younger, healthy adults (101 subjects). Virus shedding was detected in respiratory secretions by polymerase chain reaction.

RESULTS
Of 43 HCoV-associated illnesses, 15 (35%) occurred in 14 older adults (aged ≥ 60 years) and 28 (65%) in 28 younger adults (aged 21 to 40 years). Binding and neutralizing antibodies were higher in older adults. Only 16 (35.7%) of RI with increases in binding antibodies also had increases in neutralizing antibodies to HCoV. Increases in binding antibodies with RI were more frequent than increased neutralizing antibodies and virus shedding, and more frequent in younger compared to older adults.

CONCLUSIONS
Functional neutralizing antibodies were not stimulated as often as binding antibodies, explaining in part a susceptibility to reinfection with HCoV. Monitoring binding antibodies may be more sensitive for serologic detection of HCoV infections. This article is protected by copyright. All rights reserved.

Clinical characteristics of 140 patients infected by SARS-CoV-2 in Wuhan, China. [48]

BACKGROUND
Coronavirus Disease 2019 (COVID-19) caused by Severe Acute Respiratory Syndrome Coronavirus - 2 (SARS-CoV-2) infection has been widely spread. We aim to investigate the clinical characteristic and allergy status of patients infected by SARS-CoV-2.

METHODS
Electronical medical records including demographics, clinical manifestation, comorbidities, laboratory data and radiological materials of 140 hospitalized COVID-19 patients, with confirmed result of SARS-CoV-2 viral infection were extracted and analysed.

RESULTS
An approximately 1:1 ratio of male (50.7%) and female COVID-19 patients was found, with an overall median age of 57.0 years. All patients were community acquired cases. Fever (91.7%), cough (75.0%), fatigue (75.0%) and gastrointestinal symptoms (39.6%) were the most common clinical manifestations, whereas hypertension (30.0%) and diabetes mellitus (12.1%) were the most common comorbidities. Drug hypersensitivity (11.4%) and urticaria (1.4%) were self-reported by several patients. Asthma or other allergic diseases was not reported by any of the patients. Chronic obstructive pulmonary disease (COPD, 1.4%) and current smokers (1.4%) were rare. Bilateral ground glass or patchy opacity (89.6%) were the most common signs of radiological finding. Lymphopenia (75.4%) and eosinopenia (52.9%) were observed in most patients. Blood eosinophil counts correlate positively with lymphocyte counts in severe (r=0.486, p<0.001) and non-severe (r=0.469, p<0.001) patients after hospital admission. Significantly higher levels of D-dimer, C-reactive protein and procalcitonin were associated with severe patients compared to non-severe patients (all p<0.001).

CONCLUSION
Detailed clinical investigation of 140 hospitalized COVID-19 cases suggest eosinopenia together with lymphopenia may be a potential indicator for diagnosis. Allergic diseases, asthma and COPD are not risk factors for SARS-CoV-2 infection. Elder age, high number of comorbidities and more prominent laboratory abnormalities were associated with severe patients.

Clinical findings in a group of patients infected with the 2019 novel coronavirus (SARS-Cov-2) outside of Wuhan, China: retrospective case series. [49]

OBJECTIVE
To study the clinical characteristics of patients in Zhejiang province, China, infected with the 2019 severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) responsible for coronavirus disease 2019 (covid-2019).

DESIGN
Retrospective case series.

SETTING
Seven hospitals in Zhejiang province, China.

PARTICIPANTS
62 patients admitted to hospital with laboratory confirmed SARS-CoV-2 infection. Data were collected from 10 January 2020 to 26 January 2020.

MAIN OUTCOME MEASURES
Clinical data, collected using a standardised case report form, such as temperature, history of exposure, incubation period. If information was not clear, the working group in Hangzhou contacted the doctor responsible for treating the patient for clarification.

RESULTS
Of the 62 patients studied (median age 41 years), only one was admitted to an intensive care unit, and no patients died during the study. According to research, none of the infected patients in Zhejiang province were ever exposed to the Huanan seafood market, the original source of the virus; all studied cases were infected by human to human transmission. The most common symptoms at onset of illness were fever in 48 (77%) patients, cough in 50 (81%), expectoration in 35 (56%), headache in 21 (34%), myalgia or fatigue in 32 (52%), diarrhoea in 3 (8%), and haemoptysis in 2 (3%). Only two patients (3%) developed shortness of breath on admission. The median time from exposure to onset of illness was 4 days (interquartile range 3-5 days), and from onset of symptoms to first hospital admission was 2 (1-4) days.

CONCLUSION
As of early February 2020, compared with patients initially infected with SARS-Cov-2 in Wuhan, the symptoms of patients in Zhejiang province are relatively mild.

Incubation Period and Other Epidemiological Characteristics of 2019 Novel Coronavirus Infections with Right Truncation: A Statistical Analysis of Publicly Available Case Data [50]

The geographic spread of 2019 novel coronavirus (COVID-19) infections from the epicenter of Wuhan, China, has provided an opportunity to study the natural history of the recently emerged virus. Using publicly available event-date data from the ongoing epidemic, the present study investigated the incubation period and other time intervals that govern the epidemiological dynamics of COVID-19 infections. Our results show that the incubation period falls within the range of 2-14 days with 95% confidence and has a mean of around 5 days when approximated using the best-fit lognormal distribution. The mean time from illness onset to hospital admission (for treatment and/or isolation) was estimated at 3-4 days without truncation and at 5-9 days when right truncated. Based on the 95th percentile estimate of the incubation period, we recommend that the length of quarantine should be at least 14 days. The median time delay of 13 days from illness onset to death (17 days with right truncation) should be considered when estimating the COVID-19 case fatality risk.

Comparison of the clinical characteristics between RNA positive and negative patients clinically diagnosed with 2019 novel coronavirus pneumonia [51]

Objective: To raise awareness about 2019 novel coronavirus pneumonia (NCP) and reduce missed diagnosis rate and misdiagnosis rate by comparing the clinical characteristics between RNA positive and negative patients clinically diagnosed with NCP. Methods: From January 2020 to February 2020, 54 patients who were newly diagnosed with NCP in Wuhan Fourth Hospital were included in this study. RT-PCR method was used to measure the level of 2019-nCov RNA in pharyngeal swab samples of these patients. The patients were divided into RNA positive and negative group, and the differences of clinical, laboratory, and radiological characteristics were compared. Results: There were 31 RNA of 2019-nCov positive cases, and 23 negative cases. Common clinical symptoms of two groups were fever (80.64% vs. 86.96%), chills (61.29% vs.52.17%), cough (80.64% vs.95.65%), fatigue (61.30% vs.56.52%), chest distress (77.42% vs.73.91%). Some other symptoms were headache, myalgia, dyspnea, diarrhea, nausea and vomiting. The laboratory and radiological characteristics of two groups mainly were lymphopenia,
increased erythrocyte sedimentation rate, increased C-reactive protein, increased lactate dehydrogenase, decreased oxygenation index, normal white blood cell count and bilateral chest CT involvement. There was no statistically significant difference in other clinical characteristics except for dyspnea between two groups. Conclusions: RNA positive and negative NCP patients shared similar clinical symptoms, while RNA positive NCP patients tended to have dyspnea. Therefore, we should improve the understanding of NCP to prevent missed diagnosis and misdiagnosis; In addition, more rapid and accurate NCP diagnostic approaches should be further developed.

Epidemiological characteristics of 1212 COVID-19 patients in Henan, China [52]

Based on publicly released data for 1212 patients, we investigated the epidemiological characteristics of COVID-19 in Henan of China. The following findings are obtained:

1) COVID-19 patients in Henan show gender (55% vs 45%) and age (81% aged between 21 and 60) preferences, possible causes were explored;

2) Statistical analysis on 483 patients reveals that the estimated average, mode and median incubation periods are 7.4, 4 and 7 days; Incubation periods of 92% patients were no more than 14 days;

3) The epidemic of COVID-19 in Henan has undergone three stages and showed high correlations with the numbers of patients that recently return from Wuhan;

4) Network analysis on the aggregate outbreak phenomena of COVID-19 revealed that 208 cases were clustering infected, and various people's Hospital are the main force in treating patients.

The related investigations have potential implications for the prevention and control of COVID-19.

Breakthrough: Chloroquine phosphate has shown apparent efficacy in treatment of COVID-19 associated pneumonia in clinical studies [53]

The coronavirus disease 2019 (COVID-19) virus is spreading rapidly, and scientists are endeavoring to discover drugs for its efficacious treatment in China. Chloroquine phosphate, an old drug for treatment of malaria, is shown to have apparent efficacy and acceptable safety against COVID-19 associated pneumonia in multicenter clinical trials conducted in China.

In the early in vitro studies, chloroquine was found to block COVID-19 infection at low-micromolar concentration, with a half-maximal effective concentration (EC50) of 1.13 μM and a half-cytotoxic concentration (CC50) greater than 100 μM (4). A number of subsequent clinical trials have been quickly conducted in China to test the efficacy and safety of chloroquine or hydroxychloroquine in the treatment of COVID-19 associated pneumonia in more than 10 hospitals in Wuhan, Jingzhou, Guangzhou, Beijing, Shanghai, Chongqing, and Ningbo. Thus far, results from more than 100 patients have demonstrated that chloroquine phosphate is superior to the control treatment in inhibiting the exacerbation of pneumonia, improving lung imaging findings, promoting a virus-negative conversion, and shortening the disease course according to the news briefing. Severe adverse reactions to chloroquine phosphate were not noted in the aforementioned patients.
Given these findings, a conference was held on February 15, 2020; participants including experts from government and regulatory authorities and organizers of clinical trials reached an agreement that chloroquine phosphate has potent activity against COVID-19. The drug is recommended for inclusion in the next version of the Guidelines for the Prevention, Diagnosis, and Treatment of Pneumonia Caused by COVID-19 issued by the National Health Commission of the People's Republic of China. Chloroquine is a cheap and safe drug that has been used for more than 70 years. In light of the urgent clinical demand, chloroquine phosphate is recommended to treat COVID-19 associated pneumonia in larger populations in the future.

**Asymptomatic cases in a family cluster with SARS-CoV-2 infection [54]**

In a previously reported family cluster, most infected individuals had clinical symptoms, decreased lymphocyte counts, and abnormal chest CT images, and were positive for the virus on quantitative RT-PCR (qRT-PCR) analysis. However, some of the family members had abnormal chest CT images and positive qRT-PCR results without any clinical symptoms. Here, we report the clinical characteristics of a family cluster of SARS-CoV-2 infection. In this family of three, one 35-year-old man (patient 1) had clinical symptoms, a decreased lymphocyte count, abnormal chest CT images, and a positive result on qRT-PCR. By contrast, the other two family members—a 33-year-old woman (patient 2) and a 3-year-old boy (patient 3)—were both asymptomatic, with normal lymphocyte counts and chest CT images but positive qRT-PCR results.

On Jan 22, 2020, patient 1 travelled from Wuhan (Hubei, China) to Guangzhou (Guangdong, China) with his wife (patient 2) and son (patient 3) by high-speed rail. On Jan 26, patient 1 developed a fever of 37.5°C, which lasted for 1 day. The next day, the patient presented to the Third Affiliated Hospital of Guangzhou Medical University with a body temperature of 37.4°C, and on the same day developed a sore throat, arthralgia, and myalgia, without chills or headache. Patient 1 was observed from Jan 27 to Jan 29, during
which time his body temperature normalised. Chest CT scans taken 2 days after symptom onset showed bilateral multiple lobular and subsegmental areas of ground-glass opacities and consolidation. Two sets of nasopharyngeal swab samples from patient 1 tested positive for SARS-CoV-2 on qRT-PCR. Patients 2 and 3 had no signs or clinical symptoms during the same observation period (Jan 27–29), with no decreases in white blood cell or lymphocyte counts. Chest CT images taken from these two patients on Jan 28 did not show significant abnormalities. However, two sets of nasopharyngeal swab samples, taken at the same time as those from patient 1, tested positive for SARS-CoV-2 on qRT-PCR. All three family members were diagnosed with SARS-CoV-2 infection and were thus transferred to the Infectious Diseases Unit of the Eighth People’s Hospital of Guangzhou for isolation and treatment. In this family cluster, although all individuals tested positive for SARS-CoV-2 infection on qRT-PCR, only patient 1 showed clinical symptoms, decreased lymphocyte count, and abnormal chest CT images. However, any of the three individuals could have been the first one to become infected and thus transmitted the virus to the other two family members. Importantly, asymptomatic patients (such as patients 2 and 3) might be unaware of their disease and therefore not isolate themselves or seek treatment, or they might be overlooked by healthcare professionals and thus unknowingly transmit the virus to others.

To prevent and control this highly infectious disease as early as possible, people with family members with SARS-CoV-2 infection should be closely monitored and examined to rule out infection, even if they do not have any symptoms. In the case of this family, since the time between presentation and identification of SARS-CoV-2 infection was short, more studies are needed to observe the symptoms and test results of infected individuals in greater detail.

**Radiological findings from 81 patients with COVID-19 pneumonia in Wuhan, China: a descriptive study [55]**

**Background:** A cluster of patients with coronavirus disease 2019 (COVID-19) pneumonia caused by infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) were successively reported in Wuhan, China. We aimed to describe the CT findings across different timepoints throughout the disease course.

**Methods:** Patients with COVID-19 pneumonia (confirmed by next-generation sequencing or RT-PCR) who were admitted to one of two hospitals in Wuhan and who underwent serial chest CT scans were retrospectively enrolled. Patients were grouped on the basis of the interval between symptom onset and the first CT scan: group 1 (subclinical patients; scans done before symptom onset), group 2 (scans done ≤1 week after symptom onset), group 3 (>1 week to 2 weeks), and group 4 (>2 weeks to 3 weeks). Imaging features and their distribution were analysed and compared across the four groups.

**Findings:** 81 patients admitted to hospital between Dec 20, 2019, and Jan 23, 2020, were retrospectively enrolled. The cohort included 42 (52%) men and 39 (48%) women, and the mean age was 49·5 years (SD 11·0). The mean number of involved lung segments was 10·5 (SD 6·4) overall, 2·8 (3·3) in group 1, 11·1 (5·4) in group 2, 13·0 (5·7) in group 3, and 12·1 (5·9) in group 4. The predominant pattern of abnormality observed was bilateral (64 [79%] patients), peripheral (44 [54%]), ill-defined (66 [81%]), and ground-glass opacification (53 [65%]), mainly involving the right lower lobes (225 [27%] of 849 affected segments). In group 1 (n=15), the predominant pattern was unilateral (nine [60%]) and multifocal (eight [53%]) ground-glass opacities (14 [93%]). Lesions quickly evolved to bilateral (19 [90%]), diffuse (11 [52%]) ground-glass...
opacity predominance (17 [81%]) in group 2 (n=21). Thereafter, the prevalence of ground-glass opacities continued to decrease (17 [57%] of 30 patients in group 3, and five [33%] of 15 in group 4), and consolidation and mixed patterns became more frequent (12 [40%] in group 3, eight [53%] in group 4).

**Interpretation:** COVID-19 pneumonia manifests with chest CT imaging abnormalities, even in asymptomatic patients, with rapid evolution from focal unilateral to diffuse bilateral ground-glass opacities that progressed to or co-existed with consolidations within 1–3 weeks. Combining assessment of imaging features with clinical and laboratory findings could facilitate early diagnosis of COVID-19 pneumonia.

**Clinical characteristics of 51 patients discharged from hospital with COVID-19 in Chongqing, China [56]**

**Background:** Since December 2019, Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infected disease (Coronavirus Disease 2019, COVID-19) emerged in Wuhan, China, and rapidly spread throughout China, even throughout the world. We try to describe the epidemiological and clinical characteristics of COVID-19 in non-Wuhan area, and explore its effective treatment.

**Methods:** Retrospective, single-center case series of the 51 hospitalized patients with confirmed COVID-19 at Chongqing University Three Gorges Hospital in Chongqing, China, from January 20 to February 3, 2020; The discharge time was from January 29 to February 11, 2020. The main results and indicators of epidemiology, demography, clinical manifestation, laboratory examination, imaging data and treatment data of 51 patients with covid-19 were collected and analyzed. The changes of blood routine and biochemical indexes at discharge and admission were compared. Compare the clinical characteristics of severe patients (including severe and critical patients) and non-severe patients (general patients).

**Results:** Of 51 hospitalized patients with COVID-19, the median age was 45 years (interquartile range, 34-51; range, 16-68 years) and 32 (62.7%) were men.43 (84.3%) patients had been to Wuhan or Other Hubei areas outside Wuhan, and 4 (7.7%) patients had a clear contact history of COVID-19 patients before the onset of the disease, and 4 (7.7%) patients had no clear epidemiological history of COVID-19. Common symptoms included fever (43 [84.3%]), cough (38 [74.5%]) and fatigue (22 [43.1%]). Lymphopenia was observed in 26 patients (51.0%), and elevated C-reactive protein level in 32 patients (62.7%). Ground-glass opacity was the typical radiological finding on chest computed tomography (41 [80.4%]), Local consolidation of pneumonia in some patients(17 [33.3%]). Most of the patients were treated with traditional Chinese medicine decoction (28 [54.9%]), all of them received aerosol inhalation of recombinant human interferon a-1b for injection and oral antiviral therapy with Lopinavir and Ritonavir tablets (51 [100%]); Most of the patients were given Bacillus licheniformis capsules regulated intestinal flora treatment (44 [86.3%]). 10 patients (19.6%) received short-term (3-5 days) glucocorticoid treatment. Compared with non-severe patients (n = 44), severe patients (n = 7) were older (median age, 52 years vs 44 years), had a higher proportion of diabetes mellitus (4 [57.1%] vs 0 [0.0%]), most of them needed antibiotic treatment (7 [100%] vs 4 [9.1%], most of them needed nutritional diet (6 [85.7%] vs 0 [0.0%], and were more likely to have dyspnea (6 [85.7%] vs 5 [11.4%]), most of them needed noninvasive mechanical ventilation (6 [85.7%] vs 0 [0.0%]). Except one patient died, the remaining 50 patients were discharged according to the discharge standard, the common clinical symptoms disappeared basically, the
lymphocyte increased significantly (P=0.008), CRP decreased significantly (P <0.001). The median length of stay was 12 days (IQR, 9-13).

**Conclusion:** In 51 single center cases confirmed as COVID-19 and discharged from the hospital, 13.7% of the patients were severe. The main clinical symptoms of patients with COVID-19 were fever, cough and asthenia. Some patients had obvious dyspnea. They had clinical laboratory and radiologic characteristics. There is no specific drug treatment for the disease. For the treatment of COVID-19, in addition to oxygen inhalation and antiviral treatment, attention should be paid to the dialectical treatment of traditional Chinese medicine, regulation of intestinal flora, nutritional support treatment and other comprehensive treatment.

**Radiological findings from 81 patients with COVID-19 pneumonia in Wuhan, China: a descriptive study [57]**

**Background**
A cluster of patients with coronavirus disease 2019 (COVID-19) pneumonia caused by infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) were successively reported in Wuhan, China. We aimed to describe the CT findings across different timepoints throughout the disease course.

**Methods**
Patients with COVID-19 pneumonia (confirmed by next-generation sequencing or RT-PCR) who were admitted to one of two hospitals in Wuhan and who underwent serial chest CT scans were retrospectively enrolled. Patients were grouped on the basis of the interval between symptom onset and the first CT scan: group 1 (subclinical patients; scans done before symptom onset), group 2 (scans done ≤1 week after symptom onset), group 3 (>1 week to 2 weeks), and group 4 (>2 weeks to 3 weeks). Imaging features and their distribution were analysed and compared across the four groups.

**Findings**
81 patients admitted to hospital between Dec 20, 2019, and Jan 23, 2020, were retrospectively enrolled. The cohort included 42 (52%) men and 39 (48%) women, and the mean age was 49·5 years (SD 11·0). The mean number of involved lung segments was 10·5 (SD 6·4) overall, 2·8 (3·3) in group 1, 11·1 (5·4) in group 2, 13·0 (5·7) in group 3, and 12·1 (5·9) in group 4. The predominant pattern of abnormality observed was bilateral (64 [79%] patients), peripheral (44 [54%]), ill-defined (66 [81%]), and ground-glass opacification (53 [65%]), mainly involving the right lower lobes (225 [27%] of 849 affected segments). In group 1 (n=15), the predominant pattern was unilateral (nine [60%]) and multifocal (eight [53%]) ground-glass opacities (14 [93%]). Lesions quickly evolved to bilateral (19 [90%]), diffuse (11 [52%]) ground-glass opacity predominance (17 [81%]) in group 2 (n=21). Thereafter, the prevalence of ground-glass opacities continued to decrease (17 [57%] of 30 patients in group 3, and five [33%] of 15 in group 4), and consolidation and mixed patterns became more frequent (12 [40%] in group 3, eight [53%] in group 4).

**Interpretation**
COVID-19 pneumonia manifests with chest CT imaging abnormalities, even in asymptomatic patients, with rapid evolution from focal unilateral to diffuse bilateral ground-glass opacities that progressed to or co-existed with consolidations within 1–3 weeks. Combining assessment of imaging features with clinical and laboratory findings could facilitate early diagnosis of COVID-19 pneumonia.

**Feasibility of controlling COVID-19 outbreaks by isolation of cases and contacts [58]**
Background
Isolation of cases and contact tracing is used to control outbreaks of infectious diseases, and has been used for coronavirus disease 2019 (COVID-19). Whether this strategy will achieve control depends on characteristics of both the pathogen and the response. Here we use a mathematical model to assess if isolation and contact tracing are able to control onwards transmission from imported cases of COVID-19.

Methods
We developed a stochastic transmission model, parameterised to the COVID-19 outbreak. We used the model to quantify the potential effectiveness of contact tracing and isolation of cases at controlling a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)-like pathogen. We considered scenarios that varied in the number of initial cases, the basic reproduction number (R0), the delay from symptom onset to isolation, the probability that contacts were traced, the proportion of transmission that occurred before symptom onset, and the proportion of subclinical infections. We assumed isolation prevented all further transmission in the model. Outbreaks were deemed controlled if transmission ended within 12 weeks or before 5000 cases in total. We measured the success of controlling outbreaks using isolation and contact tracing, and quantified the weekly maximum number of cases traced to measure feasibility of public health effort.

Findings
Simulated outbreaks starting with five initial cases, an R0 of 1.5, and 0% transmission before symptom onset could be controlled even with low contact tracing probability; however, the probability of controlling an outbreak decreased with the number of initial cases, when R0 was 2.5 or 3.5 and with more transmission before symptom onset. Across different initial numbers of cases, the majority of scenarios with an R0 of 1.5 were controllable with less than 50% of contacts successfully traced. To control the majority of outbreaks, for R0 of 2.5 more than 70% of contacts had to be traced, and for an R0 of 3.5 more than 90% of contacts had to be traced. The delay between symptom onset and isolation had the largest role in determining whether an outbreak was controllable when R0 was 1.5. For R0 values of 2.5 or 3.5, if there were 40 initial cases, contact tracing and isolation were only potentially feasible when less than 1% of transmission occurred before symptom onset.

Interpretation
In most scenarios, highly effective contact tracing and case isolation is enough to control a new outbreak of COVID-19 within 3 months. The probability of control decreases with long delays from symptom onset to isolation, fewer cases ascertained by contact tracing, and increasing transmission before symptoms. This model can be modified to reflect updated transmission characteristics and more specific definitions of outbreak control to assess the potential success of local response efforts.


Background
Chest CT is used for diagnosis of 2019 novel coronavirus disease (COVID-19), as an important complement to the reverse-transcription polymerase chain reaction (RT-PCR) tests.

Purpose
To investigate the diagnostic value and consistency of chest CT as compared with comparison to RT-PCR assay in COVID-19.

Methods
From January 6 to February 6, 2020, 1014 patients in Wuhan, China who underwent both chest CT and RT-PCR tests were included. With RT-PCR as reference standard, the performance of chest CT in diagnosing COVID-19 was assessed. Besides, for patients with multiple RT-PCR assays, the dynamic conversion of RT-PCR results (negative to positive, positive to negative, respectively) was analyzed as compared with serial chest CT scans for those with time-interval of 4 days or more.

**Results**

Of 1014 patients, 59% (601/1014) had positive RT-PCR results, and 88% (888/1014) had positive chest CT scans. The sensitivity of chest CT in suggesting COVID-19 was 97% (95% CI, 95-98%, 580/601 patients) based on positive RT-PCR results. In patients with negative RT-PCR results, 75% (308/413) had positive chest CT findings; of 308, 48% were considered as highly likely cases, with 33% as probable cases. By analysis of serial RT-PCR assays and CT scans, the mean interval time between the initial negative to positive RT-PCR results was 5.1 ± 1.5 days; the initial positive to subsequent negative RT-PCR result was 6.9 ± 2.3 days. 60% to 93% of cases had initial positive CT consistent with COVID-19 prior (or parallel) to the initial positive RT-PCR results. 42% (24/57) cases showed improvement in follow-up chest CT scans before the RT-PCR results turning negative.

**Conclusion**

Chest CT has a high sensitivity for diagnosis of COVID-19. Chest CT may be considered as a primary tool for the current COVID-19 detection in epidemic areas.

**Transmission characteristics of the COVID-19 outbreak in China: a study driven by data [60]**

The COVID-19 outbreak has been a serious public health threat worldwide. We use individually documented case descriptions of COVID-19 from China (excluding Hubei Province) to estimate the distributions of the generation time, incubation period, and periods from symptom onset to isolation and to diagnosis.  
The recommended 14-day quarantine period may lead to a 6.7% failure for quarantine. We recommend a 22-day quarantine period. The mean generation time is 3.3 days and the mean incubation period is 7.2 days. It took 3.7 days to isolate and 6.6 days to diagnose a patient after his/her symptom onset. Patients may become infectious on average 3.9 days before showing major symptoms. This makes contact tracing and quarantine ineffective.  
The basic reproduction number is estimated to be 1.54 with contact tracing, quarantine and isolation, mostly driven by super spreaders.

**Imaging and clinical features of patients with 2019 novel coronavirus SARS-CoV-2 [61]**

**Background**

The pneumonia caused by the 2019 novel coronavirus (SARS-CoV-2, also called 2019-nCoV) recently break out in Wuhan, China, and was named as COVID-19. With the spread of the disease, similar cases have also been confirmed in other regions of China. We aimed to report the imaging and clinical characteristics of these patients infected with SARS-CoV-2 in Guangzhou, China.

**Methods**

All patients with laboratory-identified SARS-CoV-2 infection by real-time polymerase chain reaction (PCR) were collected between January 23, 2020, and February 4, 2020, in a designated hospital (Guangzhou Eighth People’s Hospital). This analysis included 90 patients (39 men and 51 women; median age, 50 years (age range, 18–86 years). All the included SARS-CoV-2-infected patients underwent non-contrast enhanced chest computed tomography (CT). We analyzed the clinical characteristics of the patients, as
well as the distribution characteristics, pattern, morphology, and accompanying manifestations of lung lesions. In addition, after 1–6 days (mean 3.5 days), follow-up chest CT images were evaluated to assess radiological evolution.

Findings
The majority of infected patients had a history of exposure in Wuhan or to infected patients and mostly presented with fever and cough. More than half of the patients presented bilateral, multifocal lung lesions, with peripheral distribution, and 53 (59%) patients had more than two lobes involved. Of all included patients, COVID-19 pneumonia presented with ground glass opacities in 65 (72%), consolidation in 12 (13%), crazy paving pattern in 11 (12%), interlobular thickening in 33 (37%), adjacent pleura thickening in 50 (56%), and linear opacities combined in 55 (61%). Pleural effusion, pericardial effusion, and lymphadenopathy were uncommon findings. In addition, baseline chest CT did not show any abnormalities in 21 patients (23%), but 3 patients presented bilateral ground glass opacities on the second CT after 3–4 days.

Conclusion
SARS-CoV-2 infection can be confirmed based on the patient’s history, clinical manifestations, imaging characteristics, and laboratory tests. Chest CT examination plays an important role in the initial diagnosis of the novel coronavirus pneumonia. Multiple patchy ground glass opacities in bilateral multiple lobular with periphery distribution are typical chest CT imaging features of the COVID-19 pneumonia.

Nepal's First Case of COVID-19 and public health response [62]

Background
As of February 20, 2020, there have been 75,748 confirmed cases of the coronavirus disease 2019 (COVID-19), caused by the novel coronavirus (2019-nCov) with 2,129 deaths. On January 30, World Health Organization (WHO) declared the current outbreak that originated in Wuhan, China as a Public Health Emergency of International Concern, while recommending against travel or trade disruptions to and from China. In Nepal, as of February 20, only one positive case has been identified among 212 tested.

Findings
One confirmed case in Nepal was a Nepalese student, studying in Wuhan, with symptom-onset on January 3. The infected 32-year-old male had returned on January 9 to spend winter holidays in Nepal. He had prior knowledge about the outbreak in China and visited the Sukraraj Tropical and Infectious Disease Hospital (STIDH) in Kathmandu on January 13. Taking into account his travel history, he was isolated and was given supportive treatment with broad-spectrum antibiotics. The throat swab sample of the person was sent to the WHO Collaborating Center, Hong Kong and was tested positive. There weren’t any complications, except for a surge in temperature to 102°F on January 14, which then subsided on January 16. Upon clinical improvement, he was discharged on January 17, with a total 4 days in isolation. On January 25, the test results came back confirming COVID-19, although the man had been discharged. He was requested to remain under self-quarantine. Negative results for COVID-19 were given by consecutive follow-up tests on January 29 and 31.

Conclusion
Considering the possibility of travel of infected cases, high vigilance coupled with a strong response plan is required to address the current risk of COVID-19. In this regard, a directive from the Government of Nepal is vital for educating the public to respond to the outbreak through necessary precautions and inform travelers about possible risk. Likewise, it is necessary to identify and contain suspected cases from the site of origin for which the capacity of the primary health system needs to be strengthened. COVID-19 and past outbreak scenarios should be a learning experience for Nepal not only on emergency
management but also towards developing a strong surveillance system and taking preventive actions for similar events in the future.

**Clinical characteristics of 36 non-survivors with COVID-19 in Wuhan, China [63]**

**Abstract**

Background Although the outbreak of Coronavirus disease 2019 (COVID-19) has caused over 2200 deaths in China, there was no study about death yet. We aimed to describe the clinical characteristics of non-survivors with COVID-19. Methods For this retrospective, single-center study, we included 36 non-survivors with COVID-19 in the Fifth Hospital of Wuhan. Cases were confirmed by real-time RT-PCR between Jan 21 and Feb 10, 2020 according to the recommended protocol. The epidemiological, demographic, clinical, laboratory, radiological and treatment data were collected and analyzed. Outcomes were followed up until Feb 14, 2020. This study was approved by the ethics commissions of the Fifth Hospital of Wuhan, with a waiver of informed consent due to a public health outbreak investigation. Results We included 36 patients who died from COVID-19. The mean age of the patients was 69.22 years (SD 9.64, range 50-90). 25(69.44%) patients were males, and 11 (30.56%) female. 26 (72.22%) patients had chronic diseases, mainly including hypertension, cardiovascular disease and diabetes. Patients had common clinical symptoms of fever (34 [94.44%] patients), cough (28 [77.78%] patients), shortness of breath (21 [58.33%] patients), and fatigue (17 [47.22%] patient). Chest computed tomographic scans showed that 31 (96.88%) patients had bilateral pneumonia. Lymphopenia occurred in 24 patients (70.59%), decreased albumin (30.18, [SD, 4.76]) in 25 patients (80.65%), elevated D-dimer (8.64 [IQR, 2.39-20]) in 27 patients (100%), and elevated lactate dehydrogenase (502.5 U/L [IQR, 410-629]) in 26 patients (100%). Nearly all of the patients have elevated CRP (106.3 mg/L [IQR, 60.83-225.3]), PCT (0.61 ng/ml [IQR, 0.16-2.10]) and IL-6 (100.6 pg/ml [IQR, 51.51-919.5]). Most patients received antiviral therapy and antibiotic therapy, and more than half of patients received glucocorticoid therapy (25 [69.44%]). All the patients had acute respiratory distress syndrome (ARDS). The median time from onset to ARDS was 11 days. One (2.78%) patient presented with acute renal injury. The median time from onset to death was 17 days. Discussion Lots of patients died from COVID-19 till now. The median survival time of these non-survivors from onset to death was about 2 weeks. Most patients were older males with comorbidities. They finally progressed to ARDS. The median time from onset to ARDS was 11 days. Gradually decreased lymphocytes and increased inflammation biomarkers were common, and need to be monitored in the routine treatment.

**Chest Radiographic and CT Findings of the 2019 Novel Coronavirus Disease (COVID-19): Analysis of Nine Patients Treated in Korea [64]**

Objective: This study presents a preliminary report on the chest radiographic and computed tomography (CT) findings of the 2019 novel coronavirus disease (COVID-19) pneumonia in Korea. Materials and Methods: As part of a multi-institutional collaboration coordinated by the Korean Society of Thoracic Radiology, we collected nine patients with COVID-19 infections who had undergone chest radiography and CT scans. We analyzed the radiographic and CT findings of COVID-19 pneumonia at baseline. Fisher’s exact test was used to compare CT findings depending on the shape of pulmonary lesions. Results: Three of the nine patients (33.3%) had parenchymal abnormalities detected by chest radiography, and most of the abnormalities were peripheral consolidations. Chest CT images showed bilateral involvement in eight of the nine patients, and a unilobar reversed halo sign in the other patient. In total, 77 pulmonary lesions were found, including patchy lesions (39%), large confluent lesions (13%), and small nodular lesions (48%). The peripheral and posterior lung fields were involved in 78% and 67% of the lesions, respectively. The lesions were typically ill-defined and were composed of mixed ground-glass opacities and consolidation or pure ground-glass opacities. Patchy to confluent lesions were
primarily distributed in the lower lobes ($p = 0.040$) and along the pleura ($p < 0.001$), whereas nodular lesions were primarily distributed along the bronchovascular bundles ($p = 0.006$).

Conclusion: COVID-19 pneumonia in Korea primarily manifested as pure to mixed ground-glass opacities with a patchy to confluent or nodular shape in the bilateral peripheral posterior lungs. A considerable proportion of patients with COVID-19 pneumonia had normal chest radiographs.

**Time Course of Lung Changes On Chest CT During Recovery From 2019 Novel Coronavirus (COVID-19)**

**Pneumonia [65]**

**Background:** Chest CT is used to assess the severity of lung involvement in COVID-19 pneumonia.

**Purpose:** To determine the change in chest CT findings associated with COVID-19 pneumonia from initial diagnosis until patient recovery.

**Materials and Methods:** This retrospective review included patients with RT-PCR confirmed COVID-19 infection presenting between 12 January 2020 to 6 February 2020. Patients with severe respiratory distress and/ or oxygen requirement at any time during the disease course were excluded. Repeat Chest CT was obtained at approximately 4 day intervals. The total CT score was the sum of lung involvement (5 lobes, score 1-5 for each lobe, range, 0 none, 25 maximum) was determined.

**Results:** Twenty one patients (6 males and 15 females, age 25-63 years) with confirmed COVID-19 pneumonia were evaluated. These patients underwent a total of 82 pulmonary CT scans with a mean interval of 4±1 days (range: 1-8 days). All patients were discharged after a mean hospitalized period of 17±4 days (range: 11-26 days). Maximum lung involved peaked at approximately 10 days (with the calculated total CT score of 6) from the onset of initial symptoms ($R^2=0.25$), $p<0.001$). Based on quartiles of patients from day 0 to day 26 involvement, 4 stages of lung CT were defined: (1)Stage 1 (0-4 days): ground glass opacities (GGO) in 18/24 (75%) patients with the total CT score of 2±2; (2)Stage-2 (5-8d days): increased crazy-paving pattern 9/17 patients (53%) with a increase in total CT score (6±4, $p=0.002$); (3) Stage-3 (9-13days): consolidation 19/21 (91%) patients with the peak of total CT score (7±4); (4) Stage-4 (≥14 days): gradual resolution of consolidation 15/20 (75%) patients with a decreased total CT score (6±4) without crazy-paving pattern.

**Conclusion:** In patients recovering from COVID-19 pneumonia (without severe respiratory distress during the disease course), lung abnormalities on chest CT showed greatest severity approximately 10 days after initial onset of symptoms.

**Clinical Characteristics And Risk Factors For Fatal Outcome in Patients With 2019-Coronavirus Infected Disease (COVID-19) in Wuhan, China [66]**

**Background:** Increasing numbers of confirmed cases and deaths due to 2019-coronavirus infected disease (COVID-19) have occurred in Wuhan, China since December 2019. However, there is currently no effective antiviral treatment. Information is scarce on clinical characteristics of COVID-19 or risk factors associated with death.

**Methods:** From January 1 to February 15, data was retrospectively collected from cured discharged cases and death cases with COVID-19 with complete data at the Seventh Hospital of Wuhan City.Confirmation of COVID-19 enrolled in this study were diagnosed according to the interim guidance of the World Health Organization. Clinical characteristics, laboratory findings on admission and the complications and
treatment during Hospitalization were compared between discharged cases and death cases. Risk factors were evaluated for predicting death.

Findings: Compared with the discharged patients, those who died (death group) had a higher percentage of men, were older, and had higher rates of hypertension, coronary heart disease and cardiomyopathy (P = 0.006, <0.001, 0.04, 0.007, 0.019 respectively). The death group also had significantly higher rates of fever and dyspnea. The median duration from symptom onset to discharge or death were 22.1 (IQR 17–28) and 17.7 (IQR, 13–23) days respectively. On admission, patients who later died showed higher WBC, lower lymphocyte, and lower platelet counts (P < 0.001, =0.015, <0.001). The death group had higher D-dimer, high-sensitivity C-reactive protein (hsCRP), procalcitonin, troponin T (TnT), and N-terminal pro-brain natriuretic peptide (NT-proBNP), and lower PaO2/FiO2, and significantly higher levels of creatinine and aspartate aminotransferase, and lower albumin (P < 0.001, all). The logistic regression analysis indicated that TnT, D-dimer, PaO2/FiO2, and hsCRP independently predicted mortality. During hospitalization, The median durations from admission to the use of mechanical ventilation and death were only 4.6 (IQR 1-5) and 9.2 (IQR 4-14) days, respectively. The death group were more commonly to have complications of Acute Respiratory Distress Syndrome (ARDS), acute cardiac injury, acute coagulopathy, acute kidney injury and shock compared with the discharged group (P<0.001, all). The death group utilized a significantly higher percentage of hormone therapy, respiratory support compared with the discharged group, the utilization of angiotensin-Converting Enzyme Inhibitors and angiotensin Receptor Blockers exhibited no statistical difference in the two groups.

Interpretation: The identified independent risk factors (elevated TnT, CRP, and D-dimer, and declined PaO2/FiO2) suggest that fatality due to COVID-19 was associated with multiple organ dysfunction. The independent risk factors found in this research can help identify the high-risk patients of COVID-19 with poor prognosis in order to offer early warning and intervention, and also help funnel the flow of patient with COVID-19.

The Clinical and Chest CT Features Associated with Severe and Critical COVID-19 Pneumonia [67]

Objective
To investigate the clinical and CT features associated with severe and critical Corona Virus Disease 2019 (COVID-19) pneumonia.

Materials and Methods
Eighty-three patients with COVID-19 pneumonia including 25 severe/critical cases and 58 ordinary cases were enrolled. The chest CT images and clinical data of them were reviewed and compared. The risk factors associated with disease severity were analyzed.

Results
Compared with the ordinary patients, the severe/critical patients had older ages, higher incidence of comorbidities, cough, expectoration, chest pain and dyspnea. The incidences of consolidation, linear opacities, crazy-paving pattern and bronchial wall thickening in severe/critical patients were significantly higher than those of the ordinary patients. Besides, severe/critical patients showed higher incidences of lymph node enlargement, pericardial effusion and pleural effusion than the ordinary patients. The CT scores of severe/critical patients were significantly higher than those of the ordinary patients (P < 0.001). Receiver operating characteristic (ROC) curve showed that the sensitivity and specificity of CT Score were 80.0% and 82.8% respectively for the discrimination of the two types. The clinical factors of age > 50 years old, comorbidities, dyspnea, chest pain, cough, expectoration, decreased lymphocytes and increased inflammation indicators were risk factors for severe/critical COVID-19 pneumonia. CT findings of
consolidation, linear opacities, crazy-paving pattern, bronchial wall thickening, high CT scores and extrapulmonary lesions were features of severe/critical COVID-19 pneumonia.

Conclusions
There are significant differences in clinical symptoms, laboratory examinations and CT manifestations between the ordinary patients and the severe/critical patients. Many factors are related to the severity of the disease, which can help clinicians to judge the severity of the patient and evaluate the prognosis.

Clinical and CT features in paediatric patients with COVID-19 infection: Different points from adults [68]

Purpose
To discuss the different characteristics of clinical, laboratory, and chest computed tomography (CT) in pediatric patients from adults with 2019 novel coronavirus (COVID-19) infection.

Methods
The clinical, laboratory, and chest CT features of 20 pediatric inpatients with COVID-19 infection confirmed by pharyngeal swab COVID-19 nucleic acid test were retrospectively analyzed during 23 January and 8 February 2020. The clinical and laboratory information was obtained from inpatient records. All the patients were undergone chest CT in our hospital.

Results
Thirteen pediatric patients (13/20, 65%) had an identified history of close contact with COVID-19 diagnosed family members. Fever (12/20, 60%) and cough (13/20, 65%) were the most common symptoms. For laboratory findings, procalcitonin elevation (16/20, 80%) should be pay attention to, which is not common in adults. Coinfection (8/20, 40%) is common in pediatric patients. A total of 6 patients presented with unilateral pulmonary lesions (6/20, 30%), 10 with bilateral pulmonary lesions (10/20, 50%), and 4 cases showed no abnormality on chest CT (4/20, 20%). Consolidation with surrounding halo sign was observed in 10 patients (10/20, 50%), ground-glass opacities were observed in 12 patients (12/20, 60%), fine mesh shadow was observed in 4 patients (4/20, 20%), and tiny nodules were observed in 3 patients (3/20, 15%).

Conclusion
Procalcitonin elevation and consolidation with surrounding halo signs were common in pediatric patients which were different from adults. It is suggested that underlying coinfection may be more common in pediatrics, and the consolidation with surrounding halo sign which is considered as a typical sign in pediatric patients.

Clinical Characteristics of 24 Asymptomatic Infections With COVID-19 Screened Among Close Contacts in Nanjing, China [69]

Previous studies have showed clinical characteristics of patients with the 2019 novel coronavirus disease (COVID-19) and the evidence of person-to-person transmission. Limited data are available for asymptomatic infections. This study aims to present the clinical characteristics of 24 cases with asymptomatic infection screened from close contacts and to show the transmission potential of asymptomatic COVID-19 virus carriers. Epidemiological investigations were conducted among all close contacts of COVID-19 patients (or suspected patients) in Nanjing, Jiangsu Province, China, from Jan 28 to Feb 9, 2020, both in clinic and in community. Asymptomatic carriers were laboratory-confirmed positive for the COVID-19 virus by testing the nucleic acid of the pharyngeal swab samples. Their clinical records, laboratory assessments, and chest CT scans were reviewed. As a result, none of the 24 asymptomatic cases presented any obvious symptoms while nucleic acid screening. Five cases (20.8%) developed symptoms (fever, cough, fatigue, etc.) during hospitalization. Twelve (50.0%) cases showed typical CT images of ground-glass chest and 5 (20.8%) presented stripe shadowing in the lungs. The remaining 7
(29.2%) cases showed normal CT image and had no symptoms during hospitalization. These 7 cases were younger (median age: 14.0 years; \( P=0.012 \)) than the rest. None of the 24 cases developed severe COVID-19 pneumonia or died. The median communicable period, defined as the interval from the first day of positive nucleic acid tests to the first day of continuous negative tests, was 9.5 days (up to 21 days among the 24 asymptomatic cases). Through epidemiological investigation, we observed a typical asymptomatic transmission to the cohabiting family members, which even caused severe COVID-19 pneumonia. Overall, the asymptomatic carriers identified from close contacts were prone to be mildly ill during hospitalization. However, the communicable period could be up to three weeks and the communicated patients could develop severe illness. These results highlighted the importance of close contact tracing and longitudinally surveillance via virus nucleic acid tests. Further isolation recommendation and continuous nucleic acid tests may also be recommended to the patients discharged.

**Clinical analysis of 10 neonates born to mothers with 2019-nCoV pneumonia [70]**

**Background**
The newly identified 2019-nCoV, which appears to have originated in Wuhan, the capital city of Hubei province in central China, is spreading rapidly nationwide. A number of cases of neonates born to mothers with 2019-nCoV pneumonia have been recorded. However, the clinical features of these cases have not been reported, and there is no sufficient evidence for the proper prevention and control of 2019-nCoV infections in neonates.

**Methods**
The clinical features and outcomes of 10 neonates (including 2 twins) born to 9 mothers with confirmed 2019-nCoV infection in 5 hospitals from January 20 to February 5, 2020 were retrospectively analyzed.

**Results**
Among these 9 pregnant women with confirmed 2019-nCoV infection, onset of clinical symptoms occurred before delivery in 4 cases, on the day of delivery in 2 cases, and after delivery in 3 cases. In most cases, fever and a cough were the first symptoms experienced, and 1 patient also had diarrhea. Of the newborns born to these mothers, 8 were male and 2 were female; 4 were full-term infants and 6 were born premature; 2 were small-for-gestational-age (SGA) infants and 1 was a large-for-gestational-age (LGA) infant; there were 8 singletons and 2 twins. Of the neonates, 6 had a Pediatric Critical Illness Score (PCIS) score of less than 90. Clinically, the first symptom in the neonates was shortness of breath (\( n=6 \)), but other initial symptoms such as fever (\( n=2 \)), thrombocytopenia accompanied by abnormal liver function (\( n=2 \)), rapid heart rate (\( n=1 \)), vomiting (\( n=1 \)), and pneumothorax (\( n=1 \)) were observed. Up to now, 5 neonates have been cured and discharged, 1 has died, and 4 neonates remain in hospital in a stable condition. Pharyngeal swab specimens were collected from 9 of the 10 neonates 1 to 9 days after birth for nucleic acid amplification tests for 2019-nCoV, all of which showed negative results.

**Conclusions**
Perinatal 2019-nCoV infection may have adverse effects on newborns, causing problems such as fetal distress, premature labor, respiratory distress, thrombocytopenia accompanied by abnormal liver function, and even death. However, vertical transmission of 2019-nCoV is yet to be confirmed.

**Chest CT Findings in Coronavirus Disease-19 (COVID-19): Relationship to Duration of Infection [71]**

In this retrospective study, chest CTs of 121 symptomatic patients infected with coronavirus disease-19 (COVID-19) from four centers in China from January 18, 2020 to February 2, 2020 were reviewed for common CT findings in relationship to the time between symptom onset and the initial CT scan (i.e. early, 0-2 days (36 patients), intermediate 3-5 days (33 patients), late 6-12 days (25 patients)). The hallmarks of
COVID-19 infection on imaging were bilateral and peripheral ground-glass and consolidative pulmonary opacities. Notably, 20/36 (56%) of early patients had a normal CT. With a longer time after the onset of symptoms, CT findings were more frequent, including consolidation, bilateral and peripheral disease, greater total lung involvement, linear opacities, “crazy-paving” pattern and the “reverse halo” sign. Bilateral lung involvement was observed in 10/36 early patients (28%), 25/33 intermediate patients (76%), and 22/25 late patients (88%).

**Chest computed tomography in children with COVID-19 respiratory infection [72]**

**Background**
Infection with COVID-19 is currently rare in children.

**Objective**
To describe chest CT findings in children with COVID-19.

**Materials and methods**
We studied children at a large tertiary-care hospital in China, during the period from 28 January 2019 to 8 February 2020, who had positive reverse transcriptase polymerase chain reaction (RT-PCR) for COVID-19. We recorded findings at any chest CT performed in the included children, along with core clinical observations.

**Results**
We included five children from 10 months to 6 years of age (mean 3.4 years). All had had at least one CT scan after admission. Three of these five had CT abnormality on the first CT scan (at 2 days, 4 days and 9 days, respectively, after onset of symptoms) in the form of patchy ground-glass opacities; all normalised during treatment.

**Conclusion**
Compared to reports in adults, we found similar but more modest lung abnormalities at CT in our small paediatric cohort.

**Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study [73]**

**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.

Comparative effectiveness and safety of ribavirin plus interferon-alpha, lopinavir/ritonavir plus interferon-alpha and ribavirin plus lopinavir/ritonavir plus interferon-alpha in patients with mild to moderate novel coronavirus pneumonia [74]

Background
Corona Virus Disease 2019 (COVID-19) due to the 2019 novel coronavirus (SARS-CoV-2) emerged in Wuhan city and rapidly spread throughout China. We aimed to compare arbidol and lopinavir/ritonavir (LPV/r) treatment for patients with COVID-19 with LPV/r only.

Methods
In this retrospective cohort study, we included adults (age≥18years) with laboratory-confirmed COVID-19 without Invasive ventilation, diagnosed between Jan 17, 2020, and Feb 13, 2020. Patients, diagnosed after Jan 17, 2020, were given oral arbidol and lopinavir/ritonavir (LPV/r) in the combination group and oral LPV/r only in the monotherapy group for 5–21 days. The primary endpoint was a negative conversion rate of coronavirus from the date of COVID-19 diagnosis (day7, day14), and assessed whether the pneumonia was progressing or improving by chest CT (day7).

Results
We analyzed 16 patients who received oral arbidol and LPV/r in the combination group and 17 who oral LPV/r only in the monotherapy group, and both initiated after diagnosis. Baseline clinical, laboratory, and chest CT characteristics were similar between groups. The SARS-CoV-2 could not be detected for 12(75%) of 16 patients’ nasopharyngeal specimens in the combination group after seven days, compared with 6 (35%) of 17 in the monotherapy group (p<0.05). After 14 days, 15 (94%) of 16 and 9 (52•9%) of 17, respectively, SARS-CoV-2 could not be detected (p<0.05). The chest CT scans were improving for 11(69%) of 16 patients in the combination group after seven days, compared with 5(29%) of 17 in the monotherapy group (p<0.05).

Conclusion
In patients with COVID-19, the apparent favorable clinical response with arbidol and LPV/r supports further LPV/r only

Epidemiologic Features and Clinical Course of Patients Infected With SARS-CoV-2 in Singapore [75]
Importance Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged in Wuhan, China, in December 2019 and has spread globally with sustained human-to-human transmission outside China.

Objective To report the initial experience in Singapore with the epidemiologic investigation of this outbreak, clinical features, and management.

Design, Setting, and Participants Descriptive case series of the first 18 patients diagnosed with polymerase chain reaction (PCR)–confirmed SARS-CoV-2 infection at 4 hospitals in Singapore from January 23 to February 3, 2020; final follow-up date was February 25, 2020.

Exposures Confirmed SARS-CoV-2 infection.

Main Outcomes and Measures Clinical, laboratory, and radiologic data were collected, including PCR cycle threshold values from nasopharyngeal swabs and viral shedding in blood, urine, and stool. Clinical course was summarized, including requirement for supplemental oxygen and intensive care and use of empirical treatment with lopinavir-ritonavir.

Results Among the 18 hospitalized patients with PCR-confirmed SARS-CoV-2 infection (median age, 47 years; 9 [50%] women), clinical presentation was an upper respiratory tract infection in 12 (67%), and viral shedding from the nasopharynx was prolonged for 7 days or longer among 15 (83%). Six individuals (33%) required supplemental oxygen; of these, 2 required intensive care. There were no deaths. Virus was detectable in the stool (4/8 [50%]) and blood (1/12 [8%]) by PCR but not in urine. Five individuals requiring supplemental oxygen were treated with lopinavir-ritonavir. For 3 of the 5 patients, fever resolved and supplemental oxygen requirement was reduced within 3 days, whereas 2 deteriorated with progressive respiratory failure. Four of the 5 patients treated with lopinavir-ritonavir developed nausea, vomiting, and/or diarrhea, and 3 developed abnormal liver function test results.

Conclusions and Relevance Among the first 18 patients diagnosed with SARS-CoV-2 infection in Singapore, clinical presentation was frequently a mild respiratory tract infection. Some patients required supplemental oxygen and had variable clinical outcomes following treatment with an antiretroviral agent.

Clinical Characteristics of 101 Non-Survivors Hospitalized with COVID-19 - A Single Center, Retrospective Study [76]

Background: Since December, 2019, a pneumonia associated with coronavirus disease-19 (COVID-19) emerged and thousands of individuals lost their lives in Wuhan, China. We aimed to clarify the epidemiological, demographic, clinical characteristics and laboratory findings of died patients with confirmed COVID-19, and tracked the causes of the death.

Methods: In this retrospective study, we included all died patients with confirmed COVID-19 in Renmin Hospital of Wuhan University (including Shouyi campus and Eastern campus) from Jan 1 to Feb 15, 2020. Clinical data were collected and compared between non-survivors who died within 3 days and after 3 days of admission. The primary outcome was vital organs damage or failure from admission to death and the risk factors for death. Secondary outcomes were to present the demographic and clinical characteristics or other findings of died patients.

Findings: Of 121 died patients with confirmed COVID-19, 101 cases with complete medical records were
included. The median age of the 101 non-survivors were 71 years (IQR, 59-80), 60 (59-41%) were men. 82 (81-19%) had fever, 82 (81-19%) had 1 or more comorbidities including hypertension (59 [58.42%]) and diabetes (22 [21.78%]) etc. The median course from hospitalization to death was 4d (IQR, 2-7d). Of 101 died patients, 100 (99.01%) suffered respiratory failure, 53 (52.48%) developed acute myocardial injury, acute kidney and liver injury occurred in 23 (22.77%) and 18 (17.82%) patients, respectively. Chest computed tomographic scans of non-survivors showed vast and fused ground-glass shadows. Compared to patients who survived 3 days, no statistical difference was noticed on lung severity score (11-91 vs 12-07) in patients who died within 3 days. Furthermore, significant elevated laboratory indicators including hypersensitive troponin (1.98 vs 0.2ng/ml), blood urea nitrogen (15.20 vs 10.08mmol/l), neutrophil count (11.23 vs 6.48×10 9 /L), procalcitonin (2.26 vs 0.58ng/ml) and lactic acid (3.80 vs 2.62 mmol/l) etc. were noted in patients who died with 3 days while PaO2 (54.75 vs 67.45mmHg), CD3% (51.57 vs 60.43%) and CD8% (16.42 vs 23.42%) were significantly depressed.

**Interpretation:** Older patients (>70 years) with comorbidities had a steeply increased risk of death when they suffered COVID-19. Besides respiratory system, acute cardiac and kidney damage or failure, secondary to COVID-19, played a crucial role in causing death of patients.

**Clinical Features of 69 Cases with Coronavirus Disease 2019 in Wuhan, China [77]**

**Background**
From December 2019 to February 2020, 2019 severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has caused a serious outbreak of coronavirus disease 2019 (COVID-19) in Wuhan, China. Related clinical features are needed.

**Methods**
We reviewed 69 patients who were hospitalized in Union hospital in Wuhan between January 16 to January 29, 2020. All patients were confirmed to be infected with SARS-CoV-2 and the final date of follow-up was February 4, 2020.

**Results**
The median age of 69 enrolled patients was 42.0 years (IQR 35.0-62.0), and 32 patients (46%) were men. The most common symptoms were fever (60[87%]), cough (38[55%]), and fatigue (29[42%]). Most patients received antiviral therapy (66 [98.5%] of 67 patients) and antibiotic therapy (66 [98.5%] of 67 patients). As of February 4, 2020, 18 (26.9%) of 67 patients had been discharged, and five patients had died, with a mortality rate of 7.5%. According to the lowest SpO2 during admission, cases were divided into the SpO2≥90% group (n=55) and the SpO2<90% group (n=14). All 5 deaths occurred in the SpO2<90% group. Compared with SpO2≥90% group, patients of the SpO2<90% group were older, and showed more comorbidities and higher plasma levels of IL6, IL10, lactate dehydrogenase, and c reactive protein. Arbidol treatment showed tendency to improve the discharging rate and decrease the mortality rate.

**Conclusions**
COVID-19 appears to show frequent fever, dry cough, and increase of inflammatory cytokines, and induced a mortality rate of 7.5%. Older patients or those with underlying comorbidities are at higher risk of death.
**Evaluation of SARS-CoV-2 RNA shedding in clinical specimens and clinical characteristics of 10 patients with COVID-19 in Macau [78]**

**Abstract**

As a city famous for tourism, the public healthcare system of Macau SAR has been under great pressure during the outbreak of the Coronavirus Disease 2019 (COVID-19). In this study, we report clinical and microbiological features of ten COVID-19 patients enrolled in the Centro Hospitalar Conde de São Januário (CHCSJ) between January 21 to February 16, 2020. Clinical samples from all patients including nasopharyngeal swab (NPS)/sputum, urine, and feces were collected for serial virus RNA testing by standard qRT-PCR assay. In total, seven were imported cases and three were local cases. The median duration from Macau arrival to admission in imported cases was 3 days. Four patients required oxygen therapy but none of them needed machinal ventilation. No fatal cases were noted. The most common symptoms were fever (80%) and diarrhea (80%). In the "Severe" group, there was significantly more elderly patients (p=0.045), higher lactate dehydrogenase levels (p=0.002), and elevated C-Reactive protein levels compared to the "Mild to Moderate" group (p<0.001). There were positive SARS-CoV-2 RNA signals in all patients' NPS and stool specimens but negative in all urine specimens. Based on our data on SARS-CoV-2 RNA shedding in stool and the possibility of a lag in viral detection in NPS specimens, the assessment of both fecal and respiratory specimen is recommended to enhance diagnostic sensitivity, and also to aid discharge decision before the role of viral RNA shedding in stool is clarified.

**Chest CT Findings in Cases from the Cruise Ship “Diamond Princess” with Coronavirus Disease 2019 (COVID-19) [79]**

**Abstract**

**Purpose**

To evaluate the chest CT findings in an environmentally homogeneous cohort from the cruise ship “Diamond Princess” with Coronavirus Disease 2019 (COVID-19).

**Materials and Methods**

This retrospective study comprised 112 cases (mean age, 62 years ± 16, range 25-93) with COVID-19 confirmed with RT-PCR. CT images were reviewed and the CT severity score was calculated for each lobes and the entire lung. CT findings were compared between asymptomatic and symptomatic cases.

**Results**

Of 112 cases, 82 (73%) were asymptomatic, 44 (54%) of which had lung opacities on CT. Other 30 (27%) cases were symptomatic, 24 (80%) of which had abnormal CT findings. Symptomatic cases showed lung opacities and airway abnormalities on CT more frequently than asymptomatic cases [lung opacity; 24 (80%) vs 44 (54%), airway abnormalities; 15 (50%) vs 15 (18%)]. Asymptomatic cases showed more GGO over consolidation (80%), while symptomatic cases more frequently showed consolidation over GGO (38%). The CT severity score was higher in symptomatic cases than asymptomatic cases, particularly in the lower lobes [symptomatic vs asymptomatic cases; right lower lobe: 2 ± 1 (0-4) vs 1 ± 1 (0-4); left lower lobe: 2 ± 1 (0-3) vs 1 ± 1 (0-3); total score: 7 ± 4 (1-17) vs 4 ± 2 (1-11)].

**Conclusion**

This study documented a high incidence of subclinical CT changes in cases with COVID-19. Compared to symptomatic cases, asymptomatic cases showed more GGO over consolidation and milder extension of disease on CT.
The clinical characteristics of pneumonia patients co-infected with 2019 novel coronavirus and influenza virus in Wuhan, China. [80]

Abstract

The outbreak of 2019 novel coronavirus (COVID-19) infection emerged in Wuhan, China on December 2019. Since then the novel coronavirus pneumonia disease has been spreading quickly and many countries and territories have been affected, with major outbreaks in China, South Korea, Italy and Iran. Influenza virus has been known as a common pathogen in winter and it can cause pneumonia. It was found clinically that very few patients were diagnosed with both COVID-19 and influenza virus. 5 out of the 115 patients confirmed with COVID-19 were also diagnosed with influenza virus infection, with three cases being influenza A and two cases being influenza B.

In this study, we describe the clinical characteristics of those patients who got infected with COVID-19 as well as influenza virus. Common symptoms at onset of illness included fever (5 [100%] patients), cough (5 [100%] patients), shortness of breath (5 [100%] patients), nasal tampon (3 [60%] patients), pharyngalgia (3 [60%] patients), myalgia (2 [40%] patients), fatigue (2 [40%] patients), headache (2 [40%] patients), and expectoration (2 [40%] patients). The laboratory results showed that compared to the normal values, the patients' lymphocytes were reduced (4 [80%] patients), and liver function ALT and AST (2 [40%] patients, 2 [40%] patients) and C-reactive protein (4 [80%] patients) were increased when admitted to hospital. They stayed in hospital for 14, 30, 17, 12, and 19 days (28.4±7.02), respectively. The main complications for the patients were acute respiratory distress syndrome (ARDS) (1 [20%] patients), acute liver injury (3 [60%] patients), and diarrhea (2 [40%] patients). All patients were given antiviral therapy (including oseltamivir), oxygen inhalation, and antibiotics. Three patients were treated with glucocorticoids including two treated with oral glucocorticoids. One of the five patients had transient hemostatic medication for hemoptysis. Fortunately, all patients did not need ICU care and were discharged from hospital without death.

In conclusion, those patients with both COVID-19 and influenza virus infection did not appear to show a more severe condition because based on the laboratory findings, imaging studies, and patient prognosis, they showed similar clinical characteristics as those patients with COVID-19 infection only. However, it is worth noting that the symptoms of nasal tampon and pharyngalgia may be more prone to appear for those co-infection patients.
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