Public Health Ontario | Santé publique Ontario

TECHNICAL BRIEF

(ARCHIVED) Cohorting Strategies to Facilitate Bed Flow in Acute Care Settings

Published: January 2022
Archived: December 2023

Introduction

This document outlines cohorting strategies for patients with suspect or confirmed COVID-19 in order to facilitate bed flow in acute care settings. This document does not include cohorting recommendations for patients with antibiotic resistant organisms (AROs) or other infections.

Key Findings

- While it is recommended that patients with suspect or confirmed COVID-19 be placed in single rooms with access to their own toileting facility whenever possible, cohorting patients may be required when sufficient single rooms are not available. Cohorting should be performed in consultation with the clinical and Infection Prevention and Control (IPAC) teams.
- Cohorting of patients and staff assignments is one of many layers of protection available to prevent the spread of infection, with others including vaccination, screening, masking, ventilation, hand hygiene, environmental cleaning and use of personal protective equipment. All layers of protection in the hierarchy of controls should be optimized to reduce and mitigate the risk of exposing individuals in the healthcare setting.
- There is extensive experience cohorting with previous variants of concern. Decisions around cohorting should take into consideration the period of infectivity and reinfection risk by variant status and rates of community transmission.
- The limited evidence to date suggests that the period of infectivity with the Omicron variant (B.1.1.529) is similar or increased compared to prior lineages. At the time of the search, there was no evidence available on the interval length of Omicron reinfection for those who have been previously infected with Omicron variant. For those individuals with a previous non-Omicron variant infection who have a subsequent reinfection with the Omicron variant, evidence is limited but suggests an interval of greater than 90 days between episode dates.

Background

- Ontario continues to experience waves of COVID-19 activity, causing periodic surges in hospital and ICU admissions. Ongoing transmission of SARS-CoV-2 worldwide has resulted in the emergence of multiple variants of concern (VOC), with Omicron as the dominant variant in Ontario.[1]

- Rising admissions to acute care hospitals have raised concerns about the number of admitted patients remaining in the emergency departments who cannot be admitted to an inpatient unit.[1]

- Omicron is more transmissible than previous variants in Ontario.[2] The relative contributions of increased transmissibility inherent in the Omicron variant and immune evasion (due to Omicron mutations and waning immunity), is yet to be fully established.

- There is limited evidence on the infectivity of the Omicron variant compared to other variants (See Appendix A). Modelling data from PHO/PHOL suggests that Omicron does not appear to be less infectious compared to other variants and that the period of infectivity is not reduced compared to prior lineages and may be increased in certain instances.

- Evidence on individuals with a previous non-Omicron variant infection who have a subsequent reinfection with the Omicron variant is limited but suggests an interval of greater than 90 days between episode dates (See Appendix B). No evidence was found on the interval length of Omicron reinfection for those who have been previously infected with Omicron variant. Limited evidence suggests that those with an Omicron variant infection produce an antibody neutralization response to the Omicron variant. No evidence was found that provided the duration of this neutralizing immunity.

- Based on PHO's COVID-19 Variant of Concern Omicron (B.1.1.529) Risk Assessment, December 29, 2021, the current risk of increased Omicron transmission in Ontario is high, with a low degree of uncertainty.[2] The risk of reinfection and breakthrough infection (after two doses of Pfizer, Moderna, AstraZeneca, or a heterologous combination) in Ontario is high with a low degree of uncertainty. The two-dose schedule of common COVID-19 vaccines is less effective at preventing Omicron breakthrough infections compared to protection against other VOCs and 'wild-type' SARS-CoV-2. A third vaccine dose increases short-term protection against symptomatic Omicron infection; the duration of protection from a third dose vaccine is unclear and there is early evidence of reduced vaccine effectiveness beginning around nine to ten weeks after a third dose. The risk of increased disease severity is reduced with a high degree of uncertainty. The overall risk assessment may change as new evidence emerges.

- Transmission of a different VOC to an individual that already has active COVID-19 infection has not been described. However, with 100% Omicron in circulation, cohorting of active COVID-19 cases with unknown VOC status would not confer a significant risk to the patients.

- For the purposes of this document, based on the reviewed data on Omicron reinfection in Ontario, recently recovered patients are defined as those who have been taken out of Additional Precautions AND are within 90 days of their infection AND were diagnosed with COVID-19 on or after Dec 20, 2021 (when Omicron represented over 90% of cases in Ontario).

Methods

A literature search was conducted on January 1 and 2, 2022 by Public Health Ontario (PHO) Library Services to find articles that address Omicron and Delta infectivity period. The search involved one database (Ovid MEDLINE; January 01 to December 30, 2021) and preprints (October 01, 2021 to January 01, 2022). Search terms included, but were not limited to: Omicron, Delta, and infectivity. Titles and abstracts were screened by three reviewers. Two papers were included. One additional paper was identified from previous VOC scanning. Additional articles and grey literature identified for other Scientific and Technical Requests and related work with relevance to this request were also included. See Appendix A for a summary of the literature identified through this search.

The PHO Library Services team conducts a rapid review of existing literature on the infectiousness of Omicron variant infections on a weekly basis (every Wednesday). Ovid MEDLINE database was used to search peer-reviewed literature up to December 29, 2021. The search strategy retrieved articles containing at least one search term related to COVID-19, one search term related to Omicron variants, and one search term related to infection/reinfection in the title, abstract, subject heading, or keyword heading fields. A grey literature search including preprints was also conducted for the same time period. Articles were limited to the English language and duplications were removed from the search. Given uncertainty with Omicron reinfection and to understand the interval between subsequent infections, no specific time interval was used in this response. See Appendix B for a summary of the literature identified through this search.

Jurisdictional Scan

The Greater Toronto Area (GTA) Hospitals updated their IPAC Guidance on December 31, 2021 (Personal communication, Susy Hota). Considerations for the review were the rapid transmission of Omicron variant, now considered the dominant strain in the community, and the subsequent strain on human resources for health care settings when implementing the standard approach to quarantine and isolation. The hospitals of the GTA have identified conditions and internal capacity triggers to adjust their IPAC strategies including early return of Healthcare worker cases and contacts and patient cohorting. The guidance uses a colour coded system for categorizing health care system strain: green for business as usual; yellow for moderate strain and red for high strain.

Strategies for Cohorting Patients

Cohorting involves grouping patients together with common traits/conditions and/or common infections. Cohorting is often used to confine and contain transmission of virus, but may also be used to provide staffing efficiencies and optimize capacity.

Ideally, when staff resources and hospital beds are not at risk, patients with suspect or confirmed COVID-19 should be cared for in a single room under Additional Precautions with access to their own toileting facility whenever possible.[3]

When there are critical staffing shortages and/or critical bed shortages, patient cohorting strategies may be considered (see Table 1).

Table 1. Patient Cohorting Options in Acute Care Settings

Patient Type	Preferred	Alternative	Room Designs
Patients with confirmed COVID-19 by molecular (e.g., PCR) or Rapid Antigen Test	Cohort with patients with confirmed COVID-19	Cohort with recently recovered* patients	Consider 2+ bed rooms with spatial separation optimized (ideally > 2 meters between each patient's bed space).
Patients with suspect COVID-19	Cohorting not recommended	Cohorting not recommended	Single room preferred
Patients with high risk exposure to SARS CoV-2	Cohorting not recommended	Cohort with recently recovered patients	
Recently recovered* patients	Cohort with patients who are NOT suspect or confirmed COVID-19	Cohort with: • Patients with confirmed COVID-19 • Recently recovered patients	Consider 2+ bed rooms with spatial separation optimized (ideally > 2 meters between each patient's bed space).

*Recently recovered patients are those who have been taken out of Additional Precautions AND are within 90 days of their infection AND were diagnosed with COVID-19 on or after Dec 20, 2021 (when Omicron represented over 90% of cases in Ontario).

Strategies for Cohorting Staff

Staff cohorting is the practice of assigning specified health care providers to care only for patients known to be colonized or infected with the same microorganism. Staff cohorting can be used in addition to patient and geographical cohorting by assigning dedicated staff to care for either those patients who are infected or those who are not. This practice can be used, particularly during outbreaks to reduce the potential for cross-infection between patients and limit the number of health care workers and other staff exposed to infected cases by limiting the number of staff interacting with patients. See Table 2 for staff cohorting options.

Table 2. Staff Cohorting Options in Acute Care Settings

Staff Type	Preferred	Alternative
Staff with confirmed COVID-19 returning to work during their self-isolation period**	May be assigned to: • Patients with confirmed COVID-19 • Patients who are recently recovered Keep staffing assignment consistent to minimize exposures.	Usual assignments, but if feasible avoid direct care of patients at highest risk of severe disease (e.g. unvaccinated older patients) Keep staffing assignment consistent to minimize exposures.

**Refer to Ministry of Health for additional workplace precautions COVID-19 Integrated Testing & Case and Contact Management. Interim Guidance: Omicron Surge[4]

Strategies for Managing Essential Care Partners of Cohorted Patients

Considerations for choice and safe management of essential care partners of cohorted patients should be documented in the patient care plan and may include the following:

- Their risk of acquisition and/or transmission of COVID-19 i.e., whether they currently infected, exposed or recovered from COVID-19 (lowest risk for those who are recently recovered from infection with Omicron variant)
- Their risk for infection and severe disease (e.g., age, vaccination status including booster)
- Their ability to understand and follow directions for IPAC practices including PPE donning and doffing, hand hygiene and travelling directly to/from and remaining within the patient care environment.
- Compliance with self-isolation, screening and testing requirements of the organization

Considerations for Patient Cohorting

In addition to applying available evidence there are many important contextual factors that need to be considered as part of any risk assessment and recommendations:[5]

- Patient cohorting should only be considered when appropriate facilities and staffing are available.
- Geographical cohorting refers to restricting patients who are infected or colonized with the same microorganism to several rooms along a corridor or an entire clinical unit. Use of this practice can limit transmission by separating those who are infected or colonized to a specified area away from those who are not.
- Multiple bed moves to accommodate cohorting can be associated with unintended consequences including increased potential risk of transmission, increased strain on staffing, and adverse effects on patient care and safety such as increase in falls and disorientation.[6]
- When considering cohorting, other factors that impact both cohorting and bed flow should be evaluated:
    - Turnaround times of relevant diagnostic test results
    - Environmental and portering service resources
    - Need to accommodate a caregiver/parent/aide
    - Medical and safety needs of the patient
    - Skill set of clinical staff
- Cohorting should never compromise infection control practices and Additional Precautions must be applied **individually** for each patient within the cohort when applicable.
- Clear protocols should be available to guide staff in the appropriate use of PPE within and between cohorts including donning and doffing practices.[7]

- Care equipment must be dedicated to each patient or cleaned between uses on patients/residents in the same cohort.
- Patients should not be cohorted if there is a risk of transmission of other infections, e.g., *Clostridium difficile* infection.
- Patients with confirmed COVID-19 can be cohorted regardless of VOC status.
- Patients with suspect COVID-19 should not be cohorted.[8]
- Patients who are recently recovered may be cohorted with the following:
    - With patients who are NOT suspect or confirmed COVID-19
    - With patients with confirmed COVID-19, starting with the most recently recovered patients
    - With other recently recovered patients
    - With patients with high risk exposure to SARS CoV-2, starting with the most recently recovered patients.
- Prioritize single rooms for:
    - Patients with suspect COVID-19
    - Patients with high risk exposure to SARS CoV-2
- Prioritize multi-bedded rooms for cohorting:
    - Patients with confirmed COVID-19
    - Patients recently recovered from COVID-19
- Cohorting in unconventional spaces (hallways, open bays, repurposed non-clinical rooms) should be avoided for patients with suspect or confirmed or with high risk exposure to SARS Co-V-2.
- Spaces used for cohorting should:
    - Accommodate spatial separation needed between patients within a cohort (ideally >2m between bed spaces) including individual toileting commode at the bedside if feasible
    - Have ventilation optimized
    - Accommodate any safety or medical needs of patients

Appendices: Literature Summary

Appendix A: Duration of Infectivity

The methods for identifying the literature summarized below are documented in the Methods section.

Laboratory Considerations

Test-Based Definitions of Infectivity

- The likelihood of secondary transmission from a COVID-19 infected individual to a non-infected individual is multifactorial. Two factors that affect transmission are the 1) presence and 2) amount of replication-competent (infectious) viruses in the respiratory tract.
- The standard method to detect replication-competent viruses is through viral culture. However, culture is time-consuming, requires specific expertise and infrastructure. Viral culture usually requires a high viral load for viable viruses to be detectable on cultured cells and therefore is not highly sensitive.[9] A negative culture does not necessarily equate the absence of replication-competent viruses in the tested sample.
- Since virus quantification requires parallel testing of previously quantified samples, most laboratories do not routinely measure SARS-CoV-2 copy numbers in clinical samples. A surrogate marker of viral load is the number of PCR thermocycling cycles above which the amplification signal detected in the sample is above the background signal of the assay. The higher the viral load, the lower the number of cycles needed before a signal is detected. PCR assays vary in their efficiency and detection capabilities, therefore the cycle threshold (Ct) value that defines a detected sample may vary significantly depending on which assay is used.

PHO Laboratory Data on Ct Values of Positive Omicron Specimens

- Between July 1 and November 30, 2021, when Delta was the dominant lineage, the median Ct value of positive SARS-CoV-2 specimens on the laboratory-developed PCR testing platform (LDT) at PHO ranged from 23.6 to 26.7 for asymptomatic cases and 21 to 22.1 for symptomatic cases.
- From December 15 to 20, 2021, as Omicron became the predominant lineage, the median Ct value of positive samples ranged from 20.7 to 24.1 for asymptomatic cases and 18.3 to 22.1 for symptomatic cases (see Table A1).

Table A1. Ct values of confirmed SARS-CoV-2 specimens (n = 2,271) from both symptomatic and asymptomatic cases by vaccination status, December 15 - 20, 2021 (PHO Laboratory).

Vaccination Status	Symptomatic infections					Asymptomatic infections				
	N	Ct Value (LDT E gene)				N	Ct value (LDT E gene)			
		Median	P25	P75	Mean		Median	P25	P75	Mean
Unvaccinated	239	**22.1**	18.3	26.6	22.8	224	**23.1**	18.9	27.7	23.9
1 dose (partially vaccinated)	23	**18.3**	16.7	21.7	19.9	38	**24.1**	19.6	28.6	24.6
2 dose BTI	835	**20.7**	17.5	24.6	21.7	876	**20.7**	17.8	25.4	22.3
3-dose BTI	15	**22.8**	20.1	25.4	23.8	21	**22.5**	20.9	28.1	24.1
Total	1,112					1,159				

Table A1 Legend: N, number of cases; Ct, cycle threshold; LDT, laboratory-developed test; E, envelope; P25, lower quartile (25th percentile); P75, upper quartile (75th percentile); BTI, breakthrough infection.

- Overall, there seemed to be a trend towards slightly lower Ct values during the period of December 15 to 20, 2021 compared to the period of July 1 to November 30, 2021, especially among breakthrough infections. This could suggest slightly increased infectivity risk in these populations, although further analyses are needed to address whether these differences are statistically significant. One hypothesis could be that the reduced vaccine effectiveness against Omicron could lead to higher viral loads in seen vaccinated populations.

Ct Values and Viral Dynamics for Omicron Based on Symptom Onset

- Modelling from PHO's laboratory data and public health's case and contact management (CCM) tool also reinforces that Omicron does not appear to be less infectious compared to other variants (see Figure 1). Based on estimates of Ct values by days since symptom onset, the modelling data suggests equivalent (if not slightly increased) viral loads around the time of symptom onset compared to prior lineages. The viral load dynamics over time also suggest that the period of infectivity is not reduced compared to prior lineages and may be increased in certain instances. With other variants of concern, a faster reduction in viral load from infection was seen in vaccinated cohorts as opposed to unvaccinated individuals.[10,11] In the case of Omicron however, there does not seem to be a more rapid viral clearance in vaccinated groups (Personal communication, Kevin Brown).

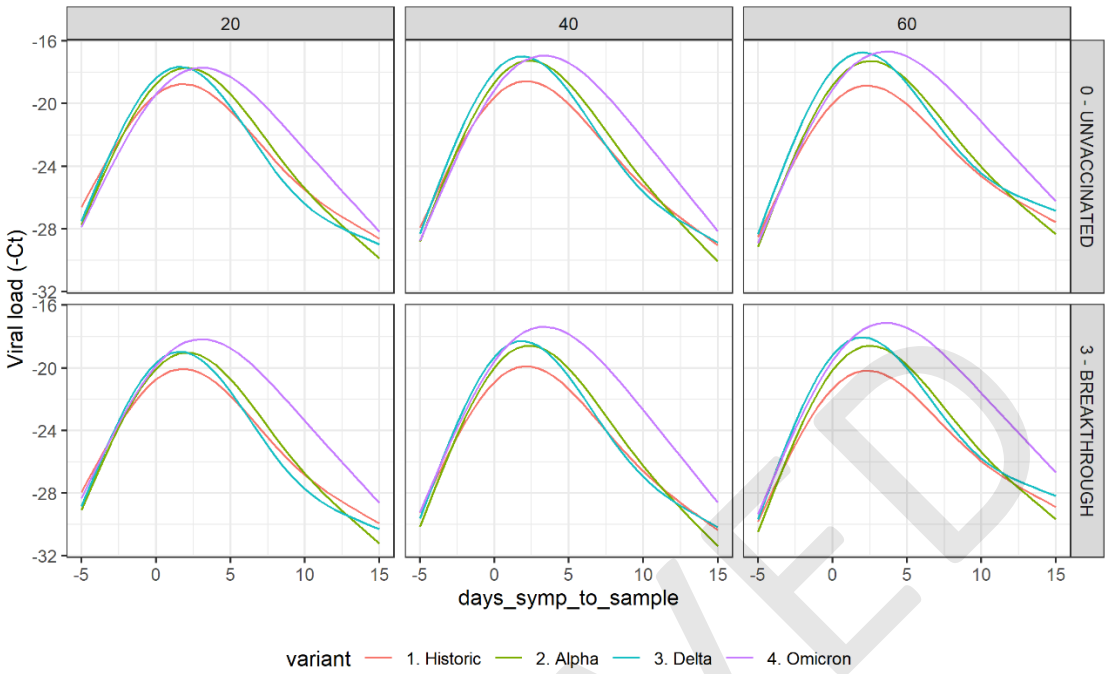

Figure 1. Viral load over time from symptom onset and grouped by age in years (20, 40, 60) and vaccination status (unvaccinated vs 2 doses). The viral load is represented by an inverted -y-axis scale of cycle threshold (-Ct), as cycle threshold values are inversely proportional to viral load. The x-axis represents days from symptom onset (days_symp_to_sample), with negative values representative of the pre-symptomatic phase of illness.

Literature on Duration of Infectivity

- In a rapid review, no evidence was found related to the duration of infectivity and the Omicron variant.
    - In the U.S., the New York Times reported that when the CDC made its recent recommendations to cut isolation periods for infected people from 10 days to five, the CDC incorporated unpublished modeling on the spread of the Delta variant that found the risk of transmission was 13% five days after someone tested positive, and that the CDC was working to make that data public.[12,13]
- A pre-print modelling study of Omicron transmission in Danish households suggests increased secondary attack rates (SAR) of up to 31% by day 7 from primary case identification, compared to 21% for Delta infections.[14] The difference between the two lineages was more significant in vaccinated groups as opposed to unvaccinated groups. The SAR seemed to plateau toward day 7, although the proportion of household members being tested also plateaued by day 7 at around 87-89% of household members.
- Very limited evidence on the duration of infectivity and the Delta variant suggest viral cultures are positive for 5-7 days after onset of illness/positive test, and cultures are usually positive for the same period of time or longer compared to wild-type SARS-CoV infections.

- A small study by Siedner et al., examined the duration of viral shedding and culture positivity with post-vaccination breakthrough Delta (n=10) versus non-Delta (n=14) infections.[15] Individuals with Delta breakthrough infections had a higher initial viral load, slower viral load decay assessed by PCR (median 13.5 vs 4 days), and longer duration of culturable virus (median 7 vs 3 days) compared to non-delta variants, although the difference in the duration of culturable viruses was not statistically significant. All had negative cultures by day 10, except one individual with Delta who had a positive culture at day 11 and was still symptomatic at the time of culture.

- A pre-print by Salvatore et al., monitored viral shedding markers in vaccinated and unvaccinated individuals in a US federal prison during an outbreak of Delta.[16] The study included 95 cases (78 fully vaccinated, 17 not fully vaccinated). Mid-turbinate nasal swabs were collected for 10 days following an individual's testing confirmation of being infected; a total of 978 mid-turbinate nasal specimens were collected (July 12 - August 4, 2021) and tested using PCR. No significant differences were detected in duration of PCR positivity among fully vaccinated participants versus those not fully vaccinated (median: 13 days). For the duration of culture positivity, no significant difference was found between those that were vaccinated or not fully vaccinated (median: 5 days).

- No evidence was found related to the Omicron variant and the residual risk of infected individuals transmitting COVID-19 based on days since symptom onset. Modeling studies prior to the emergence of VOCs suggest the residual risk is about 3% after 5 days. Limited data on Delta transmission suggest the majority of transmission occurred within 4 days after symptom onset.

  - Pre-VOC modelling data evaluated the residual risk of infected individuals to transmit COVID-19 based on days since symptom onset, and estimated the risk at 10.9-13.7% after 5 days, 2.7-3.1% after 7 days, and 0.3% after 10 days.[17]

  - Kang et al. (pre-print) retrospectively analyzed data for cases and close contacts who became secondary cases, all of whom had laboratory-confirmed SARS-CoV-2 infection with Delta (B.1.617.2) in Guangdong, China between May and June 2021.[18] From 94 transmission pairs, infectiousness was estimated to peak at 2.1 days (95% CI: 1.5–2.7 days) before symptom-onset; 73.9% of transmission occurred before illness onset and 97.1% of transmission occurred within 4 days after illness onset.

- PHO has also published the Options for Shortened Quarantine Period for Asymptomatic Close Contacts addressing the role for shortening the quarantine period, including limited evidence related to Delta transmission risk.[19] Most of the evidence related to test-based clearance approaches.

Appendix B: Existing Evidence on Reinfection

The methods for identifying the literature summarized below are documented in the Methods section.

Emerging Evidence on Reinfection Pre-Omicron

- In Ontario, the COVID-19 Fully Vaccinated and Previously Positive Individual Interim Guidance defines a previously positive individual as having a confirmed SARS-CoV-2 infection within 90 days of having been cleared from their initial infection.[20]
    - This guidance does not mean reinfection is not possible within 90 days of initial infection, but rather is based on the lower risk of exposed resolved cases acquiring the infection within the 90 day period.
    - As of January 4, 2022, Ontario has not yet adopted a time-based reinfection case definition.
- In December 2021, the Public Health Agency of Canada (PHAC) released a time-based reinfection case definition.[21] This case definition includes confirmed cases that have been classified as resolved and have a subsequent confirmed infection of SARS-CoV-2 at least 90 days after the previous infection episode date.
- Evidence supporting the use of a 90-day interval for reinfections includes:
    - According to the US Centers for Disease Control and Prevention (CDC), recovered adults can continue to shed detectable but non-infectious SARS-CoV-2 RNA in upper respiratory specimens for up to 3 months after illness onset.[22] Thus, for adults recovered from SARS-CoV-2 infection, a positive SARS-CoV-2 RT-PCR result without new symptoms during the 90 days after illness onset more likely represents persistent shedding of viral RNA than reinfection.
    - Several studies support the use of an interval of 90 days or greater to define reinfection:
        - Lee et al. investigated patients (n=73) with potential SARS-CoV-2 reinfection in the United States (May–July 2020) and did not confirm SARS-CoV-2 reinfection within 90 days of the initial infection based on clinical and laboratory characteristics of cases.[23]
        - Nicholson et al. identified 11 individuals (positive cases between March 18, 2020 and October 31, 2020) who had viral RNA detected from their upper respiratory tract >70 days after their primary SARS-CoV-2 infection.[24] Seven were consistent with probable reinfection (based on time and test based criteria), while four were considered primary infection with prolonged viral RNA shedding. All seven individuals had at least 90 days between their primary SARS-CoV-2 infection and their probable reinfection.
- Some evidence, based on a small number of confirmed SARS-CoV-2 reinfections, support the use of a <90-day interval:
    - Wang et al. conducted a review of 17 cases of genetically confirmed COVID-19 reinfection cases and found the mean interval between the first and the second infections averaged 76 days (range 19–142).[25]
    - Choudhary et al. conducted a review of 20 genetically confirmed COVID-19 reinfection case; the interval between diagnosis of the first infection and the second infection ranged from 44 days to 282 days with a median of 113.5 days.[26]

Emerging Evidence on Omicron Reinfection

Non-Omicron to Omicron Reinfection

Evidence on individuals with a previous non-Omicron variant infection who have a subsequent reinfection with the Omicron variant is limited. Existing evidence suggests that amongst individuals previously infected with a non-Omicron variant who were then re-infected with Omicron variant, the interval between episodes for the vast majority of infections was more than 90 days. However, there is high uncertainty in these findings as most evidence excluded potential reinfections < 90 days between episode dates (as per existing time-based reinfection case definitions).

- The UK Health Security Agency (UKHSA) examined 17 individuals with a previous confirmed infection who were diagnosed with an Omicron variant infection between November 1 and December 3, 2021.[27] The interval to reinfection with Omicron variant from previous SARS-CoV-2 infection ranged from 88 to 541 days (median 314 days) with first episodes occurring both within periods of Alpha and Delta variant dominance.
    - 16/17 cases had an interval of ≥ 90 days and would therefore have been identified as a reinfection on the basis of the UK surveillance definition (an interval between 2 sequential positive SARS-CoV-2 test results of ≥ 90 days).
    - 1/17 cases had an interval of 88 days between 2 positive episodes.
- A more recent UKHSA report (December 23, 2021) reports that of 116,683 individuals identified with an Omicron infection between November 1 and December 18, 2021, 11,103 individuals (9.5%) had a previous confirmed infection (by PCR or rapid antigen testing).[28] The interval to reinfection ranged from 90 to 650 days, with a median of 343 days. This was the third episode of infection for 69 individuals (>=90 days between each episode).
- A peer reviewed article from Norway examined an Omicron outbreak, in which 81 of 117 individuals at a Christmas party were infected.[29] In total, 8 of the individuals previously had COVID-19, but none in the previous 4 months.
- A pre-print from South Africa identified 2,796,982 individuals with lab-confirmed SARS-CoV-2 who had a positive test result before August 29, 2021.[30] There were 35,670 suspected reinfections occurring between November 1 and 27, 2021 (Omicron period). This pre-print only included reinfections if the time between sequential positive tests was at least 90 days. The time between successive positive tests for individuals with suspected reinfections was bimodally distributed with peaks around 180 and 360 days, strongly influenced by the timing of South Africa's epidemic waves.
- Another pre-print from South Africa examined 17,650 Omicron variant 2-dose breakthrough infections (BTI) occurring between November 15 and December 15, 2021.[31] There were 28 reinfections previously infected during the Beta period (February 17 – May 17, 2021) and 786 reinfections previously infected during the Delta period (May 18 – November 14, 2021).
- Kingston, Frontenac, Lennox and Addington area (KFL&A) Public Health Unit has a large Omicron variant driven outbreak that began in early December 2021. As of December 22, 2021 there have been a total of 11 confirmed reinfections with none having occurred within 90 days of the initial infection.

- Public Health Ontario's (PHO) Weekly Epidemiological Summary reports data available from the Case and Contact Management Solution (CCM) for all public health units (PHUs) in Ontario.[32] As of December 29, 2021, 186 (0.6%) of the cases confirmed as B.1.1.529 (Omicron) or S-gene target failure are classified reinfections. This data would under-represent the number of reinfections however, as it only captures cases identified as reinfections meeting the Ministry of Health: Case Definition – Coronavirus Disease (COVID-19) as indicated by public health units selecting the reinfection checkbox.

Omicron-to-omicron Reinfection

- No evidence was found on the interval length for Omicron reinfection for individuals who have been previously infected with Omicron.

- Limited evidence suggests that those with an Omicron variant infection produce an antibody neutralization response to the Omicron variant. No evidence was found that provided the duration of this neutralizing immunity.

    - A pre-print from South Africa investigated whether Omicron infection amongst 15 individuals elicits neutralizing immunity to both Omicron and Delta virus at enrollment versus a median of 14 days after enrollment.[33] Neutralization of Omicron variant increased 14-fold over this time, showing a developing antibody response to the variant. Importantly, there was an enhancement of Delta variant neutralization, which increased 4.4-fold suggesting that the increase in Delta variant neutralization in individuals infected with Omicron variant may result in decreased ability of the Delta variant to reinfect those individuals.

- As of January 4, 2022, it will have been 57 days since Omicron was first detected in South Africa and it is prudent to continue monitoring evidence regarding whether those with an Omicron infection can be re-infected with Omicron within 90 days of their initial episode date.

References

1. Jüni P, Maltsev A, Katz GM, Perkhun A, Yan S, Bodmer NS; Ontario COVID-19 Science Advisory Table. Ontario dashboard: tracking Omicron [Internet]. Toronto, ON: Queen's Printer for Ontario; 2021 [cited 2022 Jan 17]. Available from: https://doi.org/10.47326/ocsat.dashboard.2021.1.0

2. Ontario Agency for Health Protection and Promotion (Public Health Ontario). COVID-19 variant of concern Omicron (B.1.1.529): risk assessment, December 29, 2021 [Internet]. Toronto, ON: Queens's Printer for Ontario; 2021 [cited 2022 Jan 17]. Available from: https://www.publichealthontario.ca/-/media/documents/ncov/voc/2022/01/covid-19-omicron-b11529-risk-assessment-dec-29.pdf?sc_lang=en

3. Ontario Agency for Health Protection and Promotion (Public health Ontario). Interim IPAC recommendations for use of personal protective equipment for care of individuals with suspect or confirmed COVID-19 [Internet]. Toronto, ON: Queens's Printer for Ontario; 2021 [modified 2021 Dec 15; cited 2022 Jan 17]. Available from: https://www.publichealthontario.ca/-/media/documents/ncov/updated-ipac-measures-covid-19.pdf?la=en

4. Ontario. Ministry of Health. COVID-19 integrated testing & case, contact and outbreak management interim guidance: Omicron surge [Internet]. Version 2.0. Toronto, ON: Queen's Printer for Ontario; 2022 [cited 2022 Jan 17]. Available from: https://www.health.gov.on.ca/en/pro/programs/publichealth/coronavirus/docs/contact_mngmt/management_cases_contacts_omicron.pdf

5. Ontario Agency for Health Protection and Promotion, Provincial Infectious Diseases Advisory Committee. Routine practices and additional precautions in all health care settings. 3rd edition. Toronto, ON: Queen's Printer for Ontario; 2012. Available from: https://www.publichealthontario.ca/-/media/documents/B/2012/bp-rpap-healthcare-settings.pdf

6. Toye C, Slatyer S, Kitchen S, Ingram K, Bronson M, Edwards D, et al. Bed moves, ward environment, staff perspectives and falls for older people with high falls risk in an acute hospital: a mixed methods study. Clin Interv Aging. 2019;14:2223-37. Available from: https://doi.org/10.2147/CIA.S211424

7. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Focus on: cohorting in outbreaks in congregate living settings [Internet]. 2nd ed. Toronto, ON: Queen's Printer for Ontario; 2021 [cited 2022 Jan 17]. Available from: https://www.publichealthontario.ca/-/media/documents/ncov/cong/2020/06/focus-on%20cohorting-outbreaks-congregate-living-settings.pdf?la=en

8. Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infectious Diseases Advisory Committee. Interim guidance for infection prevention and control of SARS-CoV-2 variants of concern for health care settings [Internet]. 2nd revision. Toronto, ON: Queen's Printer for Ontario; 2021 [cited 2022 Jan 17]. Available from: https://www.publichealthontario.ca/-/media/documents/ncov/voc/2021/02/pidac-interim-guidance-sars-cov-2-variants.pdf?la=en

9. Binnicker MJ. Can testing predict SARS-CoV-2 infectivity? The potential for certain methods to be surrogates for replication-competent virus. J Clin Microbiol. 2021;59(11):e00469-21. Available from: https://doi.org/10.1128/JCM.00469-21

10. Chia PY, Ong SW, Chiew CJ, Ang LW, Chavatte JM, Mak TM, Cet al. Virological and serological kinetics of SARS-CoV-2 Delta variant vaccine-breakthrough infections: a multi-center cohort study. Clin Microbiol Infect. 2021 Nov 23 [Epub ahead of print]. Available from: https://doi.org/10.1016/j.cmi.2021.11.010

11. Kissler SM, Fauver JR, Mack C, Tai CG, Breban MI, Watkins AE, et al. Viral dynamics of SARS-CoV-2 variants in vaccinated and unvaccinated persons. N Engl J Med. 2021;385(26):2489-91. Available from: https://doi.org/10.1056/nejmc2102507

12. Mueller B. Will shortened isolation periods spread the virus? New York Times [Internet], 2021 Dec 28 [modified 2021 Dec 30, cited 2021 Jan 17]. Available from: https://www.nytimes.com/2021/12/28/health/covid-isolation-period-omicron.html

13. Centers for Disease Control and Prevention. CDC updates and shortens recommended isolation and quarantine period for general population [Internet]. Atlanta, GA: Centers for Disease Control and Prevention; 2021 [cited 2022 Jan 17]. Available from: https://www.cdc.gov/media/releases/2021/s1227-isolation-quarantine-guidance.html

14. Lyngse FP, Mortensen LH, Denwood MJ, Christiansen LE, Møller CH, Skov RL, et al. SARS-CoV-2 Omicron VOC transmission in Danish households. medRxiv 21268278 [Preprint]. 2021 Dec 27 [cited 2022 Jan 10]. Available from: https://doi.org/10.1101/2021.12.27.21268278

15. Siedner MJ, Boucau J, Gilbert RF, Uddin R, Luu J, Haneuse S, et al. Duration of viral shedding and culture positivity with post-vaccination SARS-CoV-2 delta variant infections. JCI insight. 2021 Dec 6 [Epub ahead of print]. Available from: https://doi.org/10.1172/jci.insight.155483

16. Salvatore PP, Lee CC, Sleweon S, McCormick DW, Nicolae L, Knipe K, et al. Transmission potential of vaccinated and unvaccinated persons infected with the SARS-CoV-2 Delta variant in a federal prison, July-August 2021. medRxiv 21265796 [Preprint]. 2021 Nov 19 [cited 2022 Jan 21]. Available from: https://doi.org/10.1101/2021.11.12.21265796

17. Shrestha NK, Marco Canosa F, Nowacki AS, Procop GW, Vogel S, Fraser TG, et al. Distribution of transmission potential during nonsevere COVID-19 illness. Clin Infect Dis. 2020;71(11):2927-32. Available from: https://doi.org/10.1093/cid/ciaa886

18. Kang M, Xin H, Yuan J, Ali ST, Liang Z, Zhang J, et al. Transmission dynamics and epidemiological characteristics of Delta variant infections in China. medRxiv 21261991 [Preprint]. 2021 Aug 13 [cited 2022 Jan 21]. Available from: https://doi.org/10.1101/2021.08.12.21261991

19. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Focus on: options for shortened quarantine period for asymptomatic close contacts [Internet]. Toronto, ON: Queen's Printer for Ontario; 2021 [cited 2022 Jan 17]. Available from: https://www.publichealthontario.ca/-/media/documents/ncov/phm/2021/09/covid-19-shortened-quarantineoptions-asymptomatic.pdf?sc_lang=en

20. Ontario. Ministry of Health. COVID-19 fully vaccinated and previously positive individuals: case, contact and outbreak management interim guidance [Internet]. Version 3.0. Toronto, ON: Queen's Printer for Ontario; 2021 [cited 2022 Jan 17]. Available from: https://www.health.gov.on.ca/en/pro/programs/publichealth/coronavirus/docs/contact_mngmt/COVID-19_fully_vaccinated_interim_guidance.pdf

21. Public Health Agency of Canada. National case definition: coronavirus disease (COVID-19) [Internet]. Ottawa, ON: Government of Canada; 2021 [cited 2022 Jan 17]. Available from: https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/health-professionals/national-case-definition.html#re

22. Centers for Disease Control and Prevention. Ending isolation and precautions for people with COVID-19: interim guidance [Internet]. Atlanta, GA: Centers for Disease Control and Prevention; 2022 [cited 2022 Jan 17]. Available from: https://www.cdc.gov/coronavirus/2019-ncov/hcp/duration-isolation.html#:~:text=1%2D5) ,Patients%20who%20have%20recovered%20from%20COVID%2D19%20can%20continue%20to,recovered%20and%20infectiousness%20is%20unlikely.

23. Lee JT, Hesse EM, Paulin HN, Datta D, Katz LS, Talwar A, et al. Clinical and laboratory findings in patients with potential severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) reinfection, May–July 2020. Clin Infect Dis. 2021;73(12):2217-25. Available from: https://doi.org/10.1093/cid/ciab148

24. Nicholson EG, Avadhanula V, Fragoso S, Stroh R, Ye X, Bond N, et al. SARS-CoV-2 re-infection versus prolonged shedding: a case series. Influenza Other Respir Viruses. 2021;15:691-6. Available from: https://doi.org/10.1111/irv.12879

25. Wang J, Kaperak C, Sato T, Sakuraba A. COVID-19 reinfection: a rapid systematic review of case reports and case series. J Investig Med. 2021;69:1253-5. Available from:

26. http://dx. doi.org/10.1136/jim-2021- 001853

27. Choudhary MC, Crain CR, Qiu X, Hanage W, Li JZ. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) sequence characteristics of coronavirus disease 2019 (COVID-19) persistence and reinfection. Clin Infect Dis. 2021 Apr 27 [Epub ahead of print]. Available from: https://doi.org/10.1093/cid/ciabfofocus380

28. United Kingdom. Health Security Agency. SARS-CoV-2 variants of concern and variants under investigation in England: technical briefing 31 [Internet]. London: Health Security Agency; 2021 [modified 2021 Dec 10; cited 2022 Jan 17]. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1042367/technical_briefing-31-10-december-2021.pdf

29. United Kingdom. Health Security Agency. SARS-CoV-2 variants of concern and variants under investigation in England: technical briefing 33 [Internet]. London: Health Security Agency; 2021 [modified 2021 Dec 23; cited 2022 Jan 17]. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1043807/technical-briefing-33.pdf

30. Brandal LT, MacDonald E, Veneti L, Ravlo T, Lange H, Naseer U, et al. Outbreak caused by the SARS-CoV-2 Omicron variant in Norway, November to December 2021. Euro Surveill. 2021;26(50):2101147. Available from: https://doi.org/10.2807/1560-7917.es.2021.26.50.2101147

31. Pulliam JR, van Schalkwyk C, Govender N, von Gottberg A, Cohen C, Groome MJ, et al. Increased risk of SARS-CoV-2 reinfection associated with emergence of the Omicron variant in South Africa. medRxiv 21266068 [Preprint]. 2021 Dec 02 [cited 2022 Jan 21]. Available from: https://doi.org/10.1101/2021.11.11.21266068

32. Goga A, Bekker LG, Garret N, Reddy T, Yende-Zuma N, Fairall L, et al. Breakthrough Covid-19 infections during periods of circulating Beta, Delta and Omicron variants of concern, among health care workers in the Sisonke Ad26. COV2. S vaccine trial, South Africa. medRxiv 21268171 [Preprint]. 2021 Dec 22 [cited 2022 Jan 21]. Available from: https://doi.org/10.1101/2021.12.21.21268171

33. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Weekly epidemiological summary: COVID-19 lineage B.1.1.529 (Omicron) or S-gene target failure (SGTF) in Ontario: October 31, 2021 to December 29, 2021 [Internet]. Toronto, ON: Queen's Printer for Ontario; 2021 [cited 2022 Jan 17]. Available from: https://www.publichealthontario.ca/-/media/documents/ncov/epi/covid-19-omicron-weekly-epi-summary.pdf?sc_lang=en

34. Khan K, Karim F, Cele S, San JE, Lustig G, Tegally H, et al. Omicron infection enhances neutralizing immunity against the Delta variant. medRxiv 21268439 [Preprint]. 2021 Dec 27 [cited 2022 Jan 21]. Available from: https://doi.org/10.1101/2021.12.27.21268439

Citation

Ontario Agency for Health Protection and Promotion (Public Health Ontario). Cohorting strategies to facilitate bed flow in acute care settings. Toronto, ON: Queens's Printer for Ontario; 2022.

Disclaimer

This document was developed by Public Health Ontario (PHO). PHO provides scientific and technical advice to Ontario's government, public health organizations and health care providers. PHO's work is guided by the current best available evidence at the time of publication. The application and use of this document is the responsibility of the user. PHO assumes no liability resulting from any such application or use. This document may be reproduced without permission for non-commercial purposes only and provided that appropriate credit is given to PHO. No changes and/or modifications may be made to this document without express written permission from PHO.

Public Health Ontario

Public Health Ontario is an agency of the Government of Ontario dedicated to protecting and promoting the health of all Ontarians and reducing inequities in health. Public Health Ontario links public health practitioners, front-line health workers and researchers to the best scientific intelligence and knowledge from around the world.

For more information about PHO, visit publichealthontario.ca.

Ontario