Table 1: Effect Estimates for Outbreak Severity

	Effect Estimates		
Risk Factors	**Attack Rate**	**30-Day Case Mortality**	**Outbreak Duration**
Length of stay	0.006‡		0.02‡
Comorbidity total factor	0.142‡		0.11*
Hand hygiene rates during outbreak	-1.775‡	-10.32*	-5.24‡
Hand hygiene rates prior to outbreak		0.04‡	2.68‡
Bed Moves	0.468‡		
Unit age	0.003*		0.02‡
Nursing hours to patient days	0.017*		
Facility Type			
Regional	-0.15*		-0.34*
Community (reference)	---		---
Region			
North	-0.118*	-1.34‡	-0.31‡
South	-0.084	-0.31	0.23
East (reference)	---	---	---

*: p<0.05; ‡: p<0.01

the pandemic were positively associated with duration and mortality. Increased unit age was also associated with increases in each of the severity measures. Comorbidity total factor was correlated with outbreak attack rate and duration, demonstrating the importance of individual patient characteristics in an outbreak. **Conclusions:** Our findings highlight the importance of hand hygiene practices during an outbreak. Additionally, it is important to understand the difficulties faced by older facilities, many of which face infrastructural challenges. This study reinforces the need to incorporate infection control standards into healthcare planning and construction.

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Subject Category: COVID-19

Duration of exposure is the most important risk factor for nosocomial COVID-19 in open multibed wards

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Background: The National University Hospital (NUH) is a 1,200 bed tertiary-care hospital with no documented nosocomial transmission of COVID-19 among patients for the first year and a half of the pandemic, despite 65% of the patients being housed in 4- to 8-bedded open cubicles with shared bathrooms. However, this arrangement changed in late September 2021 with large community clusters including in healthcare institutions nationally associated with the spread of the δ (delta) variant of SARS-CoV-2. We conducted a retrospective review of hospital epidemiology data to determine risk factors for SARS-COV-2 transmission during this period. **Methods:** Index patients were defined as the first patient in an open cubicle with a confirmed positive SARS-CoV-2 PCR test. Contacts were defined as being in the same cubicle as a patient before isolation from 2 days before symptom onset, up to 7 days from positive test if asymptomatic. Clinical and patient movement data were obtained manually from routine clinical records. Proximity of the contact from the index was classified as within, or more than, 2 m away, according to the prevailing definition from the Singapore Ministry of Health. A univariate analysis was performed to identify risk factors for nosocomial acquisition of SARS-CoV-2. The analysis was deemed exempt from ethics review (reference no. NHG-DSRB-2021/01026). **Results:** From October 1 to November 30, 2021, 30 index cases occurred in open cubicles identified (median, 9 days after admission; IQR, 19 days). Contact tracing yielded 211 contacts, of whom 10 (4.7%) were infected. Linear regression analysis found the duration of contact for each hour spent in the same room as the index case was the only statistically significant risk variable for contracting COVID-19, with an odds ratio 1.02 (Table 1). **Conclusions:** Patients in open cubicles are at risk for nosocomial transmission of COVID-19 and other infections. The duration of contact appeared to be more important than vaccination status of index or ward ventilation status. Larger multicentered studies are needed to validate this finding, which has significant implications for infection prevention strategies and pandemic planning.

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Table 1.

	Infected contacts (n=10)	Uninfected contacts (n=201)	Univariate odds ratio, 95% CI, p-value	p-value
Index case Ct value, median units, IQR	17.33, 6.74	18.7, 5.9	0.961 [0.849, 1.08]	0.511
Index vaccinated, n (%)	8 (80.0%)	155 (77.1%)	1.19 [0.244, 5.79]	0.829
Index immunocompromised, n (%)	2 (20.0%)	36 (17.9%)	1.15 [0.233, 5.62]	0.868
Age of index, mean ± sd	65.5 ± 13.1	63.6 ± 19.3	1.00 [0.970, 1.04]	0.759
Index symptomatic, n (%)	7 (70.0%)	133 (66.2%)	1.19 [0.299, 4.76]	0.800
Air-conditioned ward, n (%)	2 (20.0%)	47 (23.4%)	0.819 [0.168, 3.99]	0.802
Ward with air blowers, n (%)	4 (40.0%)	66 (32.8%)	1.36 [0.372, 5.00]	0.643
Proximity of contact within 2 metres, n (%)	3 (30.0%)	53 (26.4%)	1.20 [0.299, 4.80]	0.802
Duration of contact, hrs, mean ± sd	80.2 ± 44.9	42.3 ± 40.7	1.02 [1.00, 1.03]*	0.0121
Contact vaccinated, n (%)	9 (90.0%)	163 (82.7%)	1.88 [0.230, 15.3]	0.525
Contact immunocompromised, n (%)	3 (30.0%)	43 (21.4%)	1.57 [0.391, 6.35]	0.535
Age of contact, mean ± sd	69.1 ± 11.4	61.2 ± 20.3	1.02[0.985, 1.07]	0.192

*statistically significant odds ratio for each hour of contact duration in the same room

Presentation Type:
Poster Presentation - Poster Presentation
Subject Category: COVID-19

Rapid identification and isolation of patients with COVID-19 reduces the odds of transmission to hospital roommates

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Background: The Cleveland Clinic Main Campus is a multispecialty academic medical center with 1,200 adult patient beds, 58% of which are double occupancy. Our facility relies on double-occupancy rooms to provide needed care during the COVID-19 pandemic. Inherently, double occupancy poses a greater risk of exposure to SARS-CoV-2 despite mitigation efforts. We investigated the incidence of postexposure SARS-CoV-2 infection in double-occupancy rooms and evaluated risk factors for viral transmission. **Methods:** Early in the observation period patients were tested for SARS-CoV-2 based on clinical suspicion. By June 2020, all admitted patients were tested. Symptomatic patients were admitted with pending tests under transmission-based precautions. Asymptomatic patients were managed with standard precautions including patients admitted to double-occupancy rooms. A double-occupancy exposure event was defined as an uninfected patient sharing a room with a patient positive for SARS-CoV-2. All patient exposures were tracked and evaluated by the infection prevention (IP) team. The IP prospective review of source patients included determination of lowest cycle threshold (Ct) value of first COVID-19 test, and whether their infection was hospital or community onset. Review of exposed patients included sex, age, and exposure time (in hours) to the source patient. Postexposure infection was defined as a positive test for SARS-CoV-2 in the exposed population within 14 days of the defined exposure event. We fit a multivariable logistic regression model to estimate the effect of exposure time on the odds of postexposure infection in susceptible roommates. **Results:** From March 15 to December 15, 2020, 172 susceptible patients were exposed to a roommate with COVID-19. Also, 28 exposed patients met our definition for postexposure infection (attack rate, 16%). The frequency of postexposure infection was higher in patients for whom the source was hospital-onset versus community-onset disease (25% vs 10%; $P = .01$) and when the source patient's Ct value was below the median value of 21.1 (26% vs 11% p **Conclusions:** We identified a post-exposure infection attack rate of 16% for double-occupancy patients in

the first 9 months of the pandemic. Time exposed to source patient was significantly associated with infection. Our experience demonstrates the potential benefit of asymptomatic admission testing with expedited turnaround time to mitigate viral transmission between patients in double-occupancy rooms.
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Fitted containment efficiency of face masks for reducing emission of aerosols in the indoor environment
William Bennett; Steven Prince; Kirby Zeman and James Samet

Background: Face masks are a major tool for reducing the spread of COVID-19 has been the use of face masks because (1) they protect the wearer from aerosol laden virus in the environment and (2) they reduce aerosol emissions to the environment from infected individuals. Methods that quantify the fitted mask filtration efficiency for protection of the wearer are well established (eg, Sickbert-Bennett et al, *JAMA Intern Med* 2020;180:1607). In contrast, current methods for assessing face-mask containment efficiency are generally semiquantitative and rely on measurement of a very low concentration of aerosols emitted from a healthy or infected human, or the use of mannequins in which a high concentration of surrogate aerosols can be introduced inside the mask. **Methods:** Expanding on our standard methods used for fitted face-mask filtration efficiency, we designed a small-volume, low-ventilation chamber to accommodate a seated study participant. The study participant wore a ported face mask to allow introduction of a stream of 0.05 µm NaCl particles at a constant concentration (TSI 8026 particle generator) into the mask space. The ambient chamber concentration was continuously measured by a TSI 3775 condensation particle counter sampling 2 feet (~2 m) in front of the participant's head over a series of three 3-minute periods: (1) resting, (2) reading out loud, and (3) repeated forceful coughing (2 × 10 coughs) (~450 L/min peak flows). Figure 1 shows a raw data sample for the coughing procedure. Containment efficiency (%) for each mask and procedure were determined as 100 × (1 – the average of all 1 – second ambient concentration values between 30 and 180 seconds divided by the same for the "no mask" condition). **Results:** Table 1 shows the average % containment efficiency for 2 study days with each mask or procedure in an adult male. The 2-ear-loop masks (KN95 and procedure) tested during coughing had the greatest reduction in % containment efficiency compared to that during resting breathing, likely owing to a decreased mask fit with transient pressure increase inside the mask associated with the coughs. The N95 was least affected by the introduction of reading and/or coughing,

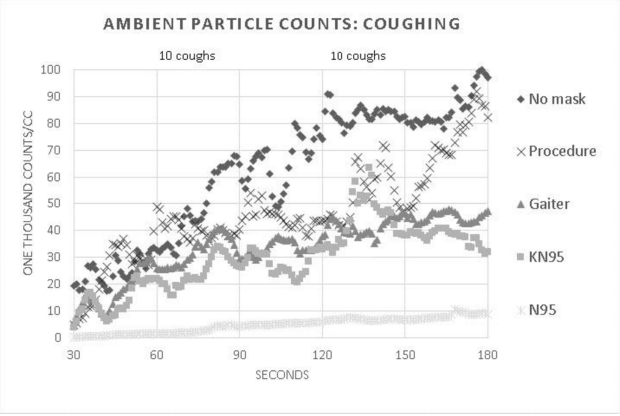

Fig. 1.

Table 1.

Masks	%CE		
	Resting	Reading	Coughing
N95	94.8	94.8	94.2
KN95	64.0	64.0	52.0
Procedure	46.6	41.6	29.9
Gaiter	39.0	45.1	47.6

maintaining near 95% containment efficiency throughout. **Conclusions:** Our preliminary data on fitted containment efficiency of masks under different conditions suggest that the fitted containment efficiency closely mimics their performance for personal protection. This information that may aid in providing optimum source control in indoor environments.
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Subject Category: COVID-19
SARS-CoV-2 breakthrough infections among hospitalized patients in southeastern Michigan
Sydney Fine; Kellee Necaise; Alexandra Hayward and Anurag Malani

Background: As of January 2022, more than 57 million cases of COVID-19 have been reported in the United States. Three primary COVID-19 vaccines are widely available: Pfizer (BNT162b2), Moderna (mRNA-1273), and Johnson & Johnson's-Janssen (JNJ-78436735). The vaccines are effective but do not prevent all infections. We investigated trends in type of vaccine receipt, demographic characteristics, and disease outcomes in COVID-19 breakthrough infections among hospitalized patients. **Methods:** A breakthrough case is defined as the detection of SARS-CoV-2 ≥14 days after completion of all doses of an FDA-authorized COVID-19 vaccine. An electronic medical record report in EPIC EHR software identified 85 fully vaccinated patients with a documented positive SARS-CoV-2 result between February and September 2021 at 2 hospitals in southeastern Michigan. Demographic information and hospitalization characteristics, including length of stay and oxygen requirements, were collected from the report. Patients were classified into disease severity categories: nonsevere, severe, or critical. A case was considered severe if the patient's oxygen saturation level (SpO_2) was ≤94% on room air or if the patient required supplemental oxygen. Illness was considered critical if the patient developed respiratory failure, including mechanical ventilation or extracorporeal membrane oxygenation. All other cases were classified as nonsevere. Cycle threshold (Ct) values, the number of PCR cycles required to reach a threshold of SARS-CoV-2 genomic material, were collected from the hospital microbiology lab. **Results:** We identified 85 breakthrough infections (Fig. 1). The average patient age was 69.9±15.7 years, and 44 (51.8%) were female. Severe disease was most common (n = 73, 85.9%) followed by nonsevere disease (n = 7, 8.24%), and 9 patients (10.6%) in this cohort died. Most patients received either the Moderna (n = 35, 41.2%) or Pfizer (n = 38, 44.7%) vaccines. Pfizer vaccine receipt was most common among patients with severe illness (n = 33 of 73, 45.2%), and Moderna vaccine receipt was most common among patients with critical illness (n = 4 of 5, 80.0%). Average time from last vaccination to positive test was longest among Moderna vaccine recipients (181.9±43.1 days) and shortest among J&J vaccine recipients (91.0±61.1 days). The average Ct value was 23.8±7.5 and ranged from 13.0 to 41.3. There were no appreciable differences in the average Ct value by vaccine manufacturer.