COVID-19 Breakthrough Infections

July 2021

Background

As of July 13, 2021, more than 43 million doses of COVID-19 vaccines have been administered in Canada, of which approximately 69% of Canadians 18 and over have received at least their first dose, and approximately 52% of Canadians aged 12 and over have been fully vaccinated with the recommended number of doses.[i] In BC, 79% of British Columbians aged 12 and over have received at least their first dose of a COVID-19 vaccine (80% of eligible adults 18 and over), and 47% of those 12 and over have been fully vaccinated with the recommended two doses (50.5% of eligible adults 18 and over).[ii]

COVID-19 vaccines are not 100% effective at preventing infection, but they are proven to significantly reduce an individual's likelihood of not only becoming infected but also severely ill or hospitalized as a result of COVID-19.[iii] For reference, this is the same expectation as with other vaccines that protect against other viruses. A recent preprint study of two approved mRNA vaccines in Canada found that the Pfizer-BioNTech and Moderna vaccines significantly reduced the risk of severe illness, hospitalization or death caused by COVID-19.[iv] The study found these vaccines lowered the risk of severe outcomes by 70% just two weeks after the first dose and by 98% one week after the second dose.[v] Those infections that occur after immunization against COVID-19 are called 'breakthrough infections' and may be either symptomatic or asymptomatic.[vi] This is an important indicator in that the presence of asymptomatic infection is another way of demonstrating the real-world effectiveness of vaccines, as they reduce serious illness caused by the virus.

In Canada, breakthrough infections have been rare. In late June 2021 during a media briefing, the Public Health Agency of Canada (PHAC) noted that as of June 21st, nationally Canada's breakthrough infections in fully vaccinated people have accounted for around 2700 cases (or 0.5%) of all reported cases since vaccination rollout began, as reported by 10 provinces and territories (data was not provided from Quebec, Saskatchewan or Newfoundland/Labrador at this time).[vii,viii] Out of those 2700 fully vaccinated cases there were 66 deaths, compared to 13,000 deaths nationwide since December.[ix] The PHAC also stated that of vaccinated individuals, only 0.0027% of those who died were partially vaccinated (single dose), and 0.0018% of those who died were fully vaccinated (recommended two doses), and that 'the protective effect [of vaccination] was significant among partially vaccinated cases aged 60+ years and those that occurred after vaccination with two doses over 80 years of age.'[x] Furthermore in BC, the most recent July report from the BC Centre for Disease Control (BCCDC) notes that the majority of COVID-19 infections in the province in June were in unvaccinated individuals (76%), while 22% of infections occurred in recently vaccinated or single dose recipients, and only 2% of cases were reported in those who were fully vaccinated.[xi] BC case counts continue to be monitored and reported biweekly by the BCCDC.

In the United States, breakthrough infections have also been very low. As of early May 2021, approximately 10,000 cases of breakthrough infections had been reported in the US, out of approximately 101 million persons who had been fully immunized with the recommended number of doses.[xii] Of those 10,000 cases, more than one-quarter were asymptomatic (27%), and of the approximately 2% of those cases which resulted in deaths, the median age of those individuals was 82 years.[xiii]

Furthermore, one study out of Israel found that of 152 cases of breakthrough infection in fully vaccinated individuals, the majority of those individuals suffered from one or more comorbidities prior to vaccination.[xiv] Of those 152, 71% suffered from hypertension, 48% from diabetes, 27% from congestive heart failure, 24% from chronic kidney disease, 24% from chronic lung disease, 19% from dementia, and 24% from cancer.[xv] To date, just over 10 million vaccines have been administered in Israel, of which 60% of the country is fully vaccinated with the recommended number of doses.[xvi]

Real-world evidence shows that COVID-19 vaccines are highly effective in protecting against severe illness or death as a result of COVID-19. In Canada and around the world in countries where COVID-19 immunization campaigns have rolled out, the cases of symptomatic COVID-19 have been reduced significantly. Now in Canada and the United States, the majority of symptomatic illness occurs among the unvaccinated population.

Additionally, of the small number of cases that occurred in fully vaccinated individuals, there may be a connection to comorbidities based on preliminary data findings (based on a small data sample). Current evidence maintains that while breakthrough infections in fully vaccinated persons are not impossible, they are rare, and serious illness as a result of breakthrough infection is rarer still.

Nurses know that immunization is a safe and effective tool in helping to prevent illness caused by COVID-19. Nurses are at the forefront of immunization campaigns around the world and are integral in moving us towards community immunity which will prevent more people from becoming seriously ill from COVID-19. As more people become fully vaccinated with the recommended number of doses depending on the vaccine they receive, their chances of becoming infected are reduced greatly. Nurses can focus on evidence-based information that can be shared with patients about vaccine effectiveness and safety, and encourage their patients, clients, and communities to get vaccinated. Nurses also know that immunization combined with other communicable disease protocols such as wearing a mask if unvaccinated or partially vaccinated, thorough hand washing, and practising physical distancing are all important parts of preventing the further spread of COVID-19.

Key Messages

- Breakthrough infections are defined as COVID-19 infections, symptomatic or asymptomatic, which occur in individuals after they have been fully vaccinated against the virus.
- Breakthrough infections remain rare in Canada and around the world in countries where large-scale vaccination campaigns have taken place.
- The PHAC states that Canada's breakthrough infections in fully vaccinated people have accounted for approximately 2700 cases, or 0.5% of cases since vaccine rollout began.
- Initial research out of Israel demonstrates that the majority of those who become ill with COVID-19 breakthrough infections experienced one or more comorbidities prior to vaccination.
- Real-world data shows that vaccination against COVID-19 significantly reduces chances of being seriously ill or requiring hospitalization from COVID-19.
- Nurses are at the forefront of immunization programs and protocols and are ideally positioned to help patients, clients, and communities understand the benefits of COVID-19 vaccinations, as well as answer questions about vaccine effectiveness.

Further Reading/Resources

- Public Health Nursing & Vaccine Delivery
- COVID-19 Variants of Concern & Variants of Interest
- COVID-19 & Border Reopening Plans
- BCCDC: COVID-19 Data Summary (reports every 2 weeks)
- BCCDC: COVID-19 cases in BC, Cases reported by Local Health Areas
- HealthLinkBC: COVID-19 Immunization
- WHO: Vaccine efficacy, effectiveness and protection
- COVID-19 Canada Vaccination Tracker
- CDC: What You Should Know About the Possibility of COVID-19 Illness After Vaccination

Please feel free to direct questions and comments to info@nnpbc.com.

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[i] N Little, 'COVID-19 Tracker Canada,' (2020). https://covid19tracker.ca/licensing.html

[ii] Ministry of Health, 'B.C. COVID-19 pandemic update,' *BC Ministry of Health*, (July 14, 2021).

https://archive.news.gov.bc.ca/releases/news_releases_2020-2024/2021HLTH0128-001368.htm

[iii] Public Health Agency of Canada (PHAC), 'An Advisory Committee Statement (ACS) National Advisory Committee on Immunization (NACI): Recommendations on the use of COVID-19 vaccines,' (July 2, 2021). https://www.canada.ca/content/dam/phac-aspc/documents/services/immunization/national-advisory-committee-on-immunization-naci/recommendations-use-covid-19-vaccines/recommendations-use-covid-19-vaccines-en.pdf

[iv] H Chung, S He, S Nasreen, ME Sundaram, et al, 'Effectiveness of BNT162b2 and mRNA-1273 COVID-19 vaccines against symptomatic SARS-CoV-2 infection and severe COVID-19 outcomes in Ontario, Canada,' *medRxiv* (May 28, 2021). https://www.news-medical.net/news/20210531/Report-on-the-effectiveness-of-mRNA-1273-and-BNT162b2-COVID-19-vaccines-in-Canada.aspx

[v] M Greenwood, 'Report on the effectiveness of mRNA-1273 and BNT126b2 COVID-19 vaccines in Canada,' *News-Medical* (July 15, 2021). https://www.news-medical.net/news/20210531/Report-on-the-effectiveness-of-mRNA-1273-and-BNT162b2-COVID-19-vaccines-in-Canada.aspx

[vi] WHO, 'Vaccine efficacy, effectiveness and protection,' (July 14, 2021). https://www.who.int/news-room/feature-stories/detail/vaccine-efficacy-effectiveness-and-protection

[vii] D Lao, 'Majority of COVID-19 infections, deaths now among unvaccinated people in Canada: Data,' *Global* (June 25, 2021). https://globalnews.ca/news/7981772/covid-19-infections-death-unvaccinated/

[viii] L Pelley, 'Why reports of COVID-19 infections after 2 vaccine doses aren't cause for alarm,' *CBC* (June 28, 2021). https://www.cbc.ca/news/health/covid-vaccines-break-through-infection-canada-doses-1.6080206

[ix] D Lao, *Majority of COVID-19 infections, deaths now among unvaccinated.*

[x] Ibid

[xi] BC Centre for Disease Control (BCCDC), 'BCCDC Data Summary,' *BCCDC,* (July 2, 2021). http://www.bccdc.ca/Health-Info-Site/Documents/COVID_sitrep/2021-07-02_Data_Summary.pdf

[xii] CDC, 'COVID-19 Vaccine Breakthrough Infections Reported to CDC – United States, January 1-April 30, 2021,' *Morbidity and Mortality Weekly Report Vol 70(21)* (May 28, 2021). https://www.cdc.gov/mmwr/volumes/70/wr/pdfs/mm7021e3-H.pdf

[xiii] CDC. *COVID-19 Vaccine Breakthrough Infections Reported to CDC – US, Jan 1-Apr 30.*

[xiv] T Brosh-Nissimov, E Orenbuch-Harroch, M Chowers, H Zayyad, et al, 'BNT162b2 vaccine breakthrough: clinical characteristics of 152 fully-vaccinated hospitalized COVID-19 patients in Israel,' *Clinical Microbiology and Infection* (July 6, 2021). https://www.clinicalmicrobiologyandinfection.com/article/S1198-743X(21)00367-0/fulltext

[xv] T Brosh-Nissimov and E Orenbuch-Harroch, *BNT162b2 vaccine breakthrough: clinical characteristics.*

[xvi] H Ritchie, E Ortiz-Ospina, D Beltekian, E Mathieu, et al, 'Coronavirus (COVID-19) Vaccinations,' (2020). https://ourworldindata.org/covid-vaccinations