SARS-CoV-2
the virus that causes COVID-19
...Even in deployment

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Disclosure

• No financial disclosures

• These are my opinions based on my own personal literature review, field experience and utilization of CDC & WHO; not the explicate views of the CENTCOM, Army or DoD
Agenda

• Background
• Symptoms
• Quarantine vs Isolation
• Levels of care
• Diagnosis
• Management
• Infection Control
Background

• All ages can be infected
  • In China:
    • 80% of deaths in >60yo
    • 75% pre-existing conditions (HTN, COPD, DM or heart disease)
    • 71% of cases male
  • 81% mild, 14% “severe” (require O2) and 3% are “critical” (ICU)
  • CFR 0.9% for previously healthy, 7% if DM, 6% if COPD/HTN/Ca

• Less fatal than MERS and SARS
• Infects less people than influenza
  • there have been at least 29 million flu illnesses
  • 280,000 hospitalizations
  • >16,000 deaths from flu including 105 pediatric deaths
  • Typical years ~1 in 10000 of all flu cases die – CFR 0.01%
Where are we in the spectrum?

**UNCLASSIFIED//FOUO**

**COVID-19 Cumulative Global Case Counts by Location & Status**

- **Notes:**
  - Global trends continue; decreasing active cases in China with increasing cases elsewhere.
  - Shutdowns, restrictions, etc. increasing across Europe and the US.

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**Confirmed Active Cases by Location & ICO Travel/Health Notices**

<table>
<thead>
<tr>
<th>Location</th>
<th>Active Cases</th>
<th>Deaths (Total)</th>
<th>Recovered (Total)</th>
<th>Confirmed Active Cases (China)</th>
<th>Confirmed Active Cases (Other)</th>
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<tbody>
<tr>
<td>China</td>
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</tbody>
</table>

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**Number of Individuals**

- 16,0000
- 14,0000
- 12,0000
- 10,0000
- 8,0000
- 6,0000
- 4,0000
- 2,0000
- 0

**Timeline:**

- 21 Jan
- 22 Jan
- 23 Jan
- 24 Jan
- 25 Jan
- 26 Jan
- 27 Jan
- 28 Jan
- 29 Jan
- 30 Jan
- 31 Jan
- 1 Feb
- 2 Feb
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- 11 Apr
- 12 Apr
- 13 Apr
- 14 Apr

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**Color Legend:**

- Red: Level 5 (Crisis): Avoid International Travel
- Amber + Level 4 (Alert): Practice Enhanced Precautions
- Green + Level 3 (Alert): Practiceusual Precautions
What are the symptoms?

- Lower respiratory infection
  - Cough
  - Shortness of breath
- Fever
- Other symptoms seen experienced in some include body aches, sore throat, runny nose and diarrhea

Incubation period:

- Range 2-14 days, most cases occur in 2-7 days and 5.2 days is mean
- Symptoms >14 days after potential exposure look for other etiologies
How is COVID spread?

• Person-to-person, appears similar to other coronaviruses and influenza
  • mainly via respiratory droplets produced when an infected person coughs or sneezes
  • Either via mucus membrane (mouths, noses, or eyes) or inhalation into the lungs.

• Able to survive on surface or object then transfers to fingers the touching mouth, nose, or possibly eyes, contributes to transmission

• We know that some people do shed COVID-19 in their feces but how much, if any, role this plays in spreading the infection remains unknown
Preventing Spread COVID-19

- There are **no** vaccines available
- The best way to prevent illness is to avoid being exposed to this virus (limiting travel to highly effected areas)
- CDC recommends everyday preventive actions to help prevent the spread of respiratory diseases, including:
  - **Cover your cough or sneeze with a tissue**, then throw the tissue in the trash.
  - Avoid close contact with people who are sick.
  - **Avoid touching your eyes, nose, and mouth.**
  - Recommend staying home when you are sick.
  - **Wash hands**

If soap and water are not readily available, use an alcohol-based hand sanitizer with at least 60% alcohol. Always wash hands with soap and water if hands are visibly dirty.
Facemask Recommendations

- Follow CDC’s recommendations for using a facemask.
  - CDC does not recommend that people who are well wear a facemask to protect themselves from respiratory diseases, including COVID-19.
  - Facemasks should be used by people who show symptoms AND had an exposure of COVID-19 to help prevent the spread of the disease to others.
Quarantine vs. Isolation

• Isolation and quarantine help protect the public by preventing exposure to people who have or may have a contagious disease.

• **Quarantine**: separates and restricts the movement of people who were **exposed** to a contagious disease to see if they become sick.

• **Isolation**: separates **sick people** with a contagious disease from people who are not sick. This is initiated by medical personnel.
Have you been in a level 2 or 3 area or had contact with a person who has been diagnosed with COVID-19?

- yes
  - Did this travel or contact occur in the past 2 weeks?
    - yes
      - Have you had fever (tem >100.5F) cough or shortness of breath in the past 2 weeks?
        - yes
          - Send person to medical clinic for further evaluation to determine if they are PUI or did not have true exposure
        - no
          - Quarantine** for 14 days
    - no
      - Cleared/done

- no
  - Cleared/done
Evaluation of possible PUI

Criteria to Guide Evaluation of PUI for COVID-19

Local health departments, in consultation with clinicians, should determine whether a patient is a PUI for COVID-2019. The CDC clinical criteria for COVID-19 PUIs have been developed based on available information about this novel virus, as well as what is known about Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS). These criteria are subject to change as additional information becomes available.

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

- Do they have an alternative diagnosis which is more likely?
  - CAP
  - CHF
  - URI
Quarantine

• Try to keep your groups small (<10)
• Total duration of time is 14 days
  • if the person remains without signs of illness
  • Unless someone in the group becomes symptomatic then reset the clock
• If they become sick remove them from quarantine and send to medical

• Have a separate latrine for them (shower and toilette)

• Unit should provide the following:
  • Food- left outside the door
  • Laundry- place in plastic bag, then dump into washer without touching

• Person
  • Can go outside
  • Can exercise outside
  • May NOT go to Gym/MWR/DeFac/Chapel
  • Does not need a mask on when in tent
Isolation

- For monitoring +/- medical care of sick patients
  - Nursing will provide:
    - monitoring 3x/day
    - Food
    - Medication/IVF as needed

- Full PPE must be worn to enter
- Limit access as much as possible
- Will still need latrines for toileting

- Needs to be either in a **negative pressure room** or separate from the rest of the medical facility if intubated
Isolation Levels of Care

- **Mild** - patient you would typically send home if in your home country
  - Needs only to be checked by nurses 3 times a day to determine if progressing and to collect lab tests once asymptomatic

- **Moderate** - patients you would typically admit to a ward
  - May require schedule OTC medications, IVF, 1-2lpm O2
  - Requires separate space but not negative pressure = utilize a ward area or rooms that will contain the patient away from other patients but is close so nursing can check on them and oxygen can be provided

- **Severe** - requires ICU level care, ie pressors, higher flow oxygen, mechanical ventilator
  - Requires **negative pressure** room = utilize a separate tent
Diagnostic Testing

- Do **NOT** send samples to Host Nation labs or CDC or any other location
- Do **NOT** collect sample until just prior to shipping
  - 72hr limit for wet ice
  - 10-14 days on dry ice

Lab testing:
- Collect 2 sets of swabs
  - Acceptable swabs are BD Universal Transport or HealthLink Floq S
  - A set is defined as 1 OP & 1 NP placed in 1 vial of VTM together
- 1 set is for BioFire
- 1 set is for SARS-CoV-2 testing at LRMC
Submitting testing

- Package the sample
- Complete the Reporting form
- Send on wet/dry ice

Each vial contains a NP & an OP swab along with liquid VTM
ACR Recommendations for the use of Chest Radiography and Computed Tomography (CT) for Suspected COVID-19 Infection

• CXR findings in COVID-19 are non-specific and overlap with other infections

• “CT should be used sparingly and reserved for hospitalized symptomatic patients with specific clinical indications for CT”

Radiology

• Mixed and diverse pattern
  • <7days
    • 72% air bronchograms
    • 40% GGO, 34% consolidation, 62% GGO + reticular pattern
    • 10% pleural effusion
  • Later phase (8-14days)
    • Progression of GGO, bronchus distortion & effusion
  • Advanced-phase
    • GGO decreases
    • 22% pleural effusion

Cavitation and tree-in-bud favor alternative etiology
Clinical Course

- **Most common symptoms:**
  - Fever, cough, sputum production, fatigue

- **Complications:**
  - Sepsis > resp failure/ARDS > heart failure, shock, coagulopathy > AKI, secondary infection

- **Death vs discharge:**
  - 18.5 days vs 22 days
  - Atherosclerosis directly contributing to plaque rupture vs potential direct cardiac involvement of the virus
Predicting severity of Illness

• D-dimer >1mcg/L, LDH, Ti, ferritin
• Having a comorbidity: HTN, DM, CAD, COPD, CKD
• Age
• High SOFA score
  • P:F, PLT, Bili, MAP, GCS, creat
• CURB-65 >3-5
  • Confusion, uremia, RR>30, SBP <90, Age >65
• Procalcitonin not helpful

Relation Between Chest CT Findings and Clinical Conditions of Coronavirus Disease (COVID-19) Pneumonia: A Multicenter Study

• Extent of lung involvement correlates with the severity of symptoms and prognosis of the patient
Treatment

- There are **no antivirals** available
- Supportive (treat similar to flu)
  - Tylenol for fever
  - Motrin for pain?
  - Anti-vomiting medication
  - IVF (should be conservative if ARI present)
- Sepsis Physiology
  - Vasopressors
    - 1st line norepi
    - 2nd line epi or vasopressin
- If sepsis consider co-infection
  - Start empiric abx w/in 1hr of sepsis (CAP vs HAP)
- Therapy to avoid
  - steroids
- Investigational
  - Remdesivir
  - Other antivirals
Respiratory Treatment

• Avoid
  • HFNC (results in aerosolization)
  • NIPPV (not a rapidly reversible process)

• Options
  • NC O2 (goal >94% sat)
  • Mechanical Ventilation
    • ARDS net protocol: low TV 4-6ml/kg and PEEP
    • Paralysis
    • Proning 12-16hrs/day

• When all fails consider ECMO
Treatment Considerations

- Enteral nutrition
- H2 blocker if at inc risk of ulcer
- Turning patients q2hrs
- Central line placement
- A-line
Caring for COVID-19 Patient

• Healthcare workers should wear the following:
  • Gloves
  • N-95
  • Gown
  • Eye protection

• Healthcare workers should avoid touching their own skin until all PPE is off and they have washed their hands

• Change PPE when switching to a new patient
  • While supplies are limited can use same N-95 for entire shift and up to 48hrs
  • Googles can be worn and cleaned at the end of each day via bleach dip
Isolation Discharge Criteria

• 7 days from diagnosis have passed plus
• Resolution of fever for 48hrs (also must be off antipyretic)
• Improvement/resolution of respiratory symptoms plus
• 2 contiguous negative COVID-19 PCR test which were done 24hrs apart

• Patient’s level of medical care may be stepped-down at any time but they must remain in isolation until all 3 criteria are met
Survivability on surfaces

Coronavirus Disease 2019

Survival of SARS-CoV-2 on Environmental Surfaces

- Survivability of coronaviruses is variable
  - Ideal conditions, 4°C and 20% humidity, some live for 28 days on steel surface
  - At room temp Metal, cloth & filter paper can’t to have detectable virus on d5 but were not found on wood, glass, mosaic, plastic
  - Once dried on plastic are viable up to 5 days
  - Survive longer in cold dry weather
  - Direct UV light from the sunshine helps kill the virus

- SARS/MERS variable on surfaces 24-72 hours

Infection Control

• **Surfaces- daily**
  
  • Wipe down daily "high-touch" surfaces, such as counters, tabletops, doorknobs, bathroom floors/sinks/showers, toilets, phones, keyboards, tables, light switches
    • Can use disinfectant on a sponge or rag or use disposable saniwipes
    • EPA web site has a list of approved products

• **Use a diluted bleach solution**
  
  • To make a bleach solution, add 60 mL (2 oz) of bleach to 4 L of water.

• **Linens**: make sure they are laundered in between use, dryer should be “hot” temp

• **Hands**: Alcohol-based hand disinfectants and common hospital personal disinfectants are all effective against COVID-19
  
  • Reuse frequently, especially before touching your face or eyes
Questions

**Pressing the flesh**
Transfer of bacteria relative to a moderate-strength handshake, %

- Moderate handshake
- Strong handshake
- Prolonged high five
- High five
- Prolonged fist bump
- Fist bump

Source: "The fist bump: a more hygienic alternative to the handshake" by S. Mela and D. Whitworth, American Journal of Infection Control 2014

The Economist