CoVID-19

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Not our first time at the rodeo...
Early spread
Inside the Metropole hotel
The spread in Singapore

FIGURE 2. Probable cases of severe acute respiratory syndrome, by reported source of infection* — Singapore, February 25–April 30, 2003

* Patient 1 represents Case 1; Patient 6, Case 2; Patient 35, Case 3; Patient 130, Case 4; and Patient 127, Case 5. Excludes 22 cases with either no or poorly defined direct contacts or who were cases translocated to Singapore and the seven contacts of one of these cases.

The Toronto Outbreak

Two phases of the Toronto SARS outbreak

Number of Cases

Onset Date

Feb 03 Mar 03 Mar 03 Mar 03 Apr 03 Apr 03 Apr 03 May 03 May 03 May 03 Jun 03 Jun 03 Jun 03 Jun 03
Toronto

- Severe HCW transmission
- Hospital shutdowns
- SARS wards
- Emergency assistance from US
The clue was in the visitors!
Avian Influenza – 2005
H1N1 (Swine) Influenza

An unusual cocktail of avian, swine and human viruses

- Bird flu
- Human flu
- Swine flu

Pigs may harbour several flu viruses simultaneously. The pathogens may mix to create a new viral strain

Transmission:
- Pig to human: By inhaling viral particles (there is no risk from eating)
- Human to human: By inhaling viral particles

Symptoms:
- High fever
- Coughing, sneezing
- Breathing difficulties
- Loss
MERS: The new SARS

- Two early cases in the US
  - HCW Indiana
  - HCW Florida

- PUI every month or so
- Never really transmitted outside the middle east
Lessons learned

- Pandemic response plan drafted in 2003
- Active monitoring and updates
- ORP model
- Screening algorithm
  - EC, transfer ctr, International office, L&D, admissions, day surgery, other entry points
  - Physician and house staff emails
  - Electronic screening, order sets, and alerts
- System approach
- Contingency plan in-house
- PPE packs placed in strategic locations
- PPE sequence training/competency for high risk HCW
- Guidelines for infection control in ancillary services
  - EVS, F&N, laboratory, imaging, security, OR
- Communications
- Drills
  - Suspected cases and system exercise
<table>
<thead>
<tr>
<th>PHASE</th>
<th>DESCRIPTION</th>
<th>MAIN ACTIONS</th>
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<tbody>
<tr>
<td>PHASE 1</td>
<td>No animal influenza virus circulating among animals have been reported to</td>
<td>Develop, exercise, and periodically review national animal preparedness and</td>
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<td>cause infection in humans.</td>
<td>response plans.</td>
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<td>PHASE 2</td>
<td>An animal influenza virus circulating in domesticated or wild animals is</td>
<td>Develop robust national surveillance systems in collaboration with national</td>
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<td>known to have caused infection in humans and is therefore considered a</td>
<td>animal health authorities, and other relevant sectors.</td>
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<td>specific potential pandemic threat.</td>
<td>Compile communications planning and initiate communications activities to</td>
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<td>communicate risk and potential risks.</td>
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<td>PHASE 3</td>
<td>An animal or human-animal influenza reassortant virus has caused localized</td>
<td>Promote beneficial behaviours in individuals for self-protection: Plan for</td>
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<td>cases or small clusters of disease in people, but has not resulted in human-</td>
<td>use of pharmaceuticals and vaccines.</td>
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<td>to-human transmission sufficient to sustain community-level outbreaks.</td>
<td>Prepare the health system to scale up.</td>
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<td>PHASE 4</td>
<td>Human to human transmission of an animal or human-animal influenza</td>
<td>Direct and coordinate rapid pandemic containment activities in collaboration</td>
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<td>reassortant virus able to sustain community-level outbreaks has been</td>
<td>with WHO to limit or delay the spread of infection.</td>
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<td></td>
<td>verified.</td>
<td>Increase surveillance. Monitor containment operations. Share findings with</td>
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<td>WHO and the international community.</td>
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<td>PHASE 5</td>
<td>The same identified virus has caused sustained community-level outbreaks in</td>
<td>Provide leadership and coordination to multifunctional resources to mitigate</td>
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<td>two or more countries in one WHO region.</td>
<td>the societal and economic impacts.</td>
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<tr>
<td>PHASE 6</td>
<td>In addition to the criteria defined in Phase 5, the same virus has caused</td>
<td>Actively monitor and assess the evolving pandemic and its impacts and</td>
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<td>sustained community level outbreaks in at least one other country in another</td>
<td>mitigation measures.</td>
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<td>WHO region.</td>
<td>Continue providing updates to general public and all stakeholders on the</td>
</tr>
<tr>
<td>POST PEAK</td>
<td>Levels of pandemic influenza in most countries with adequate surveillance</td>
<td>state of pandemic and measures to mitigate risk.</td>
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<td>PERIOD</td>
<td>have dropped below peak levels.</td>
<td>Implement individual, societal, and pharmaceutical measures.</td>
</tr>
<tr>
<td>POST PANDEMIC PERIOD</td>
<td>Levels of influenza activity have returned</td>
<td>Plan and coordinate for additional resources and capacities during possible</td>
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<tr>
<td>PERIOD</td>
<td>to the levels seen for seasonal influenza in most countries with adequate</td>
<td>future waves.</td>
</tr>
<tr>
<td></td>
<td>surveillance.</td>
<td>Continue surveillance to detect subsequent waves.</td>
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<td></td>
<td>Regularly update the public and other stakeholders on any changes to the</td>
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<td>Evaluate the effectiveness of the measures used to update guidelines, protocols,</td>
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<td></td>
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<td>and algorithms.</td>
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<td>Rest, rebuild resources, service plans, and rebuild essential services.</td>
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</table>
SHEA EXPERT GUIDANCE

Outbreak Response and Incident Management: SHEA Guidance and Resources for Healthcare Epidemiologists in United States Acute-Care Hospitals

David B. Banach, MD, MPH, MS; B. Lynn Johnston, MD, MS, FRCPC; Duha Al-Zubeidi, MD; Allison H. Bartlett, MD, MS; Susan Casey Bleasdale, MD; Valerie M. Deloney, MBA; Kyle B. Enfield, MD, MS; Judith A. Guzman-Cottrill, DO; Christopher Lowe, MD, MSc; Luis Ostrosky-Zeichner, MD; Kyle J. Popovich, MD, MS; Payal K. Patel, MD; Karen Ravin, MD, MS; Theresa Rowe, DO, MS; Erica S. Shenoy, MD, PhD; Roger Stienecker, MD; Pritish K. Tosh, MD; Kavita K. Trivedi, MD; and the Outbreak Response Training Program (ORTP) Advisory Panel
Incident command model
Hermann plan

COVID-19 INCIDENT RESPONSE
Memorial Hermann Health System
SARS-CoV-2 & CoVID-19
2019 Novel coronavirus

- Coronaviruses are a large family of viruses that are common in many different species of animals
- One of the most common causes of the “common cold” in humans
- Rarely, animal coronaviruses can infect people and then spread between people such as with MERS and SARS
- First detected in Wuhan, China in December
- Initial cases had a link to a large “wet market” suggesting animal-to-person spread
- Subsequent cases indicated person-to-person spread
- Cases are now being reported in 6 continents, with community transmission.
Coronavirus Testing: Criteria and Numbers by Country

As of March 2, 2020

<table>
<thead>
<tr>
<th>Country</th>
<th>Tests Performed</th>
<th>Tests per Million People</th>
<th>Population</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Korea</td>
<td>109,591</td>
<td>2,138</td>
<td>51,269,185</td>
<td>source</td>
</tr>
<tr>
<td>Italy</td>
<td>23,345</td>
<td>386</td>
<td>60,461,826</td>
<td>source</td>
</tr>
<tr>
<td>Austria</td>
<td>2,120</td>
<td>235</td>
<td>9,006,398</td>
<td>source</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1,850</td>
<td>214</td>
<td>8,654,622</td>
<td>source</td>
</tr>
<tr>
<td>UK</td>
<td>13,525</td>
<td>199</td>
<td>67,886,011</td>
<td>source</td>
</tr>
<tr>
<td>Finland</td>
<td>130</td>
<td>23</td>
<td>5,540,720</td>
<td>source</td>
</tr>
<tr>
<td>Turkey</td>
<td>940</td>
<td>11</td>
<td>84,339,067</td>
<td>source</td>
</tr>
<tr>
<td>United States</td>
<td>472*</td>
<td>1</td>
<td>331,001,651</td>
<td>source</td>
</tr>
</tbody>
</table>

https://www.worldometers.info/coronavirus/covid-19-testing/
Where does SARS-CoV-2 rank?

Note: Average case-fatality rates and transmission numbers are shown. Estimates of case-fatality rates can vary, and numbers for the Wuhan coronavirus are preliminary estimates.
Contrasting SARS vs CoVID-19

The first day that W.H.O. received reports of the outbreaks

Notes: The official World Health Organization case count for SARS was delayed at the beginning of the outbreak. Some cases were suspected but not confirmed; SARS is a diagnosis of exclusion, so previously reported cases may have been discarded after further investigation. Wuhan coronavirus data as of 11:30 p.m. E.T., Jan. 30.
How does COVID-19 compare to FLU?

### PRELIMINARY U.S. FLU BURDEN ESTIMATES
So far this season, CDC estimates there have been at least:

- 32 million illnesses
- 14 million medical visits
- 310,000 hospitalizations
- 18,000 deaths

Based on data from Oct. 1, 2019, through Feb. 22, 2020

* Because influenza surveillance does not capture all cases of flu that occur in the U.S., CDC provides these estimated ranges to better reflect the larger burden of influenza. These estimates are calculated based on CDC’s weekly influenza surveillance data and are preliminary.
The worst epidemiological situation.. Stop the cruises!
### Current person under investigation (PUI) criteria

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

• Incubation period: 4-7 days (95%CI), but max range is 2-14 days

• Symptoms:
  • Fever (83-98%)
  • Dry cough (46-82%)
  • Myalgia/fatigue (11-44%)
  • SOB (31%)
  • Less common: Sore throat, headache, productive cough, hemoptysis, diarrhea

• Biphasic course, deterioration during the 2nd week of illness

• Lab and Imaging:
  • Leukopenia, lymphopenia, transaminases, normal procalcitonin
  • Bilateral consolidation and ground glass opacities

• Complications:
  • ARDS
  • Secondary infection (bacterial, fungal)
  • Cardiac events
  • Shock/sepsis/MOF

• Risk factors for mortality:
  • Age >60
  • Male gender
  • Comorbidities

CDC.gov
Age is an important predictor for mortality.
**Knwon and unknowns**

**Knowns**
- Person to person spread through droplets
- **Not airborne**
- 2-14d (5-7d 95%CI) incubation period
- 90% present with fever
- Mortality associated with age and underlying comorbidities.
- 2-9 days environmental survival
- Susceptible to common disinfectants

**Unknowns**
- True number of cases
- Ease of transmission compared to other viruses
- Specific treatment
- Vertical transmission
- How contagious before symptoms
Treatment

- Supportive care
  - ECMO?
- Complication management
  - Avoid steroids!
- Antivirals?
  - Ribavirin
  - Protease inhibitors
  - Interferon
  - Oseltamivir
- Cloroquine?
- Hyperimmune serum
Common myths and urban legends

- Packages from China can transmit the virus
- Pets can be reservoirs
- Things that prevent the virus:
  - Mouthwash
  - Alcohol and bleach sprays
  - Garlic
  - Sesame oil
  - Face masks
- A vaccine is already available
- The virus was patented
- The virus is a rogue HIV vaccine/bioweapon that escaped from a BSL-4 lab

Wrong, washingtonpost.com/politics/2020/

38% of Americans wouldn’t buy Corona beer "under any circumstances" because of the coronavirus, according to a recent survey.

Just to be abundantly clear: There is no link between the virus and the beer.

cnn.it/396M5A9
What are we doing as a country?

Travel alerts to China, Italy, Iran, Japan, Hong Kong, and South Korea. TRAVEL BANS.

Repatriation/quarantine of US citizens

Airport screening US
Infection Prevention and Control Recommendations

Patients should be asked to wear a surgical mask.

Patient evaluation should occur in a private room with the door closed, ideally an airborne infection isolation room if available.

Healthcare personnel entering the room should use standard precautions, contact precautions, airborne precautions, and use eye protection (e.g., goggles or a face shield).

Immediately notify infection control personnel/health department for testing.
What to expect

- Increased number of cases, including more cases in the US
- Community/person-to-person spread in the US
- Overall, risk remains low for general public. Need to protect high risk groups to avoid a healthcare surge
- Better understanding of transmission and disease
- If SARS/MERS model, outbreak will last a few months, but potential for endemicity or seasonality
How is this going to play out: A tale of two outbreaks...

Social Distancing

- Delay epidemic peak
- Reduce height of peak
- Spread cases over a longer time period
THANK YOU

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