432. An Outbreak of Coronavirus Disease, 2019 (COVID-19) in a Skilled Nursing Facility – California, 2021: Description, Mitigation, Challenges, and Opportunities

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Session: P-19. COVID-19 Infection Prevention

Background. Skilled nursing facility (SNF) residents comprised 11% of all COVID-19 cases in the United States; however, they account for 43% of deaths with case fatality rates (CFR) of 26.0-33.7%.

Methods. We report an outbreak of COVID-19, from June 15 to July 21, 2020 in a 159-bed SNF with a staff of 172 that resulted in an infection rate of 97% in residents and 23% in HCWs (Figure 1). A retroactive review outlined mitigation efforts, discussed challenges, identified risk factors among residents and health care workers (HCW) for acquisition of COVID-19, and reviewed opportunities for improvement (Figure 2).
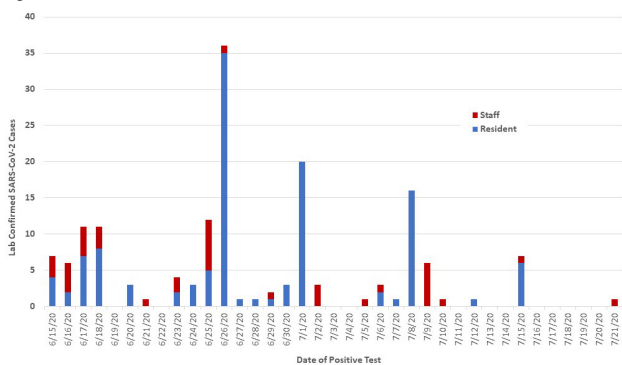
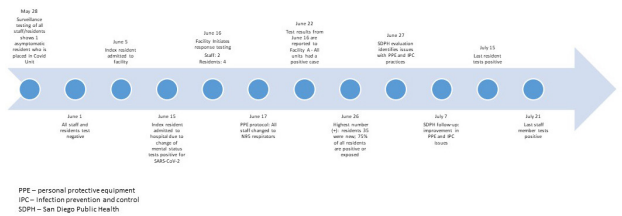Figure 1. Epi Curve of COVID-19 Outbreak in a Skilled Nursing Facility

Figure 2. Timeline of COVID-19 Outbreak in a Skilled Nursing Facility

Results. Factors that contributed to the outbreak: delay in test results had an impact on cohorting; suboptimal adherence to the principles of infection prevention and control (IPC) and minimal adherence monitoring; strict criteria were used to screen for infection; the underappreciated transmissibility of COVID-19 from presymptomatic and asymptomatic persons; symptomatic HCWs who continued to work; the changing guidance on, the suboptimal use of, and an inadequate supply of personal protective equipment; poor indoor air quality due to ventilation challenges; and the important role of community/family/interfacility spread on the outbreak. Whole genome sequencing, performed in 52 samples, identified a common strain that was also found in clusters of 2 other facilities: 1 in the same geographic location, the other in a different geographic location but whose HCWs had the same zip codes as the facility (Figure 3). Certified nursing and restorative nursing assistants had the highest risk of infection with an odds ratio (OR) of 4.02 (confidence interval 1.29-12.55, p value: 0.02) when compared to registered and licensed vocational nurses. The residents' CFR was 24%. The OR for death was increased by 10.5 (10.20-11.00) for every decade of life as was morbid obesity (BMI > 35) with an OR of 8.50. BMI as a continuous variable increased risk of mortality for every additional unit, OR 1.07 (Tables 1, 2).
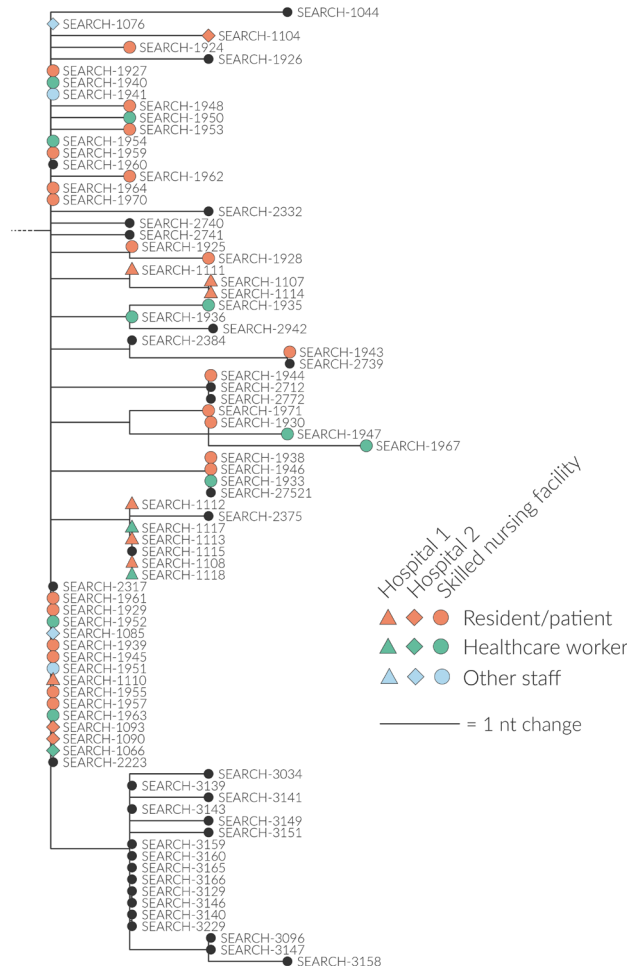
Whole Genome Sequencing of Isolates from a Skilled Nursing Facility Outbreak

Variable	Total Number (% or SD)	Survived Number (% or SD)	Died Number (% or SD)	Odds Ratio 95% (CI)	P value
All	124 (100.0%)	94 (75.8%)	30 (24.2%)		
Sex					
Male	36 (29.0%)	29 (30.9%)	7 (23.3%)	0.64 (0.23-1.60)	0.36
Female	88 (71.05%)	65 (69.1%)	23(76.7%)	1.0	-
Age	76 (SD±12.68)	74.36 (SD±12.97)	81.17 (SD±10.33)	1.05 (1.02-1.10)	0.009*
Ethnicity					
White, Not Hispanic	38 (30.6%)	27 (28.7%)	11 (36.7%)	1.0	-
Black Not Hispanic	13 (10.5%)	10 (10.6%)	3 (0.1%)	0.74 (0.17-3.20)	0.36
Hispanic	48 (38.7%)	38 (40.4%)	10 (0.33%)	0.65 (0.24-1.74)	0.20
Asian Pacific Islander	24 (19.4%)	18 (19.1%)	6 (0.2%)	0.82 (0.26-2.61)	0.38
Other	1 (0.01%)	1 (0.01%)	0 (0.00%)	-	-
Hospitalized					
Yes	43 (34.6%)	18 (41.9%)	25 (58.1%)	17.36 (6.20-48.57)	0.0001*
No	81 (65.3%)	75 (92.6%)	6 (0.07%)	1.0	-
ICU					
Yes	11 (25.6%)	4 (36.4%)	7 (63.4%)	1.36 (0.33-5.59)	0.35
No	32 (74.4%)	14 (43.8%)	18 (56.3%)	1.0	-
BMI	28.34 (SD±8.75)	27.74 (SD±8.38)	30.20 (SD±8.38)	1.02 (0.98-1.07)	0.25
Under Weight < 18.5	8 (6.45%)	6 (75%)	2(25%)	1.54 (0.21-8.26)	0.63
Normal Weight 18.5-24.9	45 (36.29%)	37 (82.22%)	8 (17.78%)	1.0	-
Overweight 25-29.9	36(29.03%)	26(72.22%)	10 (27.78%)	1.77 (0.62-5.25)	0.28
Obese 30-34.9	13 (10.48%)	11 (84.62%)	2 (15.38%)	0.84 (0.12-4.00)	0.84
Morbidly Obese 35+	21 (16.94%)	13 (61.90%)	8 (38.10%)	2.85 (0.88-9.34)	0.08
No information	1 (0.81%)	-	-	-	-

* Statistically significant; SD = standard deviation; CI = confidence interval; BMI: body mass index; P-values based on univariate logistic regression of significance.

Univariate Analysis of Selected Variables Associated with Mortality among Residents at Facility A during COVID-19 Outbreak, June 19 - July 21, 2021

Variable	Adjusted Odds Ratio (95% CI)	P value
Sex	0.72 (0.26-1.87)	0.52
Comorbidities		
Hypertension	2.25 (0.67-10.25)	0.23
Cerebrovascular Disease	0.83 (0.32-2.03)	0.69
Cardiovascular Disease	1.59 (0.68-3.73)	0.28
Diabetes	1.16 (0.50-2.72)	0.73
Dementia	1.88 (0.77-4.63)	0.17
Renal Disease	1.60 (0.66-3.82)	0.29
Pulmonary Disease	1.04 (0.41-2.53)	0.93
Hepatic Disease	2.70 (0.50-13.21)	0.22
Mobility Issues	0.98 (0.42-2.31)	0.97
BMI (continuous)	1.06 (1.01-1.13)	0.02*
Under Weight < 18.5	2.0 (0.25-11.76)	0.50
Normal Weight 18.5-24.9	1.0	-
Overweight 25-29.9	2.33 (0.76-7.52)	0.14
Obese 30-34.9	1.12 (0.14-7.51)	0.90
Morbidly Obese 35+	8.50 (2.06-40.52)	0.004*

*statistically significant; CI: confidence interval; BMI: body mass index

Multivariate Analysis of Factors Associated with Mortality from COVID-19 after Adjusting for Age among Residents (N =124) of Facility A, June 15 - July 21, 2020

Conclusion. While implementation of optimal IPC measures in the pre-COVID-19 vaccination era had no impact on the infections in residents who were likely already infected or exposed at the onset of the outbreak, these measures along with non-pharmacologic strategies were effective in halting the spread among HCWs.

Disclosures. All Authors: No reported disclosures

433. Role of Community Vaccination Coverage in Controlling Future COVID-19 Outbreaks in Nursing Homes: A Modeling Study

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Session: P-19. COVID-19 Infection Prevention

Background. As of May 2, 2021, U.S. nursing homes (NHs) have reported >651,000 COVID-19 cases and >132,000 deaths to CDC's National Healthcare Safety Network. Since U.S. COVID-19 vaccination coverage is increasing, we investigate the role of vaccination in controlling future COVID-19 outbreaks.

Methods. We developed a stochastic, compartmental model of SARS-CoV-2 transmission in a theoretical 100-bed NH with a staff of 99 healthcare personnel (HCP) in a community of 20,000 people. We modeled admission and discharge of residents (parameterized with Centers for Medicare & Medicaid Services data), assuming the following: temporary replacement of HCP when tested positive; daily visits to NH residents; isolation of COVID-19 positive residents; personal protective equipment (PPE) use by HCP; and symptom-based testing of residents and staff plus weekly asymptomatic testing of HCP and facility-wide outbreak testing once a COVID-19 case is identified. We systematically varied coverage of an mRNA vaccine among residents and HCP, and in the community. Simulations also varied PPE adherence, defined as the percentage of time in the facility that HCP properly used recommended PPE (25%, 50% or 75% of the time). Infection was initialized in the community with 40 infectious cases, and initial infection in the NH was allowed after 14 days of vaccine dose 1. Simulations were run for 6 months after dose 2 in the NH. Results were summarized over 1000 simulations.

Results. At 60% community coverage, expected cumulative symptomatic resident cases over 6 months were ≤5, due to low importation of COVID-19 infection from the community, with further reduction at higher coverage among HCP (Figure 1). Uncertainty bounds narrowed as NH resident coverage or PPE adherence increased. Results were similar if testing of staff and residents stopped. Probability of an outbreak within 4 weeks of dose 2 remained below 5% with high community coverage (Figure 2).

Figure 1. Drop in symptomatic cases in nursing home (NH) residents with rise in COVID-19 vaccine coverage in the community, increase in personal protective equipment (PPE) adherence, or increase in coverage among NH residents.
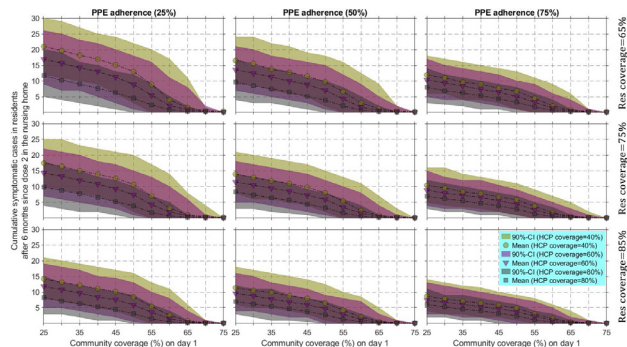
In each panel, we plotted the mean number of cumulative symptomatic cases of COVID-19 in NH residents after 6 months since vaccine dose 2 (given 28 days after dose 1) and their 90% confidence interval (CI) for three healthcare personnel (HCP) coverage scenarios: 40%, 60%, or 80%. Coverage in HCP was independently modeled of community coverage. The top row is for NH resident coverage of 65%, the middle for 75%, and the bottom row for 85%. The columns (left to right) are for facility-level PPE adherence of 25% (low adherence), 50% (intermediate adherence), and 75% (high adherence). Weekly asymptomatic testing of HCP and twice-weekly outbreak testing in the facility were modeled with an assumed point-of-care test sensitivity of 80% (symptomatic persons) and 60% (asymptomatic persons) and with specificity of 100% and test turnaround time of 15 minutes.

Figure 2. Probability of a COVID-19 outbreak in a nursing home (NH) decreased with increase in vaccine coverage in the community or in healthcare personnel (HCP).
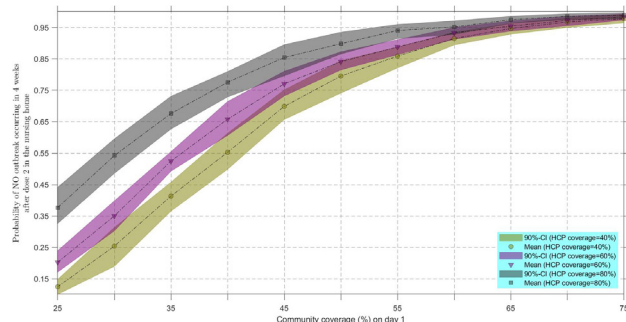
An outbreak is defined as an occurrence of 2 or more cases within 4 weeks of dose 2. Probability of no outbreak was calculated by counting how many simulations out of a total of 1000 simulations had ≤1 symptomatic case in NH residents or HCP within 4 weeks after dose 2 was administered in the nursing home. The first vaccine dose in residents and HCP was assumed to be given on day 1, and the second dose 28 days later. A probability value and its 90%-confidence interval (CI) at a given community and HCP coverage was calculated by pooling model outputs for 9 sets (3 PPE adherence values X 3 resident coverage levels) of model simulations. Simulations were performed assuming no asymptomatic testing or facility-wide outbreak testing.

Conclusion. Results suggest that increasing community vaccination coverage leads to fewer infections in NH residents. Testing asymptomatic residents and staff may have limited value when vaccination coverage is high. High adherence to recommended PPE may increase the likelihood that future COVID-19 outbreaks can be contained.

Disclosures. John A. Jernigan, MD, MS, Nothing to disclose

435. Outcomes for E484K Mutation Negative COVID-19 Patients Cohorted with E484K Mutation Positive COVID-19 Patients: A Retrospective Cohort Study

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Session: P-19. COVID-19 Infection Prevention

Background. The emergence of the E484K mutation of SARS-CoV-2 poses a risk of immune evasion but the risk of re-infection during acute infection is not well defined. Our aim was to assess the risk of re-infection among patients with existing acute E484K mutation negative COVID-19 infection who were exposed to an E484K mutation positive SARS-CoV-2 infected patient.

Methods. We performed a retrospective cohort study of patients admitted with acute E484K negative COVID-19 infection and shared a hospital room with a patient who was E484K mutation positive during their period of communicability. The primary outcome was laboratory confirmed and/or clinical evidence of re-infection within the E484K negative population within 30 days of exposure and the secondary outcome was the 30-day risk of death or re-admission to hospital due to COVID-19.

Results. We identified 41 patients who were E484K mutation negative who shared a hospital room with some of the identified 34 E484K positive patients. Six (14%) underwent repeat COVID-19 testing and remained E484K negative and none developed signs or symptoms of COVID-19 re-infection during the 30 days following exposure. The mortality rate was 7% (3/41) and re-admission rate was zero at 30 days from exposure.

Conclusion. Despite the small sample size, we did not observe any evidence of re-infection among patients with COVID-19 who shared a hospital room with E484K positive patients during their acute infection. If necessary due to high hospital occupancy, patients with discordant E484K results can be safely cohorted in a shared room.

Disclosures. All Authors: No reported disclosures

436. U-shaped-aggressiveness of SARS-CoV-2: Period Between Initial Symptoms and Clinical Progression to COVID-19 Suspicion. A Population-Based Cohort Study

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