ADI, those with Medicaid or no insurance had the lowest mean Ct values (23.3, 25.9, and 27.6, respectively) compared to Medicare or other insurance (Figure 1). Body mass index (odds ratio [OR], 1.04; 95% CI, 1.02–1.07; $P$ = .001) and male sex (OR, 2.15; 95% CI, 1.28–3.60; $P$ = .004) were independently associated with ICU admission. Every increase of a CT point (OR, 0.90; 95% CI, 0.85–0.95; p <0.001) and age >60 years old (OR 2.62, 95% CI; 1.14-6.04; p=0.023) was associated with death. **Conclusions:** In this cross-sectional study of adults tested for COVID-19 in a large midwestern academic health system, lower Ct values were independently associated with poverty and age >60 years old.

**Funding:** No

**Disclosures:** None

*Antimicrobial Stewardship & Healthcare Epidemiology* 2021;1(Suppl. S1):s18–s19

doi:10.1017/ash.2021.33

**Presentation Type:**
Oral Presentation

**Subject Category:** COVID-19

## Suspected COVID-19 Reinfections at a Tertiary Care Center, Iowa 2020

Takaaki Kobayashi; Mohammed Alsuhaibani; Miguel Ortiz; Katherine Imborek; Stephanie Holley; Alexandra Trannel; Alexandre Marra; William Etienne; Kyle Jenn; Oluchi Abosi; Holly Meacham; Lorinda Sheeler; Angie Dains; Mary Kukla; Paul McCray; Stanley Perlman; Bradley Ford; Daniel Diekema; Melanie Wellington; Alejandro Pezzulo and Jorge Salinas

**Background:** Coronavirus disease 2019 (COVID-19) is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). SARS-CoV-2 RNA can be detected by real-time reverse-transcription polymerase chain reaction (RT-PCR) for several weeks after infection. Discerning persistent RT-PCR positivity versus reinfection is challenging and the frequency of COVID-19 reinfections is unknown. We aimed to determine the frequency of clinically suspected reinfection in our center and confirm reinfection using viral whole-genome sequencing (WGS). **Methods:** The University of Iowa Hospitals and Clinics (UIHC) is an 811-bed academic medical center. Patients with respiratory complaints undergo COVID-19 RT-PCR using nasopharyngeal swabs. The RT-PCR (TaqPath COVID-19 Combo kit) uses 3 targets (ORF1ab, S gene, and N gene). We identified patients with previous laboratory-confirmed COVID-19 who sought care for new respiratory complaints and underwent a repeated SARS-CoV-2 test at least 45 days from their first positive test. We then identified patients with median RT-PCR cycle threshold (Ct) values. **Results:** During the study period, 13,603 patients had a SARS-CoV-2– positive RT-PCR. Of these, 296 (2.2%) had a clinical visit for new onset of symptoms and a repeated RT-PCR assay >45 days from the first test. Moreover, 29 patients (9.8%) had a positive RT-PCR assay in the repeated testing. Ct values were available for samples from 25 patients; 7 (28%) had Ct values. **Conclusions:** In patients with a recent history of COVID-19 infection, repeated testing for respiratory symptoms was infrequent. Some had a SARS-CoV-2–positive RT-PCR assay on repeated testing, but only 1 in 4 had Ct values suggestive of a reinfection. We confirmed 1 case of reinfection using WGS.

Funding: No

**Disclosures:** None

*Antimicrobial Stewardship & Healthcare Epidemiology* 2021;1(Suppl. S1):s19

doi:10.1017/ash.2021.34

**Presentation Type:**
Oral Presentation

**Subject Category:** COVID-19

## Evaluating the Relationship between Cycle Threshold Values and Reported COVID-19 Symptoms among Healthcare Workers

Mindy Sampson; Catherine Passaretti; Jennifer Priem; Shelley Kester; Kristin Fischer and John Longshore

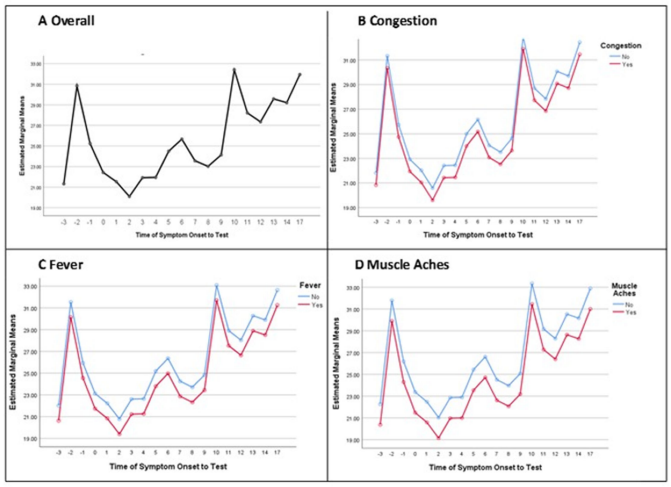
**Background:** SARS-CoV-2 detected by reverse transcription polymerase chain reaction (RT-PCR) can persist for weeks to months in some individuals. Cycle threshold (Ct) values represent the number of cycles needed to amplify viral ribonucleic acid (RNA) to reach a detectable level. As such, Ct values are inversely related to the amount of virus in a sample. As knowledge of SARS-CoV-2 viral dynamics continues to evolve, understanding the relationship between Ct values, type of symptoms, and timing of symptom onset can help determine when infected individuals are most likely to be infectious. **Methods:** We conducted a retrospective cohort study of 1,027 healthcare workers (HCWs) who tested positive for SARS-CoV-2 by RT-PCR from nasopharyngeal specimens between June 27, 2020, and September 21, 2020. All HCWs were interviewed within 72 hours of their diagnosis for symptom history. Due to multiple PCR platforms being in use in our facility, only 360 HCWs (35%) had Ct values available for analysis. Multivariate linear regression models examined the effect of COVID-19–related symptoms and timing of symptom onset to test on Ct values. **Results:** The most frequently reported symptoms were congestion (55.6%), cough (50.3%), and headache (46.7%). Other symptoms less commonly reported were fatigue (36.7%), loss of taste or smell (36.4%), fever (35.4%), muscle aches (33.3%), sore throat (27.4%), and diarrhea (26.7%). Symptomatic HCWs (88.3% of sample) had lower Ct values (ORF-1 M = 22.66, SD = 5.17; E-Gene M = 24.34, SD = 6.60) than asymptomatic individuals (ORF-1 M = 25.46, SD = 6.06; E-Gene M = 29.34, SD = 7.96). Of all symptoms measured, only presence of fever, congestion, and muscle aches predicted significantly lower Ct values. Mean Ct values decreased 2 days prior to symptom onset, were lowest the day of symptom onset, then increased in a curvilinear fashion. There were no significant 2-way interactions between symptoms and time of symptom onset to testing. **Conclusions:** The curvilinear pattern of Ct values over time from symptom onset are consistent with disease progression patterns and support current understanding of infectivity being highest 2 days prior to symptom onset through day 8. Presence of fever, congestion, and muscle aches are significantly correlated with lower Ct values, suggesting that these symptoms are associated with higher viral load. Although Ct values are not without limitations, our findings support the current understanding that presymptomatic and symptomatic individuals, particularly those with fever, congestion, and muscle aches, may pose higher risk of transmission to others.

Table 1: Linear regression modeling of the effect of symptoms associated with COVID-19 on CT values

| | E-Gene CT Value | ORF 1 CT Value |
|---|---|---|
| **Model 1 Intercept (CI)** | 28.72 | 25.67 |
| | (25.65 - 31.79) | (23.10 - 28.25) |
| Symptomatic $\beta$ (CI) | -0.31*** | -0.22*** |
| | (-9.28 - -4.63) | (-6.13 - 1.99) |
| Linear days from Symptom Onset to Test | 0.23*** | 0.28*** |
| | (0.26 - 0.68) | (0.26 - 0.61) |
| **Model 2 Intercept (CI)** | 26.38 | 23.96 |
| | (23.64 – 29.12) | (21.75 - 26.17) |
| Sore Throat | -0.001 | -0.01 |
| | (-1.65 - 1.62) | (-1.48 - 1.15) |
| Headache | -0.06 | -0.37 |
| | (-2.34 - 0.68) | (-1.43 - 1.15) |
| Fever | -0.12* | -0.13* |
| | (-3.32 - -0.21) | (-2.68 - -0.23) |
| Loss of Taste/Smell | -0.06 | 0.03 |
| | (-2.39 – 0.71) | (-0.93 - 1.52) |
| Chest Tightness | -0.03 | -0.02 |
| | (-2.81 – 1.45) | (-1.97 - 1.41) |
| Cough | -0.01 | 0.04 |
| | (-1.71 – 1.44) | (-0.83 - 1.63) |
| Congestion | -0.16** | -0.13* |
| | (-3.83 - -0.73) | (-2.58 - -0.11) |
| Gastrointestinal Discomfort | 0.04 | 0.02 |
| | (-1.15 – 2.27) | (-1.20 - 1.55) |
| Muscle Aches | -0.17** | -0.21*** |
| | (-4.23 - -0.90) | (-3.68 - -1.01) |
| Fatigue | -0.07 | -0.01 |
| | (-2.57 – 0.59) | (-1.31 - 1.20) |
| Linear days from Symptom Onset to Test | 0.19** | 0.24*** |
| | (0.18 - 0.60) | (0.20 - 0.54) |
| Curvilinear days from Symptom Onset to Test | 0.28* | 0.31* |
| | (0.01 – 0.09) | (0.01 – 0.09) |

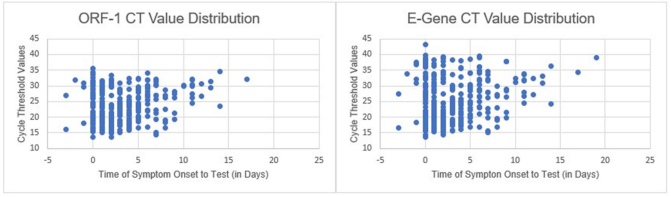
**Cell values are standardized beta coefficients and 95% confidence intervals in parentheses. Models were adjusted for sex and age. The curvilinear effect of time on CT values was nonsignificant in the asymptomatic model. *** p < .001, ** p < .01, * p < .05**

Figure 1. Estimated Marginal Mean CT Values over Time of Symptom Onset to Test




Estimated marginal mean ORF-1 CT values are adjusted for age, sex, time from symptom onset to test, and all individual symptoms.

Figure 2. CT Value Distribution over Time from Symptom Onset to COVID-19 Test




**Funding:** No
**Disclosures:** None

*Antimicrobial Stewardship & Healthcare Epidemiology* 2021;1(Suppl. S1):s19–s20
doi:10.1017/ash.2021.35

**Presentation Type:**
Oral Presentation
**Subject Category:** COVID-19
**New COVID-19 Transmission after the First Vaccine Dose at Skilled Nursing Facilities in Nebraska**
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Group Name: DHHS Epi
**Background:** The inoculation with SARS-CoV-2 vaccine at long-term care facilities (LTCFs) in Nebraska began on December 28, 2020, as part of the Centers for Disease Control and Prevention (CDC) Pharmacy Partnership for Long-Term Care Program.[1] As of February 5, 2021, 159 skilled nursing facilities (SNFs) had completed their first vaccine clinic, and 7,271 residents and 6,768 staff had received the first dose of the 2-dose series. Surveillance data before vaccination (December 21–27, 2020) and after the first vaccination dose (January 25–31, 2021) indicate that the weekly SARS-CoV-2 positivity rate at SNFs decreased from 1.18% to 0.42% for residents and 0.54% to 0.11% for staff.[2,3,4] In this study, we examined the perceived decrease in new transmission initiated by the first dose of vaccine at SNFs. **Methods:** We analyzed the data with separate logistic regressions for residents and staff. We included 145 SNFs that completed their first vaccine clinic, and we used the Federal and Pharmacy Partnership database for the number of residents and staff that received the first dose of vaccine at the first vaccine clinic. We followed the SNFs for 21 days after the first vaccine clinic from December 28, 2020, through February 5, 2021, for any first-time SARS-CoV-2–positive cases. The National Healthcare Safety Network (NHSN) database was used to collect the information on the number of residents present at the facility on the day of the first vaccine clinic, if available, or days before in the same week as the first vaccine clinic. The staff count for each facility was extracted from Nebraska Licensure for LTCFs. We collected new case information from the state surveillance, the NHSN, and the Test-Nebraska platform. **Results:** The mean resident vaccine coverage was 80% and the median staff vaccine coverage was 43%. We found a reverse association between staff vaccine coverage and new positive staff cases. For each percentage increase in staff vaccine coverage, the odds of having a new staff positive case 7 days and 14 days after the first vaccine clinic decrease by 26% and 48%, respectively. No association between coverage and new resident transmission was detected. Possible confounding exists when infected residents might have tested positive 7–14 days after the first vaccine clinic who were not affected by the vaccine. **Conclusions:** Although we observed the association between lower case count with increased facility-level vaccine coverage, we would need to wait for the administration of the second dose of vaccine before assessing the level of association between coverage and new transmission. Further initiatives are warranted to increase the suboptimal vaccine coverage for staff.
**Funding:** No
**Disclosures:** None

*Antimicrobial Stewardship & Healthcare Epidemiology* 2021;1(Suppl. S1):s20
doi:10.1017/ash.2021.36

**Presentation Type:**
Oral Presentation
**Subject Category:** COVID-19
**COVID-19 Conversion after Exposure in a Semiprivate Room at a Tertiary Care Center in Iowa, July–December 2020**
Alexandra Trannel; Takaaki Kobayashi; Oluchi Abosi; Kyle Jenn; Holly Meacham; Lorinda Sheeler; William Etienne; Angie Dains; Mary Kukla; Mohammed Alsuhaibani; Stephanie Holley; Alexandre Marra; Bradley Ford; Melanie Wellington; Daniel Diekema and Jorge Salinas

**Background:** Hospital semiprivate rooms may lead to coronavirus disease 2019 (COVID-19) patient exposures. We investigated the risk of COVID-19 patient-to-patient exposure in semiprivate rooms and the subsequent risk of acquiring COVID-19. **Methods:** The University of Iowa Hospitals & Clinics is an 811-bed tertiary care center. Overall, 16% of patient days are spent in semiprivate rooms. Most patients do not wear masks while in semiprivate rooms. Active COVID-19 surveillance included admission and every 5 days nasopharyngeal SARS-CoV-2 polymerase chain reaction (PCR) testing. We identified inpatients with COVID-19 who were in semiprivate rooms during their infectious periods during July–December 2020. Testing was repeated 24 hours after the first positive test. Cycle threshold (Ct) values of the two tests (average Ct <30), SARS-CoV-2 serology results, clinical assessment, and COVID-19 history were used to determine patient infectiousness. Roommates were considered exposed if in the same semiprivate room with an infectious patient. Exposed patients were notified, quarantined (private room), and follow-up testing was arranged (median seven days). Conversion was defined as having a negative test followed by a subsequent positive within 14 days after exposure. We calculated the risk of exposure: number of infectious patients in semiprivate rooms/number of semiprivate patient-days (hospitalization days in semiprivate rooms). **Results:** There were 16,427 semiprivate patient days during July–December 2020. We identified 43 COVID-19 inpatients who roommates during their infectious periods. Most infectious patients (77%) were male; the median age was 67 years; and 22 (51%) were symptomatic. Most were detected during active surveillance: admission testing (51%) and serial testing (28%). There were 57 exposed roommates. The risk of exposure was 3 of 1,000 semiprivate patient days. In total, 16 roommates (28%) did not complete follow-up testing. Of 41 exposed patients with follow-up data, 8 (20%) converted following their exposure. Median time to conversion was 5 days. The risk of exposure and subsequent conversion was 0.7 of 1,000 semiprivate patient days. Median Ct value of the source patient was 20 for those who converted and 23 for those who did not convert. Median exposure time was 45 hours (range, 3–73) for those who converted and 12 hours (range, 1–75) for those who did not convert. **Conclusions:** The overall risk of exposure in semiprivate rooms was low. The conversion rate was comparable to that reported for household exposures. Lower Ct values and lengthier exposures