2019 NOVEL CORONAVIRUS

MNAAP
Patsy Stinchfield, MS, CPNP, CIC
Senior Director, Infection Prevention & Control

Anu Kalaskar, MD
Co-Medical Director, Infectious Disease

3.18.2020
Objectives:

1. Describe the Epidemiology of SARS-COV2 which causes COVID-19, both what we know and don’t know

2. Review literature to date on COVID19 specifically in pediatric patients.

3. Discuss MN response to the pandemic
EPIDEMIOLOGY
Minnesota COVID-19 status 3.20.2020

As of March 20, 2020

- **Approximate number of patients tested at the MDH Public Health Lab:** 3856
- **Positive:** 115
- **Counties with cases:** Anoka, Benton, Blue Earth, Carver, Chisago, Clay, Dakota,Fillmore, Hennepin, Martin, Mower, Nicollet, Olmsted, Ramsey, Renville, Rice, Scott, Stearns, Waseca, Washington, Wright

Numbers are cumulative since Jan. 20, 2020. We will not release specific locations for any patients being tested in order to protect patient privacy.

Choosing a county on the interactive map above will provide the case count. The legend is located in the upper left. This map will not work if your browser is in compatibility mode.

**COVID-19 Hotlines:**
- Health questions: 651-201-3526 or 1-800-657-3503
  - 7 a.m. to 7 p.m.
- Schools and child care questions: 651-297-1304 or 1-800-657-3504
  - 7 a.m. to 7 p.m.

**Contact us:**
If you have questions or comments about this page, use our [RSS](https://www.health.state.mn.us/news/feed.html) subscriptions or call 651-201-5414 for the MN Infectious Disease Epidemiology, Prevention and Control Division.
US COVID-19 status 3.20.2020
Pandemic NPI

- Pandemic outbreak: no intervention
- Slow acceleration of number of cases
- Reduce peak number of cases and related demands on hospitals and infrastructure
- Reduce number of overall cases and health effects
- Pandemic outbreak: with intervention

Daily number of cases vs. Number of days since first case
Mortality Estimate Comparison

Fatality Rate (log scale)

Average number of people infected by each sick person

© 2020

NYT. 02/02/20. WHO

2019nCoV

Ebola

SARS

1918 Spanish Flu

Seasonal Flu

Cold

Chickenpox

Measles

MERS

Cold

Measles

NYT. 02/02/20. WHO

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COVID-19 Incubation Period

- 1/29/2020 NEJM article
- Mean: 5.2
  - 95% CI: 4.1-7.0 days
- 95% of all cases occurred by day 12.5
- Epidemic doubled every 7.4 days

COVID-19 infectiousness

• Reproductive (Ro) value
  • Varying reports:
    • 1/29/2020 NEJM **2.2**
      • 95% CI: 1.4-3.9
    • 1/30/2020 IJID:
      • Between*:
        **2.24** (95% CI: 1.96-2.55)
        **3.58** (95% CI: 2.89-4.39)

*Depends on changes in disease reporting and diagnosis

More recent estimate is **2.7**

https://www.npr.org/sections/health-shots/2014/10/02/352983774/no-seriously-how-contagious-is-ebola
Transmission

• rarely, animal coronaviruses can infect people

• person-to-person: respiratory droplets within 6 feet
  • droplets
  • coughing
  • indirect contact ?????
  • virus in the stool: live virus? remnants picked up by PCR?

• people at risk
  • animal market workers
  • caring for individuals with the illness
  • healthcare workers
  • older age groups
Virus Viability on Surfaces

• Likes smooth surfaces-stainless steel, plastic—can live 2-3 days
• Not as viable on rough surfaces like clothing, cardboard, paper-24 hours
• Transmission plausible for up to days later
• Killed easily with surface cleaning and usual disinfectants
• Standard waste and linen disposal
  • No special bagging requirements
• Wipes down all surfaces in room
CLINICAL MANIFESTATIONS
What are Coronaviruses?

- Large family
- Zoonotic
  - Alpha/Beta
    - Bats, Cats, Cervids
  - Gamma/Delta
    - Birds, Reptile
- Pangolin
Coronaviruses

- Large family
- Zoonotic
  - Alpha/Beta
    - Bats, Cats, Cervids
  - Gamma/Delta
    - Birds, Reptiles
- Latin:
  - corona
    - Crown
    - Wreath
    - Halo
- + sense SSRNA
- Enveloped

[Image: Schematic diagram of the SARS-coronavirus structure reproduced from ref 20 The viral Fig2_8149726]
Coronavirus Symptoms

- Usually
  - Mild/moderate symptoms
  - Upper respiratory illness
    - Common cold

- Less Common
  - Lower respiratory tract disease
    - Pneumonia
    - Bronchitis
  - These more likely in:
    - Elderly
    - Infants
    - Immunocompromised
    - Cardiopulmonary disease patients
Peds Hospital Medicine Listserve

- 400 COVID positive kids <7 years old out of 35,000 tests
- 13 deaths in < 50 years old out of 3000 deaths
COVID-19 Symptoms

• Most common symptoms
  • Fever (98%)
  • Cough (76%)
  • Myalgia/fatigue (44%)
  • Sputum production (28%)
  • Headache (8%)
  • Hemoptysis (5%)
  • Diarrhea (3%)

• Dyspnea in 55%

COVID-19 Symptoms

• 63% lymphopenia
• 100% abnormal chest CT

• Complications
  • ARDS (29%)
  • Anemia (15)
  • Acute cardiac injury (12%)
  • Secondary infection (10%)

Signs and Symptoms COVID-19

Signs/Symptoms of COVID-19

- Fever
- Cough
- Myalgia/arthritis
- Headache
- Diarrhea

Data from Wuhan City (N = 138), Hubei Province (N = 137), and China Country (N = 1,099).
Detection of COVID-19 in Children

- 6 children ages 1-7 with COVID-19 in early January
- High fever and cough were common to all patients
- Moderate to severe disease with positive chest CT findings in 4 of 6 children
- Hospitalized median 7.5 days (range 5 - 13) with one PICU admission
- No patients exposed to the Hunan Seafood Market
Table 1. Epidemiologic Characteristics, Clinical Features, and Radiologic Findings of 171 Children with SARS-CoV-2 Infection. 

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>Median (range)</td>
<td>6.7 yr (1 day–15 yr)</td>
</tr>
<tr>
<td>Distribution — no. (%)</td>
<td></td>
</tr>
<tr>
<td>&lt;1 yr</td>
<td>31 (18.1)</td>
</tr>
<tr>
<td>1–5 yr</td>
<td>40 (23.4)</td>
</tr>
<tr>
<td>6–10 yr</td>
<td>58 (33.9)</td>
</tr>
<tr>
<td>11–15 yr</td>
<td>42 (24.6)</td>
</tr>
<tr>
<td><strong>Sex — no. (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>104 (60.8)</td>
</tr>
<tr>
<td>Female</td>
<td>67 (39.2)</td>
</tr>
<tr>
<td><strong>Diagnosis — no. (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Asymptomatic infection</td>
<td>27 (15.8)</td>
</tr>
<tr>
<td>Upper respiratory tract infection</td>
<td>33 (19.3)</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>111 (64.9)</td>
</tr>
</tbody>
</table>
### Table. Characteristics of 9 Hospitalized Infants Infected With Coronavirus Disease 2019

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Patient</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
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<td></td>
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<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td><strong>Demographics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></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>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td>Female</td>
<td>Female</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td>Female</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td><strong>Symptoms at onset</strong></td>
<td></td>
<td>Fever, peaking at 38.8 °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>
</tr>
<tr>
<td><strong>Time between admission and diagnosis, d</strong></td>
<td></td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Epidemiologic history</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of family members infected</td>
<td></td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Linkage to Wuhan</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>NA</td>
</tr>
<tr>
<td>Treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intensive unit care</td>
<td></td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Mechanical ventilation</td>
<td></td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Severe complications</td>
<td></td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Abbreviation: NA, not available.


- Jan. 16 to Feb. 8 on 2,143 children in China
- Infants had higher rates of serious illness than older children.
- 11% of infants had severe or critical cases compared to 7% of children ages 1-5, 4% of those 6-10, 4% of those 11-15 and 3% of those 16 and older.
- 4% of children were asymptomatic,
- 51% had mild illness and 39% had moderate illness.
- 6% had severe or critical illness, compared to 18.5% of adults. One child, a 14-year-old boy, died. Authors called the gap between children and adults “puzzling” and said it “may be related to both exposure and host factors.” They proposed several possible reasons for the difference, including children having fewer opportunities for exposure, higher levels of antibodies against viruses or different responses from their developing immune systems. The virus also may not bind as well to children’s cells.

- 6% had severe or critical illness, compared to 18.5% of adults.
- One child, a 14-year-old boy, died. Authors called the gap between children and adults “puzzling”
  - “may be related to both exposure and host factors.”
  - children having fewer opportunities for exposure,
  - higher levels of antibodies against viruses or
  - different responses from their developing immune systems.
  - The virus also may not bind as well to children’s cells.
Table 1 Characteristics of Children' COVID-19 Cases in China

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>All cases</th>
<th>Different Category</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Confirmed</td>
<td>Suspected</td>
</tr>
<tr>
<td>Median age (Interquartile range)</td>
<td>7.00 (11.0)</td>
<td>10.00 (11.0)</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1</td>
<td>379 (17.7)</td>
<td>86 (11.8)</td>
</tr>
<tr>
<td>1-5</td>
<td>493 (23.0)</td>
<td>137 (18.7)</td>
</tr>
<tr>
<td>6-10</td>
<td>523 (24.4)</td>
<td>171 (23.4)</td>
</tr>
<tr>
<td>11-15</td>
<td>413 (19.3)</td>
<td>180 (24.6)</td>
</tr>
<tr>
<td>&gt;15</td>
<td>335 (15.6)</td>
<td>157 (21.5)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boy</td>
<td>1213 (56.6)</td>
<td>420 (57.5)</td>
</tr>
<tr>
<td>Girl</td>
<td>930 (43.4)</td>
<td>311 (42.5)</td>
</tr>
<tr>
<td>Severity of illness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asymptomatic</td>
<td>94 (4.4)</td>
<td>94 (12.9)</td>
</tr>
<tr>
<td>Mild</td>
<td>1091 (59.9)</td>
<td>315 (43.1)</td>
</tr>
<tr>
<td>Moderate</td>
<td>831 (38.8)</td>
<td>300 (41.0)</td>
</tr>
<tr>
<td>Severe</td>
<td>112 (5.2)</td>
<td>18 (2.5)</td>
</tr>
<tr>
<td>Critical</td>
<td>13 (0.6)</td>
<td>3 (0.4)</td>
</tr>
<tr>
<td>Missing</td>
<td>2 (0.1)</td>
<td>1 (0.1)</td>
</tr>
<tr>
<td>Days from symptom onset to diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median days (Interquartile range)</td>
<td>2 (4.0)</td>
<td>3 (4.0)</td>
</tr>
<tr>
<td>Range</td>
<td>0-42</td>
<td>0-42</td>
</tr>
<tr>
<td>Province</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hubei</td>
<td>984 (45.9)</td>
<td>229 (31.3)</td>
</tr>
<tr>
<td>Surrounding areas*</td>
<td>397 (18.5)</td>
<td>155 (21.2)</td>
</tr>
<tr>
<td>Others</td>
<td>762 (35.6)</td>
<td>347 (47.5)</td>
</tr>
<tr>
<td>Total</td>
<td>2143</td>
<td>731 (34.1)</td>
</tr>
</tbody>
</table>

Data are presented with median (Interquartile range) and n (%).
*Surrounding areas are the provinces and Municipality bordering Hubei, they are Anhui, Henan, Hunan, Jiangxi, Shaanxi and Chongqing.
<table>
<thead>
<tr>
<th>Age group*</th>
<th>Asymptomatic</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Critical</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>7(7.4)</td>
<td>205(18.8)</td>
<td>127(15.3)</td>
<td>33(29.5)</td>
<td>7(53.8)</td>
<td>379(17.7)</td>
</tr>
<tr>
<td>1-5</td>
<td>15(16.0)</td>
<td>245(22.5)</td>
<td>197(23.7)</td>
<td>34(30.4)</td>
<td>2(15.4)</td>
<td>493(23.0)</td>
</tr>
<tr>
<td>6-10</td>
<td>30(31.9)</td>
<td>278(25.5)</td>
<td>191(23.0)</td>
<td>22(19.6)</td>
<td>0(0)</td>
<td>521(24.3)</td>
</tr>
<tr>
<td>11-15</td>
<td>27(28.7)</td>
<td>199(18.2)</td>
<td>170(20.5)</td>
<td>14(12.5)</td>
<td>3(23.1)</td>
<td>413(19.3)</td>
</tr>
<tr>
<td>&gt;15</td>
<td>15(16.0)</td>
<td>164(15.0)</td>
<td>146(17.5)</td>
<td>9(8.0)</td>
<td>1(7.7)</td>
<td>335(15.7)</td>
</tr>
<tr>
<td>Total</td>
<td>94</td>
<td>1091</td>
<td>831</td>
<td>112</td>
<td>13</td>
<td>2141(100)</td>
</tr>
</tbody>
</table>

Data were presented with number and percent (%); *Two cases had missing values.
Laboratory testing

- Real-time reverse transcription–polymerase chain reaction (RT-PCR) performed by CDC throat and nasal swabs
  - 2,620 specimens from 1,007 patients tested from January 18–February 23, 2020

- Serologic testing (IgG, IgM, IgA) being developed by CDC for surveillance of virus circulation in the general population.

- The virus has been established in cell culture and will be securely shared with public health and academic institutions for research, vaccine development.
Management

• Supportive – Symptomatic care, respiratory support
  • Ibuprofen – Leads to worse disease? No scientific evidence, theoretical
  • Avoid steroids – inhaled and burse dose steroids for asthma ok if needed

• No vertical transmission case reports from Mom to baby

• Remdesivir
  • Investigational antiviral that has activity against SARS-CoV-2, as well as MERS and SARS in vitro and in animal studies.
  • Multiple clinical trials underway in China
  • FDA approved NIH randomized controlled trial of investigational therapeutics (first will be Remdesivir) for hospitalized patients in the U.S.

• Lopinavir-ritonavir (Kaletra) – has activity against SARS and MERS in vitro. New data suggests not beneficial.
# Allergy Season and COVID-19

## COVID-19 compared to other common conditions

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>COVID-19</th>
<th>COMMON COLD</th>
<th>FLU</th>
<th>ALLERGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>Common</td>
<td>Rare</td>
<td>Common</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Dry cough</td>
<td>Common</td>
<td>Mild</td>
<td>Common</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Shortness of breath</td>
<td>Common</td>
<td>No</td>
<td>No</td>
<td>Common</td>
</tr>
<tr>
<td>Headaches</td>
<td>Sometimes</td>
<td>Rare</td>
<td>Common</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Aches and pains</td>
<td>Sometimes</td>
<td>Common</td>
<td>Common</td>
<td>No</td>
</tr>
<tr>
<td>Sore throat</td>
<td>Sometimes</td>
<td>Common</td>
<td>Common</td>
<td>No</td>
</tr>
<tr>
<td>Fatigue</td>
<td>Sometimes</td>
<td>Sometimes</td>
<td>Common</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>Rare</td>
<td>No</td>
<td>Sometimes*</td>
<td>No</td>
</tr>
<tr>
<td>Runny nose</td>
<td>Rare</td>
<td>Common</td>
<td>Sometimes</td>
<td>Common</td>
</tr>
<tr>
<td>Sneezing</td>
<td>No</td>
<td>Common</td>
<td>No</td>
<td>Common</td>
</tr>
</tbody>
</table>

*Sometimes for children

Sources: CDC, WHO, American College of Allergy, Asthma and Immunology
Important Questions

• Does transmission take place before symptoms occur?
• Does transmission take place after symptoms reside?
• What is the true mortality rate?
• Will natural “viral dynamics” result in a reduction in prevalence?
• Is there a seasonal variation to the disease?
• Can the virus contaminate the blood supply?
• Is the virus transferred trans-placentally or in breast milk?
• Once hospitalized, what are the indicators of a poor outcome?
• Why do children appear to be protected?
Questions?