COVID-19 Considerations in the Deployed Setting

27 May 2020

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Disclosure

This presentation is based on the presenter’s personal literature review, field experience and utilization of Centers for Disease Control and Prevention and the World Health Organization. It does not represent the views of the Department of Defense or the Joint Trauma System, nor does it serve as official guidelines.
Agenda

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

- **All ages can be infected.**
  - In China:
    - 80% of deaths are in >60 year olds
    - 75% pre-existing conditions – hypertension (HTN), chronic obstructive pulmonary disease (COPD), diabetes mellitus (DM), cancer (Ca) or heart disease
    - 71% of cases are male
  - 81% mild, 14% “severe” (require O2) and 3% are “critical” (ICU)
  - In the U.S.:
    - Fatality in those >85y/o = 10-27%, 65-85y/o = 3-11% and <1% in those 20-54%
    - 20-31% are hospitalized and 4.9-11.5% admitted to ICU

US Department of Health and Human Services/Centers for Disease Control and Prevention MMWR / March 27, 2020 / Vol. 69 / No. 12
Background

- Less fatal than Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS)

- Influenza
  - Annually about 9-45 million flu illnesses
  - 140,000-810,000 hospitalizations annually
  - 12,000-61,000 deaths annually
  - Typical years ~1 in 10000 of all flu cases die – CFR 0.01%

- COVID-19: fatality rate is higher than Influenza but the spread is not yet determined as the pandemic has continued accross the globe
  - [per WHO SitRep 84] (in US case fatality rate is 1.8-3.4%)

Influenza numbers are based on CDC 2010-19
As of 7:12pm CEST, 27 May 2020, there have been 5,491,678 confirmed cases of COVID-19, including 349,190 deaths, reported to WHO.

Where Are We in the Spectrum?

Total confirmed COVID-19 deaths: how rapidly are they increasing?

Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be an accurate count of the true number of deaths from COVID-19.

These lines show the trajectories for doubling times of 1, 2, 3, 5, and 10 days. If the slope that a country is on is steeper than a particular grey line, then the doubling time of confirmed cases in that country is faster than that.

Source: European CDC – Situation Update Worldwide – Last updated 27th May, 11:00 (London time)
What are the Symptoms?

- Lower respiratory infection
  - Cough
  - Shortness of breath
- Fever (>38° C/100.4 °F)
- Other symptoms seen experienced in some include body aches, sore throat, loss of smell 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

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever (temp ≥ 37°C)</td>
<td>180</td>
<td>(94%)</td>
</tr>
<tr>
<td>Cough</td>
<td>151</td>
<td>(79%)</td>
</tr>
<tr>
<td>Sputum</td>
<td>44</td>
<td>(23%)</td>
</tr>
<tr>
<td>Myalgia</td>
<td>29</td>
<td>(15%)</td>
</tr>
<tr>
<td>Fatigue</td>
<td>44</td>
<td>(23%)</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>9</td>
<td>(5%)</td>
</tr>
<tr>
<td>Nausea or vomiting</td>
<td>7</td>
<td>(4%)</td>
</tr>
</tbody>
</table>
How is COVID-19 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 and then transfers to fingers. Touching mouth, nose or eyes contributes to transmission.
- We know 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 of 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**; 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

- CDC does not recommend people who are well wear a surgical/medical mask to protect themselves from respiratory diseases, including COVID-19.

- CDC does recommend people who show symptoms AND had an exposure of COVID-19 wear facemasks to help prevent the spread of the disease to others.

- CDC does recommend the general wear of cloth face coverings for the general public when they are in spaces where they cannot maintain 6 feet of space around them.
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.
Screening Algorithm

Have you been in had contact with a person who has been diagnosed with COVID-19?

YES

Did this contact occur 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

See next page

NO

Quarantine* * for 14 days

Have you had fever (temp >100.5F) cough or shortness of breath in the past 2 weeks?

YES

Cleared

NO

Cleared

No BUT has symptoms

No AND symptom free

Yes but symptom free

Cleared

No BUT has symptoms

Cleared

Cleared

* for 14 days
Evaluation

**Symptoms**
Fever/chills, body aches, cough, sore throat, runny nose, nasal congestion, chest pain, SOB, difficulty breathing or GI symptoms

**AND**
1. Close contact with a laboratory-confirmed COVID-19 patient within 14 days of onset or
2. Travel to a level 2 or 3 country with 14 days

**OR**
1. Age ≥60?
or
2. History of asthma, COPD, other lung disease, diabetes, cancer, pregnant, CHR or other CV disease, renal disease, liver disease, other immunocompromised condition, including inflammatory disorder or use of immunomodulators, or
3. Severe or worsening of symptoms (progressive cough, difficulty breathing, chest pain, rapid breathing, hypoxia

**OR**
1. Hospitalized patient who develops signs/symptoms consistent with COVID-19 with alternate explanation in order to inform decisions related to infection control?

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**Return to unit for 14-day quarantine (self-monitor symptoms-return medical if new or progressive symptoms.**

**Obtain 2 NP specimens. Send first NP swab for respiratory BioFire.**

**Respiratory BioFire Result**

- (+) Treat accordingly if symptoms fit with Dx (e.g., Oseltamivir for flu)
- (-) Admit patient to isolation (mild/mod/severe) while awaiting results.

**Alternative diagnosis more likely (i.e. heart failure, asthma, allergy)**

**No testing needed**
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
- Quarantined Person
  - Can go outside
  - Can exercise outside
  - **May NOT go to Gym/MWR/DeFac/Chapel**
  - Does not need a mask on when in tent

**Quarantine**

- 14 DAYS
- **Coronavirus Quarantine**

**Military Logo**

- FIRST TO CARE
- ANYTIME, ANYWHERE
- WARRIOR MEDICS
Isolation

- For monitoring +/- medical care of sick patients
  - Nursing will provide:
    - Monitoring 3x/day
    - Food
    - Medication/IVF as needed
- Full personal protective equipment (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.

Source: Economic Times
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**: Patient you would typically admit to a ward
  - May require- schedule OTC medications, IVF fluid, 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**: Patient requires ICU level care (i.e. pressors, higher flow oxygen, mechanical ventilator)
  Requires **negative pressure** room = utilize a separate tent
Diagnostic Testing

- **Do NOT send samples to Host Nation labs unless cleared by AOR Commanding Surgeon**—send to the closest Role with PCR testing capability.

- **Do NOT collect sample until just prior to shipping.**
  - 72 hour limit for wet ice
  - 10-14 days on dry ice

- **Lab testing:**
  - Collect 2 swabs
    - Acceptable swabs are BD Universal Transport or HealthLink Floq Swab
    - Nasopharyngeal swab is preferred over Oropharyngeal swab. Place in 1 vial of viral transport media (VTM) together
      - 1 is for BioFire Respiratory panel
      - 1 is for BioFire COVID-19 testing
Test Sample Submission

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

Each vial contains a NP +/- OP swab along with liquid VTM
Interpretation of Results

- **A Positive is positive**: If the test comes back positive the PUI is now diagnosed with COVID-19 and needs to remain in isolation until time completed (see separate slide)
  - Additionally, persons quarantined b/c of this patient need to remain in quarantine for the full 14 days

- **A Negative does not clear them of diagnosis** as there is a rate of false negative. Re-assess the patient.
  - If symptoms are still concerning for COVID keep the patient in isolation until time completed.
    - *Quarantined individuals must complete 14 days.*
  - If symptoms are clearly more consistent with an alternative diagnosis then (per CJTF-OIR guidance) then consider continuing quarters for 48 hours or only completing 10 days of isolation
    - *Quarantined individual can be released early.*
False Negatives

- When diagnostic testing is negative, the possibility of a false negative result should be considered in the context of a patient’s recent exposures and the presence of clinical signs and symptoms consistent with COVID-19. *(Fact Sheet for Healthcare Providers, ID NOW COVID-19- Abbott Diagnostics Scarborough, Inc. Mar 27, 2020.)*
  - The possibility of a false negative result should especially be considered if the patient’s recent exposures or clinical presentation indicate that COVID-19 is likely, and diagnostic tests for other causes of illness (e.g., other respiratory illness) are negative.
  - If COVID-19 is still suspected based on exposure history together with other clinical findings, re-testing should be considered by healthcare providers in consultation with public health authorities.

- A false negative BioFire COVID-19 test result may occur when the concentration of virus in the sample is below the device limit of detection. *(Source: BioFire Defense, LLC)*
  - Detection of viral nucleic acid is dependent upon proper sample collection, handling, transportation, storage and preparation. Failure to observe proper procedures in any one of these steps can lead to incorrect results.
ACR recommendations for the use of chest radiology and computed tomography (CT) for suspected COVID-19 infection, Mar 11, 2020

- 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.”

CT features of COVID-19 pneumonia in 62 patients in Wuhan, China, Mar 5, 2020

Mixed and diverse pattern

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

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

**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

Clinical characteristics of 138 hospitalized patients with 2019 novel Coronavirus-infected pneumonia in Wuhan, China, Feb 7, 2020

- 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, creatine
- CURB-65 >3-5
  - Confusion, uremia, RR>30, SBP <90, Age >65
- Procalcitonin not helpful

Relation between chest CT findings and clinical conditions of COVID-19 pneumonia: a multicenter study, Mar 5, 2020

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 acute respiratory infection is present)
- Sepsis Physiology
  - Vasopressors
    - 1\textsuperscript{st} line norepi
    - 2\textsuperscript{nd} line epi or vasopressin
- If sepsis consider co-infection: Start empiric antibiotics within 1 hour of sepsis (community acquired pneumonia vs hospital acquired pneumonia).
- Therapy to avoid: Steroids unless several days into course and patient develops acute SEPSIS physiology
- Clinical Trials available at Role 3 and LRMC
  - Remdesivir
Respiratory Treatment

● Avoid
  o High flow nasal cannula (HFNC) - results in aerosolization
  o Non-invasive positive pressure ventilation (NPPV) - not a rapidly reversible process)

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

● When all fails consider extracorporeal membrane oxygenation (ECMO)
### Ventilators

Zoll 731 and LTV 1000 reasonable vents to use for COVID in deployment as they allow adjustment of volume, provide PEEP, & can provide 100% FiO2

<table>
<thead>
<tr>
<th>Ventilator model</th>
<th>Hamilton T1</th>
<th>Zoll 731 (EMV+, Eagle II)</th>
<th>Impact 754 (Eagle/UniVent)</th>
<th>SAVe I</th>
<th>SAVe II</th>
<th>LTV 1000</th>
<th>PB 980</th>
</tr>
</thead>
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<td>BL (BiPAP)</td>
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<tr>
<td>Control (backup)</td>
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<td></td>
<td>true</td>
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<tr>
<td>CMV</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Breaths/min**
  - 1 - 80
  - 1 - 80
  - 1 - 150
  - fixed 10
  - 8 - 30
  - 1 - 80
  - 1 - 100

- **I:E ratio**
  - 1:1.9 - 1:4.1
  - 1:1 - 1:99.9
  - 1:1 - 1:599
  - 1:2
  - 1:2
  - 1:99 - 4:1
  - 1:1 - 1:299

- **Inverse I:E**
  - X
  - Ti 0.1 - 5.0
  - X
  - no
  - no
  - X
  - 2:1 - 149:1

- **Tidal Volume (mls)**
  - 20 - 2000mL
  - 50 - 1500mL
  - 0 - 3000mL
  - fixed 600mL
  - 200 - 800
  - 50 - 2000
  - 25 - 2500

- **PIP (cmH2O)**
  - 0 - 60
  - 10 - 80
  - 0 - 100
  - 38
  - 10 - 60
  - 0 - 120
  - 0 - 125

- **PEEP (cmH2O)**
  - 0 - 35
  - 0 - 30 (AC modes)
  - 1 - 20
  - 0 (< 2)
  - 0 - 10
  - 3 - 40
  - 0 - 45

- **PS (cmH2O)**
  - 0 - 60
  - 0 - 60 (SIMV, CPAP)
  - X
  - X
  - X
  - 1 - 60
  - 0 - 70

- **FiO2**
  - 21 - 100%
  - 21 - 100%
  - 21 - 100%
  - 21 - 62%
  - 21 - 100%
  - 21 - 100%
  - 21 - 100%

- **Maximum Flow Rate (LPM)**
  - 80
  - 100 @ 40 cmH2O PIP
  - 60
  - 16
  - 36
  - 100
  - 150

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POC: Dr. Pat Meza
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Optimal location of filters for humidification and decreasing viral aerosol.
Treatment Considerations

- Enteral nutrition
- H2 blocker if at risk of ulcer
- Turning patients every 2 hours
- 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
  - N-95 can be rotated each day (A, B, C, D) and then reused on day 5
  - Googles can be worn and cleaned at the end of each day

For more information: [www.cdc.gov/COVID19](http://www.cdc.gov/COVID19)
Isolation Discharge Criteria

1. 10 days from diagnosis have passed

   plus

2. Resolution of fever for 72 hours (also must be off antipyretic)

   plus

3. Improvement/resolution of systemic & respiratory symptoms
   (may still have a lingering cough)

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.
Clearing a Patient from Isolation
(time-based, non-testing strategy)

<table>
<thead>
<tr>
<th>Patient can be released on day 17 (14+3)</th>
<th>Mandatory 10 day isolation</th>
<th>Patient has symptoms for 14 days</th>
<th>Mandatory 3 day symptom free</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient can be released on day 13 (10+3)</td>
<td>Mandatory 10 day isolation</td>
<td>Patient has symptoms for 10 days</td>
<td>Mandatory 3 day symptom free</td>
</tr>
<tr>
<td>Patient can be released on day 10 (minimum isolation time)</td>
<td>Mandatory 10 day isolation</td>
<td>Patient has symptoms for 7 days</td>
<td>Mandatory 3 day symptom free</td>
</tr>
<tr>
<td>Patient can be released on day 10 (minimum isolation time)</td>
<td>Mandatory 10 day isolation</td>
<td>Patient has symptoms for 2 days</td>
<td>Mandatory 3 day symptom free</td>
</tr>
</tbody>
</table>
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 do not have detectable virus on d5 but were not found on wood, glass, mosaic, plastic
  - Once dried on plastic: 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 sanitary wipes.
  - 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, %

References


