2019-nCoV Literature Situation Report (Lit Rep)

May 19, 2020

The scientific literature on COVID-19 is rapidly evolving and these articles were selected for review based on their relevance to Washington State decision making around COVID-19 response efforts. Included in these Lit Reps are some manuscripts that have been made available online as pre-prints but have not yet undergone peer review. Please be aware of this when reviewing articles included in the Lit Reps.

Key Takeaways

- **The probability of a false negative SARS-CoV-2 RT-PCR test result varies significantly over the disease course. The false negatives rate was lowest between symptom onset (38%) and 3 days following symptom onset (20%). The probability of receiving a false negative test result may be as high as 67% on the day prior to symptom onset.**
- **Data from France and Switzerland suggest that children may experience acute heart failure and multisystem inflammatory syndrome following SARS-CoV-2 infection.**
- **Individuals with pre-symptomatic SARS-CoV-2 infection have sufficient viral shedding to contaminate 36% of tested surfaces in a quarantine hotel room with viral RNA, including the pillow cover, sheets, and duvet covers.**
- **By categorizing potential COVID-19 cases based on their combined likelihood of infection and likelihood of a poor outcome if infected, it is possible to make optimal use of single-occupancy rooms. Reduced occupancy multi-bedded bays on wards designated for suspected COVID-19 patients can be used to "cohort" patients at lower risk of server outcomes.**

Non-Pharmaceutical Interventions

- Patterson et al. evaluated a clinical triaging tool with four categories based on likelihood of having COVID-19 and risk of having a poor health outcome. Individuals with lowest likelihood of having COVID-19 and highest risk of having a poor outcome were prioritized for single-occupancy rooms while the others groups were "cohorted" by putting them in reduced occupancy multi-bedded bays on wards designated for suspected COVID-19 patients. Among 93 patients suspected of having COVID-19, 79 (85%) received a COVID-19 diagnosis at some point during admission. Of the 14 without COVID-19, 10 had been placed in the low-likelihood/high-risk category and were admitted to single-occupancy rooms. 28 (30%) of the suspected COVID-19 patients were evaluated to be low risk and thus eligible for cohorting. No symptomatic hospital acquired infections were detected in the cohorted patients.

  Patterson et al. (May 18, 2020). A Novel Cohorting and Isolation Strategy for Suspected COVID-19 Cases during a Pandemic. Pre-print downloaded May 19 from https://doi.org/10.1101/2020.05.14.20091843

Transmission

- Jiang et al. investigated environmental contamination in quarantine hotel rooms after being occupied by 2 pre-symptomatic SARS-CoV-2 positive patients. SARS-CoV-2 RNA was detected on 36% (8/22) of tested surfaces, as well as on the pillow cover, sheets, and duvet cover.

  Jiang et al. (May 18, 2020). Detection of Severe Acute Respiratory Syndrome Coronavirus 2 RNA on Surfaces in Quarantine Rooms. Emerging Infectious Diseases. https://doi.org/10.3201/eid2609.201435

- Infectious SARS-CoV-2 virus was isolated from feces of a patient in China who died of COVID-19 disease, suggesting there could be potential for fecal-oral or fecal-respiratory transmission.

  Xiao et al. (May 18, 2020). Infectious SARS-CoV-2 in Feces of Patient with Severe COVID-19. Emerging Infectious Diseases. https://doi.org/10.3201/eid2608.200681

Testing and Treatment

- Pinto et al. describe an antibody (S309) that neutralizes SARS-CoV-2. This antibody was identified from memory B cells of a person infected with SARS-CoV in 2003. The S309 antibody functions by engaging the SARS-CoV-2 spike glycoprotein receptor-binding domain, the region that facilitates the SARS-CoV-2 virus' entry into host cells.
- These findings can be used to facilitate development of S309- and S309-containing antibody therapies for prophylactic use in individuals at high risk of exposure or as a post-exposure therapy to limit or treat severe disease.

  Pinto et al. (May 18, 2020). Cross-Neutralization of SARS-CoV-2 by a Human Monoclonal SARS-CoV Antibody. Nature. https://doi.org/10.1038/s41586-020-2349-y

- Current confirmed COVID-19 case counts in the US underestimate the total burden of the SARS-CoV-2 due to incomplete testing, driven by limited test availability, which is restricted primarily to individuals with moderate to severe symptoms. Imperfect diagnostic accuracy of the tests also contributes to an undercount of cases.
- Wu et al. estimated that there were 6,275,072 cumulative SARS-CoV-2 infections in the US, compared to 721,245 confirmed cases (1.9% vs. 0.2% of the population) as of April 18, 2020. The authors estimated that approximately 86% of this difference was due to incomplete testing, while 14% was due to imperfect test accuracy.

  Wu et al. (May 18, 2020). Substantial Underestimation of SARS-CoV-2 Infection in the United States Due to Incomplete Testing and Imperfect Test Accuracy. Pre-print downloaded May 19 from https://doi.org/10.1101/2020.05.12.20091744

- Kucirka et al. found that the probability of a false negative SARS-CoV-2 test result using RT-PCR varied significantly over the disease course. Among 1,330 patients, the false negative rate was lowest between symptom onset (38% false negative rate) and 3 days following symptom onset (20% false negative rate).
- Prior to symptom onset, patients had a high probability of receiving a false negative test result (100% at 4 days prior to symptom onset, decreasing to 67% at 1 day prior to symptom onset). The probability of receiving a false negative increased again 4 days after symptom onset (21%) to 16 days following symptom onset (66%).

- These findings suggest that RT-PCR test results for SARS-CoV-2 should be interpreted cautiously, particularly early in the course of infection. Infection should not be ruled out on the basis of RT-PCR alone if clinical and epidemiological evidence is strongly suggestive of SARS-CoV-2 infection.

  Kucirka et al. (May 13, 2020). Variation in False-Negative Rate of Reverse Transcriptase Polymerase Chain Reaction-Based SARS-CoV-2 Tests by Time Since Exposure. Annals of Internal Medicine. https://doi.org/10.7326/M20-1495

- The authors describe clinical outcomes for the first tocilizumab-treated cohort of 11 critically-ill patients with COVID-19 in the United States. Patients experienced mixed outcomes, highlighting the need for randomized trial data.
- Although C-reactive protein levels decreased in all patients following treatment (median 211.6 mg/L pre-treatment vs. 19.7 mg/L at 5 days post-treatment), patients had higher IL-6 concentrations after tocilizumab treatment and no clinical improvement in fever or oxygen requirements. Among the 11 patients, 3 died, 6 remained in the intensive care unit, and 2 were discharged.

  Rimland et al. (May 19, 2020). Clinical Characteristics and Early Outcomes in Patients with COVID-19 Treated with Tocilizumab at a United States Academic Center. Pre-print downloaded May 19 from https://doi.org/10.1101/2020.05.13.20100404

- Gerard et al. investigated the cardiac safety of hydroxychloroquine, azithromycin, lopinavir-ritonavir and chloroquine for "off-label" use among COVID-19 patients. Over a one month period, 120 cardiac adverse drug reactions among COVID-19 patients were reported to the Nice Regional Center of Pharmacovigilance in France. 86% of these adverse events were associated with hydroxychloroquine, alone or in combination with azithromycin. The authors estimated the incidence of cardiac adverse drug reactions to be 0.77% to 1.54% of COVID-19 patients. These findings are suggestive of an elevated risk of cardiac adverse events associated with "off-label" treatments among COVID-19 patients.

  Gerard et al. (May 7, 2020). "Off-Label" Use of Hydroxychloroquine, Azithromycin, Lopinavir-Ritonavir and Chloroquine in COVID-19: A Survey of Cardiac Adverse Drug Reactions by the French Network of Pharmacovigilance Centers. Therapie. https://doi.org/10.1016/j.therap.2020.05.002

Clinical Characteristics and Health Care Setting

- Selva et al. investigated the cross-reactivity of SARS-CoV-2 and other circulating human coronavirus antibody responses in healthy children (n=89), adults (n=98), elderly (n=57), and COVID-19 patients (n=19). Their results suggest that less-experienced humoral immunity that is observed in children, associated with higher IgM, may have the potential to induce more potent antibodies upon SARS-CoV-2 infection, potentially making a future vaccine more effective among children.

  Selva et al. (May 18, 2020). Distinct Systems Serology Features in Children Elderly and COVID Patients. Pre-print downloaded May 19 from https://doi.org/10.1101/2020.05.11.20098459

- A retrospective analysis of children in France and Switzerland suggests that children may experience acute heart failure and multisystem inflammatory syndrome following SARS-CoV-2 infection. Among 35 children admitted to pediatric intensive care for cardiogenic shock, left ventricular dysfunction, or a severe inflammatory state, 88% (31/35) of patients tested positive for SARS-CoV-2 infection.

  Belhadjer et al. (May17, 2020). Acute Heart Failure in Multisystem Inflammatory Syndrome in Children (MIS-C) in the Context of Global SARS-CoV-2 Pandemic. Circulation. https://doi.org/10.1161/CIRCULATIONAHA.120.048360

Modeling and Prediction

- The author estimates that the number of daily confirmed COVID-19 cases in King County will decrease by 50% every 24.5 days (95% CI: 21.2 - 28.8). Using this empirical model, the predicted number of daily incident COVID-19 cases in King County will be 40 cases by May 24, and 20 cases by June 18, 2020.

  Roach. (May 18, 2020). Empirical Model of Spring 2020 Decrease in Daily Confirmed COVID-19 Cases in King County Washington. Pre-print downloaded May 19 from https://doi.org/10.1101/2020.05.11.20098798

- Bicher et al. developed an agent-base model of SARS-CoV-2 transmission in Austria that incorporates information about the disease course, contact networks (households, workplaces, schools), and infection control policies (lock down, contact tracing). The authors found that individual contact tracing (compared to household-level or workplace-level contact tracing) was the most effective policy, and could result in an 81% reduction in incident cases while quarantining only 28% of the population.

  Bicher et al. (May 19, 2020). Agent-Based Simulation for Evaluation of Contact-Tracing Policies Against the Spread of SARS-CoV-2. Pre-print downloaded May 19 from https://doi.org/10.1101/2020.05.12.20098970

Other Resources and Commentaries

- Importance of Precise Data on SARS-CoV-2 Transmission Dynamics Control – The Lancet Infectious Diseases (May 15)
- Investigation of a COVID-19 Outbreak in Germany Resulting from a Single Travel-Associated Primary Case: A Case Series – The Lancet Infectious Diseases (May 15)
- Sex Workers Must Not Be Forgotten in the COVID-19 Response – Lancet (May 15)
- Planning for a COVID-19 Vaccination Program – JAMA (May 18)
- Accelerating COVID-19 Therapeutic Interventions and Vaccines (ACTIV): An Unprecedented Partnership for Unprecedented Times – JAMA (May 18)
- Seroprevalence of SARS-CoV-2-Specific Antibodies Among Adults in Los Angeles County, California, on April 10-11, 2020 – JAMA (May 18)
- Understanding COVID-19 Risks and Vulnerabilities among Black Communities in America: The Lethal Force of Syndemics – Annals of Epidemiology (May 14)
- The Tightrope of Science, Media and Politics – Nature Cancer (May 14)
- Rising Tide: Responding to the Mental Health Impact of the COVID-19 Pandemic – Depression and Anxiety (May 18)
- Animal (Non-Human) Companionship for Adults Aging in Place during COVID-19: A Critical Support, a Source of Concern and Potential for Social Work Responses – Journal of Gerontological Social Work (May 18)
- Sentiment Analysis of Social Media Response on the Covid19 Outbreak – Brain, Behavior, and Immunity (May 8)
- Rising Tide: Responding to the Mental Health Impact of the COVID-19 Pandemic – Depression and anxiety (May 18)

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