The COVID-19 Concern: Navigating the Spread

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Required Disclosures

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The Emergency Nurses Association is accredited as a provider of continuing nursing education by the American Nurses Credentialing Center’s Commission on Accreditation.

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Objectives

• Virus Basics
• How do you get it
• Infectivity
• Treatment Options
• Where do we go from here?
Human Coronavirus

- Coronaviridae family
- Zoonotic, enveloped RNA viruses
- Corona = “crown” or “halo”
- HKU1, NL63, OC43, and 229E
- Three much more virulent, zoonotic strains:
  - Severe acute respiratory syndrome coronavirus (SARS-CoV)
  - Middle East respiratory syndrome coronavirus (MERS-CoV)
  - Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)
- Binds to the angiotensin-converting enzyme (ACE2)
  - Alveolar cells
  - Interstitial epithelia

Case courtesy of Dr Daniel J Bell, Radiopaedia.org, rID: 74536
Human Coronavirus

- Accounts for 10% of URIs in adults
- HKU1, NL63, OC43 & 229E
  - Nasal congestion and rhinorrhea
  - Pneumonia, exacerbation of lung issues in immunocompromised hosts/older adults
  - Diarrhea in infants
- Other URI causes - Rhinovirus, Influenza A/B, Parainfluenza, RSV, Human metapneumovirus, Adenovirus
Why is this Coronavirus “Novel”?  

- New virus that hasn’t been seen before  
- December 2019 Wuhan, in the Hubei Province of China  
- Virus name = SARS-CoV-2, Disease = COVID-19  
- Bats are the most likely reservoir  
  - mix of bat and pangolin viruses $\rightarrow$ human  
- Binds more tightly to ACE2 than SARS  

Spread of COVID-19

- 1,918,855 Total Confirmed Cases
- January 20, 2020 = first US case
- 581,679 Confirmed cases in the US as of 4/13
- 2,935,006 Tested
How It Spreads

- Large respiratory **droplets** from coughs or sneezes
- Is it airborne???
  - Aerosols smaller than 5 micrometers in diameter
  - Talking & breathing
  - NEJM study March 17\textsuperscript{th} – virus can survive in aerosol for 3 hours
  - WHO Situation Report March 26\textsuperscript{th} – Droplet and contact precautions
    - Consider aerosol generating procedures
  - Contact transmission – “fomite-to-face”
  - Direct contact with infectious secretions from a patient with COVID-19
    - Sputum, serum, blood, and respiratory droplets
    - It is not known if vomit, urine, breast milk, semen contain viable, infectious virus

• Aerosol and Surface Stability of SARS-COV-2 as Compared with SARS-COV-1: March 17th 2020
  – Aerosols – 3 hours
  – Plastic – 72 hours
  – Stainless Steel – 72 hours
  – Copper – 4 hours
  – Cardboard – 24 hours

• Stability of SARS-CoV-2 was similar to that of SARS-CoV-1
  – differences in the epidemiologic characteristics of these viruses probably arise from other factors, including high viral loads in the upper respiratory tract and the potential for persons infected with SARS-CoV-2 to shed and transmit the virus while asymptomatic.

• Aerosol and fomite transmission of SARS-CoV-2 is plausible as the virus can remain viable and infectious in aerosols for hours & on surfaces up to days
When are people contagious?

• Period of infectivity
  – Shedding of virus is highest in the first 3 days from symptom onset
    • Preliminary data – more contagious earlier in disease
    • The more severe the illness, longer shed of virus (8-37 days!)
  – Pre-symptomatic transmission is possible
    • Incubation period (exposure to virus → symptom onset)
    • Average 5-6 days, can be 14
    – Detectable viral RNA does not always correlate with isolation of infectious virus
  • Immune response and immunity duration → unknown
How Contagious is the new coronavirus?

Personal Protective Equipment

- **WHO: Rational use of PPE for COVID-19, March 19, 2020**
  - Direct care: Gowns, gloves, medical mask, eye protection
  - Aerosol generating procedures (CPR, NIV, Intubation)
    - Respirators, eye protection, gloves, fluid resistant gowns, N95
- **CDC Healthcare PPE Guidelines**
  - Direct care: Gowns, gloves, medical mask, eye protection
  - Aerosol generating procedures:
    - N95 or higher-level respirator, eye protection, gloves, and a gown

How does the virus affect children?

- Severe and critical illness uncommon
- Increased frequency in infants and young children
- [March 16 - Epidemiology of COVID-19 Among Children in China](#)
  - 728 (34.1%) lab-confirmed cases & 1407 (65.9%) suspected
  - Median age of all patients was 7 years
  - More than 90% of all patients had asymptomatic, mild, or moderate cases
  - Among the 13 cases categorized as critical, 7 patients were infants under 1 year
Safety First!

• Below are the words of Aaron Mishler, a nurse, former Army Medic, and Ebola responder in West Africa in 2014-2015.
• These are the same words we used as a team, every SINGLE time we entered the Ebola Treatment Unit:
• “Who is the most important person in the ETU?” “I am.”

There is no emergency in a pandemic.
Symptoms

• Constitutional:
  – Fevers (83-98%)
  – Dry cough (67.8-82%)
  – Dyspnea (33%)
  – Myalgias (11%)
  – Fatigue (38.1%)
  – Sore throat (13.9%)
• GI symptoms (20%)
  – Diarrhea, vomiting, abdominal pain
• Loss of taste or smell?

## Criteria to Guide Evaluation and Laboratory Testing with COVID-19

### COVID-19 Symptoms: Fever, Cough, and Shortness of Breath

<table>
<thead>
<tr>
<th>Priority</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Ensures optimal care options for all hospitalized patients, lessen the risk of healthcare-associated infections, and maintain the integrity of the U.S. healthcare system</td>
</tr>
<tr>
<td></td>
<td>- Hospitalized patients</td>
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<td></td>
<td>- Healthcare facility workers with symptoms</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>Ensures those at highest risk of complication of infection are rapidly identified and appropriately triaged</td>
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<td>- Patients in long-term care facilities with symptoms</td>
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<td>- Patients 65 years of age and older with symptoms</td>
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<td>- Patients with underlying conditions with symptoms</td>
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<td>- First responders with symptoms</td>
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<td><strong>3</strong></td>
<td>As resources allow, test individuals in the surrounding community of rapidly increasing hospital cases to decrease community spread, and ensure health of essential workers</td>
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<td>- Critical infrastructure workers with symptoms</td>
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<td>- Individuals who do not meet any of the above categories with symptoms</td>
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<td>- Healthcare facility workers and first responders</td>
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<td>- Individuals with mild symptoms in communities experiencing high numbers of COVID-19 hospitalizations</td>
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CoVID-19 Specific Testing

- RT-PCR: real-time reverse transcription polymerase chain reaction test
  - Qualitative detection of nucleic acid (RNA) from SARS-CoV-2 in upper and lower respiratory specimens
- Specimen – Nasopharyngeal swab/Sputum/Lower Resp Tract Aspirates/Lavage
- Testing Limitations
  - Quality specimen aka deep!
  - Sicker patients → higher viral burden → more likely to have a positive swab
- Sensitivity – 75%, Specificity high
  - Single negative test doesn’t exclude disease
- Widely available respiratory viral panels test only for earlier forms of human coronavirus
FDA clears first saliva test to diagnose coronavirus

• 4.13.2020
• New saliva testing for COVID-19
  – Patients spit into this plastic tube and hand to provider
• Emergency FDA approval
• Enhanced safety for health care workers
• Rutgers lab can process 10,000 patient samples per day

Workup

• Depends on clinical presentation and Vital signs!
• CBC with differential
  – Lymphopenia is common (80%)
• CMP
  – Liver enzymes commonly elevated
• Coagulation studies & D-dimer
  – Disseminated Intravascular Coagulation can be seen
• Procalcitonin
• Respiratory Panels
• Blood Cultures
• C-Reactive Protein

https://blog.pdchealthcare.com/articles/laboratory/blood-tube-label-alignment-matters/
Imaging

• CXR- Bilateral patchy ground glass opacities (70%)

Case courtesy of Dr Fabio Macori, Radiopaedia.org, rID: 74867
Multifocal ground glass, mainly in the periphery of both lungs.

Case courtesy of Dr Elshan Abdullayev, Radiopaedia.org, rID: 76015
• Multifocal regions of consolidation and ground-glass opacifications.
• These have a peripheral and basal predominance.
• No pleural or pericardial effusion.
Therapeutic Considerations

https://www.ashevillenc.gov/service/dispose-of-prescription-medication/
Respiratory Care

• Non-invasive ventilation & high-flow oxygenation
  – Used in select population of patients
  – Consider aerosolization of viral particles
  – Use facemask for HFNC and viral filter on mask

• Intubation
  – High risk intervention
  – As few people in room as possible
  – All in room wearing PPE

Doctors at St. Joseph Hospital in Bangor have been helping to develop and produce a protective device that can be placed over patients at key moments to help prevent the spread of the coronavirus.
Awake Prone Positioning

- Use in the well appearing, hypoxemic patient who is awake and cooperative
  - Improved secretion clearance
  - Recruitment of posterior lung regions
  - Improved ventilation / perfusion matching
- Can alternate sides if unable to prone
- Support devices must be well secured
Chloroquine & Hydroxychloroquine

• Antimalarial medication used for Lupus and Rheumatoid Arthritis
  – Immunomodulatory activity
    • Interferes with ACE 2 receptor
    • Cytokine storm
  – Anti-inflammatory benefits
• Efficacy pending, clinical trials in progress
• Side effects:
  – QT interval prolongation, Torsades de pointes, hypoglycemia

Azithromycin

- Macrolide antibiotic
- Some antiviral and anti-inflammatory effects
- Side effects: QT Prolongation
- Data insufficient to establish pros and cons of usage

[link](https://www.webmd.com/drugs/2/drug-1702/azithromycin-intravenous/details)
Antiviral Medications

- Lopinavir/ritonavir
  - Some in vitro activity against SARS and MERS
- Remdesivir
  - Activity against coronaviruses (MERS)
  - In vitro activity against SARS-CoV-2 (NEJM)
- Favipiravir
  - Influenza antiviral approved in China to treat COVID
- Oseltamivir

Efficacy of these medications not established, research underway

https://www.scientificamerican.com/article/a-promising-antiviral-is-being-tested-for-the-coronavirus-but-results-are-not-yet-out/
Steroids

• Corticosteroids
  – Only use if another indication (asthma/COPD)
  – Use low to moderate doses for short time period
  – Side effects: delayed viral clearance, diabetes, avascular necrosis

• Methylprednisolone
  – Possible mortality benefit with ARDS
Nebulized Medications

- Nebulizer sprays a fine, liquid mist of medication through a mouthpiece
- Theoretical risk of virus spread
- Use metered-dose inhalers (MDIs) as an alternative
Potentially Harmful Medications

- ACE Inhibitors (ACEIs) & ACE Receptor blockers (ARBs)
- Thiazolidinediones (rosiglitazone & pioglitazone)
- NSAIDS: French Tweet → WHO recommendation
  - Theory: These increase ACE2 receptors
  - COVID-19 uses ACE2 receptors for cell entry
- Not recommended to discontinue these meds
Fatality

- Overall case fatality rate is between 0.2% and 6.6%
- 80% of mortality cases are in patients >60 years old
- Age 70-79 years old: 8%
- Age >80 years old: 15%
- Chronic medical conditions → More severe illness

US Death rate as of April 10th: 3.6%
DISPO

• Discharge → Normal VS, clinically well appearing, uncomplicated PMHx
  – Quarantine Instructions
    • Self isolation/Social distancing
    • Cough into elbow or tissue
    • Discuss hand washing
    • Not touching face
    • Advise about contact with high risk patients
  – Supportive Care
  – Strict & detailed return precautions
    • Trouble breathing
    • Dehydration (not urinating, dry mouth, tachycardic)
    • More tired or not responding normally
    • Worsening symptoms

https://share.upmc.com/2020/03/self-quarantine/
Vaccination?

• No FDA approved vaccines exist
• At least 12-18 months to develop a vaccine
• [COVID-19 Vaccine Tracker](#)
Home “Decon” Routine

Develop your own system, be methodical and consistent!

• Essentials only to work!
  – No watch/jewelry/phone (fomite transmission!)
• Everything should be washable/throw away
  – Washable bag for work
  – Paper bag for food
• Station Pre-con (Chair, phone, keyboard, mouse, pens)
• Post-con → change clothes, shoes stay in garage, clothes into wash, shower, wipe down glasses/goggles
  – Be careful taking off your scrub top!

EPA: Disinfectants for USE Against SARS-CoV-2

**Disinfectants:** Bleach solution. To make a bleach solution, mix 1 tablespoon of bleach to 1 quart (4 cups) of water. For a larger supply, add ¼ cup of bleach to 1 gallon (16 cups) of water. Use the solution within 20 minutes.

https://www.alien.m.com/healthcare-providers-covid-keeping-clean-coming-home/
Helpful Websites for CoVID-19 Information

- **EMRAP CoVID-19 Response**
  - Variety of free resources EM:RAP is producing to support the EM community and their patients during this challenging time
- **Society of Critical Care Medicine - CoVID-19 Resource Center**
  - SCCM’s Critical Care for the Non-ICU Clinician provides online education to healthcare professionals who may benefit from critical care training. Be prepared with this free resource
- **EMCrit – Critical Care for Non-Intensivists during COVID19 Pandemic**
  - 8-10 hour curriculum for non-intensivists being tasked to take care of critically ill patients as a result of the COVID19 pandemic
- **Up To Date - Free Access on CoVID-19**
- **MD Calc COVID Resource Center**
- **American Society of Health System Pharmacists Evidence Summary**

https://wfmnews.com/news/lung_association_on_covid_and_patients_with_respiratory_issues
Thank you!

https://unitedwayofbrucegrey.com/thank-a-healthcare-worker-in-your-community/
Questions
References 1

References 2

References 3

- Basics
- Basics
  - Maine doctors taking a DIY approach to make up for shortage of protective gear.