Treatment of COVID-19 in the Hospitalized Patient

Michelle Harkins, MD
Pulmonary/Critical Care
The symptoms of coronavirus disease [COVID-19]

The most common signs and symptoms of 55,924 laboratory confirmed cases of COVID-19, reported from China in the period up to February 22, 2020.

- Fever: 87.9%
- Dry cough: 67.7%
- Fatigue: 38.1%
- Sputum production: 33.4%
- Shortness of breath: 18.6%
- Muscle pain or joint pain: 14.8%
- Sore throat: 13.9%
- Headache: 13.6%
- Chills: 11.4%
- Nausea or vomiting: 5%
- Nasal congestion: 4.8%
- Diarrhoea: 3.7%

Many of the most common symptoms are shared with those of the flu or cold. So it is also good to know which common symptoms of the flu or the common cold are not symptoms of COVID-19. COVID-19 infection seems to rarely cause a runny nose.


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Lab findings

- WBC normal, with low Lymphocytes
- Mild Thrombocytopenia (> 100K)
- Moderate hypoxemia
- ABG: Mild acidosis with normal lactate and severe base deficit
- Elevated LDH, Very high CRP, Elevated CK
- Normal Procalcitonin (If elevated, may mean bacterial involvement)
- D-Dimer may be elevated
- LFTs elevated in 30% pts
- Low PTT in 30% pts
- Variable glycemic control
Coronavirus: early-stage case fatality rates by underlying health condition in China

Case fatality rate (CFR) is calculated by dividing the total number of deaths from a disease by the number of confirmed cases. Data is based on early-stage analysis of the COVID-19 outbreak in China in the period up to February 11, 2020.

- Cardiovascular disease: 10.5%
- Diabetes: 7.3%
- Chronic respiratory disease: 6.3%
- Hypertension: 6%
- Cancer: 5.6%
- No health condition: 0.9%

10.5% of people with a cardiovascular disease who were diagnosed with COVID-19 died. Individuals with underlying health conditions are more vulnerable than those without.


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COVID-19 Clinical Pearls

**Incubation Period:**
Median: 5 days (range 2-14 d)

**Most Common Symptoms***
1. Fever
2. Cough
3. Dyspnea

**Common Laboratory Findings**
1. Lymphopenia (1.5x10^9/L)
2. Elevated LDH
3. Elevated D-dimer
4. Elevated CRP
5. Normal Procalcitonin

**Patterns of Disease**
1. Mild Respiratory Infection (80% of cases)
2. Non-Life-threatening Pneumonia
3. Severe Pneumonia and ARDS

**Risk Factors for Severe Disease***
1. Age (>60 years)
2. Co-morbidities:
   - Cardiovascular Disease
   - Diabetes
   - Hypertension
   - Chronic Obstructive Pulmonary Disease

**Radiographic Findings**
1. Chest CT (abnormal in ¾ of patients):
   - Ground Glass Opacities
   - Local or bilateral patchy infiltrates

*Other symptoms: Fatigue, Expectoration, Headache, Myalgia, Diarrhea
**Other laboratory findings: leukopenia, thrombocytopenia, increased transaminases, leukocytosis
***Few children have developed severe disease ****
Guiding principles

• Clinical judgement for disposition—home, ward, ICU
  • Consider risk factors such as age, comorbid conditions and disease severity for admission
• Judicious fluid and oxygen management
• Droplet and Airborne Isolation, appropriate PPE for providers, have a buddy
  • Limit visitors
• Watch for superinfection and clinical worsening—late cardiomyopathy seen
• Limit aerosolizing procedures (nebs, bipap, high flow oxygen)
• Supportive care is mainstay
• Avoid NSAIDS BMJ 2020  [http://www.bmj.com/content/368/bmj.m1086](http://www.bmj.com/content/368/bmj.m1086)
• Intubate early
  • Lung protective ventilation for those needing vents
RECOMMENDATIONS FOR COVID-19 intubation

**USE**
- Upgrade to N95 mask
- Wear fluid-resistant gown, standard gloves, a face shield
- Use negative-pressure isolation room
- Use Rapid Sequence Intubation (full dose paralytic)
- Use video laryngoscopy (limit your proximity)

**AVOID**
- Avoid high-flow O2 (Bipap, Nebs, high flow nasal, >6L/min)
- Don't allow non-critical staff in room
- Avoid bagging (when critical, 2-hand seal & viral filter)
- Avoid prolonged intubation attempt (use most qualified & quickest technique)
- Avoid open circuit (viral filter or clamp on ETT if disconnected)
- Don't bring used PPE outside the room

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Some of the text is in bold for emphasis. The recommendations are meant to provide a reasonable approach. The information is based on available evidence and expert opinions. Please consult local guidelines and protocols. This information is not to be considered medical advice. Updated recommendations are available.
Potential therapies—not enough data to suggest routine usage

• Chloroquine 500 mg BID for 10 days
  • Hydroxychloroquine 200mg BID

• Tocilizumab 8mg/kg IV once

• Vitamin C 24 gm IV daily for 7 days

• Lopinavir/ritonavir (KALETRA) 200/50mg 2cap BID for 10 days

• Remdesivir acts in vitro, compassionate use

• Corticosteroids—may increase risk of infection, NOT recommended
A Seattle Intensivist’s One-pager on COVID-19

Nomenclature
Infection: Coronavirus Disease 2019 a.k.a. COVID-19
Virus: SARS-CoV-2, 2019 Novel Coronavirus
NOT “Wuhan Virus”

Diagnosis/Presentation
Symptoms
- 65-80% cough
- 45% febrile on presentation (85% febrile during illness)
- 20-40% dyspnea
- 15% URI symptoms
- 10% GI symptoms

Labs
- CBC: Leukopenia & lymphopenia (80%+)
- BMP: ↑BUN/Cr
- LFTs: ↑AST/ALT/Tbil
- ↑D-dimer, ↑CRP, ↑LDH
- ↑IL-6, ↑Ferritin
- ↓Procalcitonin
- PCT may be high w/ superinfection (rare)*

Imaging
- CXR: hazy bilateral, peripheral opacities
- CT: ground glass opacities (GGO), crazy paving, consolidation, "rarely may be unilateral"

POCUS: numerous B-lines, pleural line thickening, consolidations w/ air bronchograms

Isolation
- Phone call is the best isolation (e.g. move to teledis)
- Place patient in mask, single room, limit/visitor restrictions

Precautions
- In correct sequence: STANDARD + CONTACT (double glove) + either AIRBORNE (for aerosolizing procedures: intubation, extubation, NIPPV, suctioning, etc) or DROPLET (for everything else)
- N95 masks must be fit tested; wear eye protection
- PPE should be donned/doffed with trained observer
- Hand hygiene: 20+ seconds w/ soap/water or alcohol containing hand gel

Treatment
- Isolate & send PCR test early (may take days to result)
- GOC discussion / triage
- Notify DOH, CDC, etc
- Fluid sparing resuscitation
- ± empiric antibiotics
- Intubate early under controlled conditions if possible
- Avoid HFNC or NIPPV (aerosolizes virus) unless individualized reasons exist (e.g. COPD, DNI status, etc; consider helmet mask interface if available) if using NIPPV
- Mechanical ventilation for ARDS
  - LPV per ARDSnet protocol
  - 7 P’s for good care of ARDS patients: e.g. PEEP/Paralytics/Proning/inhaled Prostacyclins, etc
  - ? High PEEP ladder may be better
  - ? ECMO in select cases (unclear who)
- Consider using POCUS to monitor evolve lungs
- Investigational therapies:
  - Remdesivir – block RNA dependent polymerase
  - Chloroquine – block viral entry in endosome
  - Oseltamivir – block neuraminidase
  - Lopinavir/ritonavir – inhibit protease inhibitor
  - Tocilizumab – block IL-6 (reduce inflammation)
  - Corticosteroids – block T-cells (reduce inflammation)

None of these investigational therapies is proven, but literature is evolving quickly.

Prognosis
- Age and comorbidities (DM, COPD, CVD) are significant predictors of poor clinical outcome; admission SOFA score also predicts mortality.
- Lab findings also predict mortality:
  - ↑ d-dimer
  - ↑ ferritin
  - ↑ troponin
  - ↑ cardiac, myoglobin
- Expect prolonged MV
- Watch for complications: Secondary infection (VAP), Cardiomyopathy

# FlattenTheCurve - same AUC
but distributed over a longer time, ensuring that hospitals don’t exceed capacity

\# of hospitalized patients
\# of deaths

time from onset of outbreak

city capacity

v2.3.0 2020-03-15

@nickmark

RICK MARX, MD
Additional resources

• https://jamanetwork.com/journals/jama/pages/coronavirus-alert
• https://docs.google.com/document/d/111k1L5D9TZNShV5Gr2AJ7grfuxmEx_dYXAZcNwEebQI/mobilebasic
• https://www.sccm.org/disaster
• Zhou et al. Lancet 2020
The Sequential Organ Failure Assessment (SOFA) Score is a mortality prediction score that is based on the degree of dysfunction of six organ systems.

The score is calculated on admission and every 24 hours until discharge using the worst parameters measured during the prior 24 hours.

The scores can be used in a number of ways:

- As individual scores for each organ to determine progression of organ dysfunction.
- As the sum of scores on one single ICU day.
- As the sum of the worst scores during the ICU stay.

Cr, Bili, MAP, GCS, platelets, PaO2, FiO2, on mechanical ventilation

Higher score, more likely mortality