

COVID-19 Scientific Advisory Group Evidence Summary and Recommendations

Likelihood of Transmission of COVID-19 infection after COVID-19 Vaccination

March 23, 2021

The AHS Scientific Advisory Group is a contributing member of COVID-END, the COVID-19 Evidence Network to support Decision-making.

This document summarizes the COVID-END report on the likelihood of transmission of COVID-19 infection after COVID-19 vaccination, prepared by member group University of Calgary HTA on March 2, 2021 adds some additional information, and develops key messages and recommendations grounded in the Alberta healthcare system context.



Physical
distancing
works

Lay Summary

- This document summarizes [the COVID-19 Evidence Network to support Decision-making](#) report on the likelihood of transmission of COVID-19 infection after COVID-19 vaccination, and adds some relevant information for decision makers in Alberta.
- The original question arose from healthcare leaders but has become a focus of wide interest: as the numbers of vaccine recipients go up, people wonder if public health measures still apply after vaccination, including using masks in public, and whether quarantine rules are to remain the same after vaccination.
- One issue is that the vaccine studies were designed to measure vaccine protection from COVID-19 illness, with all available vaccines are very effective at decreasing hospitalization and death from COVID-19. However they were not set up to assess the risk of transmission after vaccination. This is important since some vaccines protect against illness and carriage/transmission, while others protect against illness but the vaccinated person can still carry or spread the germ (example, pertussis). If asymptomatic SARS-CoV-2 infection after vaccination is common, and significant transmission after vaccination can occur, then currently recommended precautions would need to be maintained until more people have received vaccine.

Key Messages

- We will continue to see the reported vaccine protection numbers change as trials are done at different times, in different places, and with differing numbers of variants of concern (VOC). All of the vaccines have been highly protective against severe COVID-19.
- Information from limited studies that performed routine viral swabs after vaccination regardless of symptoms show that having a positive test without documented symptoms is less common in vaccinated people, although positive tests can still occur. Some vaccines seems to protect against this asymptomatic test positivity better than others.
- Some studies show that the amount of virus in positive tests collected after vaccination appears to be lower, so people may be less likely to transmit to others.
- Studies in which small numbers of vaccinated monkeys were exposed to the virus showed all COVID-19 vaccines reduce lung infection well but seem to vary in how well they prevent the SARS-CoV-2 virus from infecting/being carried in the nose, so it is possible that some vaccines may be better at preventing onward spread than others.
- None of the vaccine studies to date have directly measured whether people who are vaccinated and end up testing positive for COVID-19 transmit the virus to fewer people than people who test positive for COVID-19 and are not vaccinated

Conclusion: Although so far studies look promising that vaccination will reduce transmission, until more studies are finished it is most safe to maintain current precautions during vaccine rollout and reassess the evidence frequently.

Authorship and Committee Members

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The AHS Scientific Advisory Group is a contributing member of [COVID-END, the COVID-19 Evidence Network to support Decision-making](#). This document summarizes the COVID-END report on likelihood of transmission of COVID-19 infection after COVID-19 vaccination, prepared by member group University of Calgary HTA and uses its findings to develop key messages and recommendations grounded in the Alberta healthcare system context.

The original report can be accessed [here](#)

Topic: Likelihood of Transmission of COVID-19 Infection after COVID-19 Vaccination

1. Can people who have started or finished a COVID-19 vaccine series develop asymptomatic COVID-19 infection and transmit the virus to other individuals? If so, how large is the risk, in comparison to unvaccinated people?
 - a. Should close contacts of confirmed or probable COVID-19 cases who have started, or finished a COVID-19 vaccine series be required to quarantine in a similar fashion to those who are not vaccinated?
 - b. Should health care workers (HCW) assessed as having an exposure in any setting but who have started, or finished a vaccine series be required to quarantine and be off work in a similar fashion to those HCW who are not vaccinated?

Context

- It is not yet clear whether the current COVID-19 vaccines are as effective at reducing transmission as they are at reducing disease. There are vaccines that prevent disease but do not completely block transmission (e.g., acellular pertussis vaccine) - this therefore could impact transmission during and after vaccine rollout and is a consideration in public health recommendations for vaccine recipients.
- Theoretically, immunization may reduce COVID-19 transmission through 3 mechanisms: reduction of the number of people with transmissible symptomatic or asymptomatic COVID-19 infection, and potentially by reducing the infectiousness of those who do develop COVID-19 infection at any point after immunization.
- Vaccine trials for currently licensed vaccines have used symptomatic COVID-19 disease as their primary end point to establish vaccine efficacy. There are limited data to evaluate the efficacy (clinical trials settings) or real-world effectiveness (observational studies) of COVID-19 vaccines for secondary end points such as in decreasing viral loads in breakthrough infection, and in reduction of asymptomatic RT-PCR positive states after vaccination.
- There are no presently available epidemiologic studies on evidence of forward transmission after immunization; therefore, there is uncertainty around vaccine

effectiveness against potential transmission of infection from asymptomatic vaccinated people, although transmission from asymptomatic individuals is lower.

- Public health recommendations around personal protective equipment (PPE) and management of exposures and contact have not yet differentiated their recommendations for vaccinated and unvaccinated individuals.
- As the availability of COVID-19 vaccines increases and more population groups can be vaccinated, it will be important to have an evidence-informed approach to public health measures to reduce incidence rates and prevent/control any potential additional waves of SARS-CoV-2 transmission, but also to rationalize measures based on risk of infection and transmission.
- To best inform evolution of PPE use and quarantine policy, a review of current literature was requested by Alberta Health to delineate what is known about the risk of transmission of infection after vaccination and evaluate implications of changes to quarantine restrictions for vaccinated individuals, both within the healthcare system and the community.
- The scope of this review was focused on:
 - 1) A COVID-END data summary on detection of SARS-CoV-2 positivity in the absence of symptoms in vaccinated individuals from existing vaccine efficacy and effectiveness studies, data around post-infection proxy measures of infectivity such as Ct (cycle threshold) values and viral load in asymptomatic and symptomatic vaccinated people, and a targeted assessment of preclinical vaccine studies with primate challenge studies where virologic data was collected in vaccinated and unvaccinated animals after infection challenge. This review is expected to be updated in an iterative fashion as evidence emerges: the most recent version of this data can be accessed [here](#).
 - 2) A brief review of select studies addressing the biologic plausibility and pathophysiology of expected transmission during an evolving immune response or with antibody exposure (viral load, Ct values, immune response to vaccination, and COVID-19 transmission papers); as well as an expanded description of HCW vaccine effectiveness studies.
 - 3) A brief jurisdictional scan of public health guidance for vaccinated people.
- In this review's potential recommendation and guidance, it is recognized that decision-makers must balance vaccination effectiveness considerations with other factors such as economics, ethics, equity, feasibility, and acceptability. The evidence base around these factors was, however, not systematically assessed in this review. It is recognized that policy makers contemplating changes to recommendations for healthcare settings and the community must consider if it is equitable to treat individuals differently based on whether or not they have been vaccinated, given that not all individuals are eligible access to COVID-19 vaccines at this time.

Key Messages for Alberta

Asymptomatic infection and transmission in vaccinated individuals – summary of the [COVID-END report](#) (in this version, literature was searched to February 26, 2021 – this is a living review with scheduled updates so please use the link for most current version)

- People who are partially or fully vaccinated (see definitions, Appendix) have been documented to have detectable SARS-CoV-2 by RT-PCR at various time points after their vaccine first dose, although cultivatable virus has not been assessed. There have been no epidemiologic reports of transmission from SARS-CoV-2 positive vaccinated individuals as yet. There is rapidly evolving data in this area, and readers are requested to refer to the most recent posted version of the COVID-END report.
- Using the existing data on the proportion of vaccinated individuals testing COVID-19 positive without documented symptoms with licensed vaccines in randomized controlled trials (RCT) and observational studies, it is possible to illustrate the risk of testing positive after varied exposure risks to help plan management of exposures in vaccinated persons and recommended preventative measures, although presently it is unclear to what degree testing positive post vaccination is a true risk for forward transmission.
- The primary endpoint of the vaccine RCTs has been detection of test positive symptomatic COVID-19. Some RCT and cohort studies of selected COVID-19 vaccines, Pfizer BioNTech (PfBNT), Oxford AstraZeneca (AZ), Moderna and Janssen present data which suggest a reduction in the likelihood of testing positive for SARS-CoV-2 RT-PCR in the absence of documented symptoms after vaccination. The data for AZ vaccine efficacy against asymptomatic positivity is more equivocal, with an analysis of dose timing showing effectiveness against asymptomatic positivity, building later after the initial dose (3-month range 25-60%) although notably the likelihood of any positive tests declines after the first dose. It is not possible to directly compare findings across studies owing to variations in the assessment of symptom status, study design, and setting of the trials particularly with respect to degree of circulation of variants of concern (VOC).
- Separate preclinical primate studies where small numbers of vaccinated animals were challenged with SARS-CoV-2 showed vaccinated animals receiving the Moderna mRNA (8 weeks prior) or Novavax protein vaccine (35 days prior) were much less likely to have SARS-CoV-2 recovered from nasal or lower respiratory samples than unvaccinated animals. The AZ vaccine challenge study suggested it was protective against lower respiratory replication but showed no protection against nasal virus replication.
- Population-based data on SARS-CoV-2 RT-PCR Ct values (a proxy of viral load) of positive tests collected after vaccination in Israel describes significantly higher Ct values (a lower amount of virus) in vaccinated (AZ or Pfizer) than in unvaccinated controls. There was no symptom data available. This suggests that vaccination may reduce the amount of virus present in symptomatic and asymptomatic post vaccine positive cases, and thus may plausibly reduce transmission risk. More evidence is required to provide a

- clearer indication of impact on Ct values and correlation with subsequent transmission.
- Existing evidence on vaccine efficacy against VOCs is limited and is the topic of a separate in progress rapid review which will be found at the [COVID-END website](#).
 - As most of the current data is around viral detection by RT-PCR rather than evidence of cultivatable virus and epidemiologic evidence of transmission, further research is required to clarify the likelihood of forward transmission from asymptomatic or minimally symptomatic vaccinated people, both for wild type COVID-19 (no major mutations) and VOC. However, extant data does suggest vaccinated individuals are less likely to have asymptomatic detection of SARS-CoV-2 carriage than unvaccinated individuals, although this effect is less pronounced and appears to occur later with AZ vaccine versus mRNA vaccines. Those who do have detectable virus may have lower amounts of virus present, using a proxy of Ct values, which is methodologically less robust than other laboratory methods, but still supportive of potentially lower transmission risk for vaccinated individuals.
 - Other data that pertains to the plausibility of vaccine-induced reduction of transmission was reviewed: monoclonal antibody therapeutics trials for COVID-19 infection, a study that included assessment of epidemiologic evidence of transmission from individuals who were persistently RT-PCR positive after natural infection but had evidence of an immunologic response, and two studies looking at viral load or Ct measures and association with transmission. **In total, these studies support that viral load can be reduced by circulating antibody, that a lower viral load or higher Ct on RT-PCR is associated with a reduced risk of transmission, and RT-PCR positivity in the presence of neutralizing antibody and/ or correlates of cell mediated immunity should not be considered to necessarily represent transmissible infection**

Additional Evidence Review

Jurisdictional Scan:

1) Quarantine guidance for community close contacts who are fully vaccinated

- A brief jurisdictional scan revealed that aside from recent CDC (CDC[b], 2021; CDC[c], 2021) guidance there are very few guidance recommendations that have been made publicly available regarding quarantine for fully vaccinated citizens (Appendix I).
- Current recommendations from Alberta, Ontario and British Columbia require all individuals assessed as having an exposure to quarantine, regardless of immunization status.
- The US CDC (CDC[a]) released interim clinical considerations on February 10, 2021 which state that vaccinated individuals with exposure to a confirmed or suspected case of COVID-19 are not required to quarantine if they meet all three of the following criteria: 1) fully vaccinated (i.e., ≥ 2 weeks following receipt of the second dose in a 2-dose series, or ≥ 2 weeks following receipt of

- one dose of a single-dose vaccine); 2) Are within 3 months following receipt of the last dose in the series; and 3) Have remained asymptomatic since the current COVID-19 exposure.
- A few news media articles were identified that outline some countries have modified restrictions for arriving travelers to include a quarantine exemption for travelers meeting certain criteria such as: >14 days since second vaccination was administered and within three months from the date of receiving second vaccine dose.

2) Quarantine guidance for vaccinated HCWs after exposure and data from HCW surveillance and observational studies.

- The Interim Clinical Considerations released by the US CDC (CDC[a]) suggest that quarantine recommendations for vaccinated individuals in community (i.e., no quarantine requirement if the aforementioned criteria are met) should be given consideration with respect to HCW quarantine and recognize staffing considerations (Appendix I). The guidance highlights that fully vaccinated HCWs meeting the listed criteria would need to quarantine from health care settings but would follow the community guidelines above in the community.
- The Minnesota Health Department (2021) released HCW recommendations that suggest HCWs with a high-risk exposure should quarantine from work for 14 days and align with the CDC recommendations in stating that HCWs who are fully vaccinated and meet the CDC criteria described earlier would not be required to quarantine within the community (but should not attend at work).
- No Canadian recommendations regarding quarantine for fully vaccinated HCWs follow an exposure are currently available.

3) HCW specific data on asymptomatic or unknown test positivity post-vaccination was reviewed. An ongoing HCW surveillance cohort suggested a 97% reduction in asymptomatic or undocumented test positive cases from 21 days after dose 1 of the Pfizer vaccine (vaccinated people were 0.23% versus 8.13% positive without documented symptoms) (Hall et al., 2021). In this study HCW vaccinated people were also proportionally less likely to have classic COVID-19 symptoms (40% versus 63%). In a laboratory-based observational efficacy research letter from Israel also involving HCW showing overall vaccine efficacy of 75% after two weeks from vaccination (Pfizer) there was a 29% reduction in positive tests without documented symptoms, although previous RT-PCR positivity was not excluded (Amit et al., 2021). The same group published a community-based analysis showing similar results: dose 1 (2 and 3 week) effectiveness of 29% and 52%, and 90% efficacy 1 week after dose 2 (Dagen et al., 2021).

Summary: Vaccine effectiveness data

- Based on the evolving data including these studies, for overall first dose protection mRNA vaccines are most effective from approximately 3 weeks after the first dose (61%-97% effective against asymptomatic, 94% against

- symptomatic) and the effectiveness of dose 1 of nonreplicating adenovirus vaccine against combined asymptomatic and symptomatic SAR-SCoV-2 detection increases from about 46.3% at 3 weeks to 67-80% at 3 months.
- Risk scenarios are presented in Tables 1-3 of this document to illustrate HCW risk of developing asymptomatic (and symptomatic) COVID-19 as well asymptomatic and/ or asymptomatic infection.
Example: the risk of a vaccinated HCW > 3 weeks after an mRNA vaccine developing COVID-19 following a low-risk exposure ranges from 0.003%-0.02% and from 0.006%-0.04% after a medium risk exposure. The risk of a vaccinated HCW > 3 months after an adenovirus vaccine developing COVID-19 after a low-risk exposure is 0.025%-0.125% and after a medium risk exposure is 0.05-0.45%.

Committee Discussion

The committee initially provided feedback that including the pathophysiologic plausibility data including animal data, and virologic, immunologic and epidemiologic data around the likelihood of RT-PCR positivity and transmission was useful. It was recognized that this is a rapidly evolving area and as such firm recommendations may not be possible versus providing provisional recommendations and guidance in some areas. It was recognized that it is expected that further evidence will support the thesis that test positivity does not necessarily infer transmission risk, and that better data on which to assess transmission risk will allow progressive changes to reduce restrictions required to manage transmission risk from vaccinated people in the short to medium term.

Recommendations for Alberta

Recommendation 1: Isolation and testing for symptoms in partially or fully vaccinated people (see appendix for definitions)

All vaccinated people should be instructed to self-isolate and seek testing with development of COVID-compatible symptoms, with standard isolation and contact tracing procedures as per nonimmunized people in that setting (e.g., by Public Health guidance [in the community setting](#) and the [Return-to-Work guidelines](#) for HCWs).

Rationale: Vaccine protection against severe, hospitalized and fatal infection is robust in trial data thus far, but mild to moderate COVID-19 infection, including experiencing less severe and less typical symptoms have been described. Testing and contact tracing will allow assessment of transmission from vaccinated individuals in Alberta.

Recommendation 2: Quarantine recommendations for vaccinated people exposed to COVID-19 in identified health care or vulnerable settings

The evidence is presently insufficient to suggest a widespread practice change, but there is a need for appropriate risk management in the setting of uncertainty and rapidly evolving evidence. Therefore, we suggest case by case assessment

in higher risk or vulnerable settings with special considerations around PPE use, service provision, and presence of higher risk individuals. These settings include acute or long-term care (LTC), congregate living settings, shelters, and correctional facilities, where there is support by Public Health, Infection Prevention & Control [IPC], and/ or Workplace Health and Safety [WHS]) in detailed risk assessment. This should consider the nature of the exposure, whether the exposed individual was partially or fully vaccinated, the time elapsed since vaccination/expected degree of protection, and situational knowledge of the likelihood of VOC and degree of exposure risk. This information may assist in counselling, or in determination of the need for quarantine depending on the evolution of present evidence.

It is noted that individuals who develop symptoms, who are more likely to transmit, are to self-isolate and seek testing with symptoms (see Recommendation 1).

Rationale: Vaccination reduces the risk of contracting SARS-CoV-2, and the risk of subsequent forward transmission from asymptomatic or paucisymptomatic viral carriage. Although the risk of forward transmission with SAR-CoV-2 RT-PCR positivity and no or minimal symptoms after vaccination is expected to be significantly reduced, a wide range of vaccine efficacy is currently described and the data are not yet conclusive. Some Alberta HCWs have been observed to have RT-PCR positive infection after three weeks from the first dose (R. Harrison, personal communication). Moreover, increasing VOC transmission mandates additional precautions. Further HCW specific recommendations therefore will await more conclusive data.

Recommendation 3: Quarantine recommendations for vaccinated people exposed to COVID-19 in general community settings

In community settings not identified above, current quarantine guidelines should be followed. Available evidence is insufficient to inform a standard recommendation around public health guidelines for quarantine of partially or fully vaccinated individuals, although it is expected that more conclusive data is forthcoming fairly quickly. It is noted that other Public Health considerations such as community-based transmission patterns, the proportion of individuals who are vaccinated, and the evolving picture of VOC in Alberta would also be assessed with the evolving evidence in determining public quarantine recommendations.

Recommendation 4: Use of preventative measures (including masks, hand hygiene, physical distancing, sanitizing high touch surfaces) by vaccinated persons in the community

All vaccinated persons should continue to use recommended measures when in close contact and shared airspace with unvaccinated persons, as well as in public spaces, under current public health guidance.

Rationale: There is evolving data around the epidemiology of transmission of infection from vaccinated persons and although the risk of transmission is likely reduced, the degree of this reduction is not known. Of importance, as not everyone has had an opportunity to be vaccinated yet, public mask wearing and adherence to other measures should be uniformly continued as a socially supportive and appropriate measure for all until the recommendation is removed by Public Health. It is also recognized that there may be other social factors to consider in public health guidance for vaccinated people in public or private spaces, including incentivizing people to seek immunization.

Recommendation 5: Use of Alberta data sources to delineate post vaccination transmission risk in Alberta

We recommend analysis of existing Population and Public Health data collected on positive SARS-CoV-2 tests occurring after vaccination, identification of variant strain infections, outbreak data, and epidemiologic contact tracing data with laboratory data including Ct values, to prospectively monitor for evidence of forward transmitting infection from vaccinated persons in Alberta, through the COVID Responsive Analytics Collaboration (CRAC).

Practical Considerations for Alberta

- Based on current effectiveness data, people with exposures occurring >3 weeks after an initial mRNA vaccine initial dose and >3 months after a nonreplicating adenovirus vaccine dose would be considered to be significantly protected from asymptomatic, mild and moderate disease. It is noted that protection against hospitalization and death from COVID-19 is extremely high for all available vaccines starting from 2 to 3 weeks after the first dose.

Research gaps

There is a lack of surveillance data on how common truly asymptomatic test positivity is after vaccination. Further evaluation of those who test positive on RTPCR after vaccination should include additional viral studies including but not limited to viral load, cultivatable virus and sub-genomic RNA, correlations with humoral and cell mediated immune responses. Finally, epidemiologic studies to assess evidence of transmission from vaccinated persons is required. Although it is not expected that all of these elements are required to be able to inform risk management in vaccinated persons in the short to medium term, higher quality data in key areas will support initial changes to quarantine and PPE management.

Evidence Summary

The full report can be accessed [here](#).

1. Risk Table Illustrating Potential Likelihood of COVID-19 after vaccination by varied exposure risks
2. Additional Study Descriptions (expanded from COVID-END report)
 - a. HCW risk studies
 - b. Pathophysiologic Considerations from virologic, immunologic and epidemiologic studies in natural infection

1. Risk Tables – Illustration of estimated risk of vaccinated HCW by varied exposure risk, by time since first dose of vaccine.

The below three tables calculate potential risk reduction for a HCW exposed to COVID-19 after a first dose of COVID-19 vaccine (of two dose regimen) across various scenarios including attack rate, exposure risk (low, medium, high, very high-superspreader event), vaccine type (mRNA and nonreplicating adenovirus).

Vaccine related risk reduction ranges are based on available HCW study data including some additional data extraction and calculation for 3 weeks post dose 1 mRNA; 3 weeks to 12 weeks post dose 1 nonreplicating adenovirus. Vaccination protection following first dose was selected both based on available data and because this is relevant as the dosing schedules are currently based on an extended interval for many vaccinated people.

These data should be considered within the context of current uncertainties including long-term follow up data beyond three months after vaccination. As an example, interpretation from Table 1, the risk of a HCW developing an asymptomatic COVID-19 infection (estimated to be 20% of all infections) following a low-risk exposure (attack rate 0.5%) after receiving first dose of vaccine would be between 1/1,190 (3 weeks post vaccination) and 1/4,000 (12 weeks post vaccination) for nonreplicating adenovirus vaccines and 1/2,564 to 1/33,333 for mRNA vaccines 3 weeks post vaccination.

Table 1. Estimated risk of partially vaccinated HCW developing **asymptomatic** COVID-19 (approximately **20% of all cases**) after varied exposures (current data estimates from wild type SARS-CoV-2 and are evolving – will require frequent updates) compared with no vaccination¹

Attack Rate based on Exposure Risk ²	Risk of Developing COVID-19 based on Proportion of Type of COVID-19 Infection x Exposure Risk	Range of expected protection based on current studies (as of March 13, 2021)	Estimated Vaccine Risk Reduction Range (based on current data)	Range of Risk of developing COVID-19 following vaccination regimen
A	B (A x 20%)	nonreplicating adenovirus vaccine (nrAD) protection range assessed from 3 weeks and 12 weeks after first dose 16%-75% mRNA vaccine (mRNA) assessed from 3 wks after 1 st dose 61%-97%	C assumes protection remains the same regardless of exposure risk ³	D (B x C)
Low risk 0.5%	0.1%	nrAD vaccine protection range: 16%-75%	0.84 - 0.25	1/1,190 - 1/4,000
		mRNA vaccine protection range: 61-97%	0.39 – 0.03	1/2,564 – 1/33,333
Medium risk 1%	0.2%	nrAD vaccine protection range: 16%-75%	0.84 - 0.25	1/595 – 1,200
		mRNA vaccine protection range: 61-97%	0.39 – 0.03	1/1,282 - 1/16,666
High risk 5%	1%	nrAD vaccine protection range: 16%-75%	0.84 - 0.25	1/119 - 1/400
		mRNA vaccine protection range: 61-97%	0.39 – 0.03	1/256 - 1/3,333
Very high-Superspreader event 10%	2%	nrAD vaccine protection range: 16%-75%	0.84 - 0.25	1/59 - 1/200
		mRNA vaccine protection range: 61-97%	0.39 – 0.03	1/128 - 1/1,666

¹ Estimate of type of COVID-19 cases (symptomatic ~80%) is a conservative estimate derived from a meta-analysis on the proportion of asymptomatic case and potential range for community transmission. Byambasuren O, Cardona M, Bell K, Clark J, McLaws M-L, Glasziou P. Estimating the extent of asymptomatic COVID-19 and its potential for community transmission: systematic review and meta-analysis. Official Journal of the Association of Medical Microbiology and Infectious Disease Canada. 2020;5(4):223-234. <https://jammi.utpjournals.press/doi/pdf/10.3138/jammi-2020-0030>

² Estimates for attack rate derived from study data and stratified to estimate range from low risk to superspreader event risk. from Abbas et al. which identified HCW risk to range from ~2-8%. Abbas, M., Robalo Nunes, T., Martischang, R. et al. Nosocomial transmission and outbreaks of coronavirus disease 2019: the need to protect both patients and healthcare workers. Antimicrob Resist Infect Control 10, 7 (2021). <https://doi.org/10.1186/s13756-020-00875-7>

³ Study data applied to all infections and asymptomatic infections: nonreplicating adenovirus vaccines - AZ: 16% after 3 weeks, (25-60% after 12 weeks, NS); Janssen: 75% after 12 weeks (PCR and/or serology without previous symptoms). mRNA vaccines - Moderna: 61% from 3 weeks after dose 1; Pfizer BioNTech (Hall et al., 2021): 97% 21 days after dose 1 in HCW; Pfizer BioNTech (Dagen et al., 2021): 29% effectiveness 15 days after dose 1 in HCW

Table 2. Estimated risk of partially vaccinated HCW developing **symptomatic COVID-19 (80% of all cases)** after varied risk exposures (current data estimates from wild type SARS-CoV-2 and are evolving - will require frequent updates) compared with no vaccination¹

Attack Rate based on Exposure Risk ²	Risk of Developing COVID-19 based on Proportion of Type of COVID-19 Infection x Exposure Risk	Range of expected protection based on current studies (as of March 13, 2021) Vaccination Type	Estimated Vaccine Risk Reduction Range (based on current data)	Risk of vaccinated person developing COVID-19 by regimen
A	B (A x 80%)	Nonreplicating adenovirus vaccine effectiveness range across studies (67% 3w post dose 1 to ~75% 12 w post dose 1) mRNA vaccine effectiveness range (70% 3 w post dose 1 to 95% 2 wks post dose 1)	assumes protection remains the same regardless of exposure risk ³ C	D (B x C)
Low risk 0.5%	0.4%	nrAD vaccine protection range: 67% - 75%	0.22 - 0.66	1/757 – 1/1136
		mRNA vaccine protection range: 70% - 95%	0.3 - 0.05	1/833 – 1/5000
Medium risk 1%	0.8%	nrAD vaccine protection range: 67% - 75%	0.33 – 0.22	1/378 – 1/568
		mRNA vaccine protection range: 70% - 95%	0.3 – 0.05	1/416 – 1/2500
High risk 5%	4%	nrAD vaccine protection range: 67% - 75%	0.33 – 0.22	1/75 – 1/113
		mRNA vaccine protection range: 70% - 95%	0.3 – 0.05	1/83 – 1/500
Superspreader event 10%	8%	nrAD vaccine protection range: 67% - 75%	0.33 – 0.22	1/37 – 1/56
		mRNA vaccine protection range: 70% - 95%	0.3 – 0.05	1/41 – 1/250

¹ Estimate of type of COVID-19 cases (symptomatic ~80%) is a conservative estimate derived from a meta-analysis on the proportion of asymptomatic case and potential range for community transmission. Byambasuren O, Cardona M, Bell K, Clark J, McLaws M-L, Glasziou P. Estimating the extent of asymptomatic COVID-19 and its potential for community transmission: systematic review and meta-analysis. Official Journal of the Association of Medical Microbiology and Infectious Disease Canada. 2020;5(4):223-234. <https://jammi.utpjournals.press/doi/pdf/10.3138/jammi-2020-0030>

² Estimates for attack rate derived from study data and stratified to estimate range from low risk to superspreader event risk. from Abbas et al. which identified HCW risk to range from ~2-8%. Abbas, M., Robalo Nunes, T., Martischang, R. et al. Nosocomial transmission and outbreaks of coronavirus disease 2019: the need to protect both patients and healthcare workers. Antimicrob Resist Infect Control 10, 7 (2021). <https://doi.org/10.1186/s13756-020-00875-7>

³ Study data applied to symptomatic infections: nonreplicating adenovirus vaccines – AZ (Voysey et al): 76% after 3 weeks and 78% after 12 weeks; Janssen (Janssen, 2021): 67% after 14 days. mRNA vaccines – Pfizer (registration trial data, BCCDC analysis) 95% after 2 weeks onwards; Pfizer (Amit et al., 2021) 75% after 2 weeks; Pfizer (Hall et al., 2021) 70% after 3 weeks.

Table 3. Estimated risk of partially vaccinated HCW developing **symptomatic or asymptomatic** COVID-19 after varied risk exposures (current data estimates are from wild type SARS-CoV-2 and are evolving - will require frequent updates) compared with no vaccination¹

Attack Rate based on Exposure Risk ²	Risk of Developing COVID-19 based on Proportion of Type of COVID-19 Infection x Exposure Risk	Range of expected protection based on current studies (as of March 13, 2021) Vaccination Type	Estimated Vaccine Risk Reduction Range (based on current data)	Risk of developing COVID-19 following vaccination regimen
A	B (A x 100%)	Nonreplicating adenovirus vaccine effectiveness range across studies (16% 3w post dose 1 to -75% 12 w post dose 1) mRNA vaccine effectiveness range (61% 3 w post dose 1 to 97% 3 wks post dose 1)	assumes protection remains the same regardless of exposure risk ³	D (B x C)
			C	
Low risk 0.5%	0.5%	nrAD vaccine protection range: 16% - 75%	0.84 - 0.25	1/250 – 1/800
		mRNA vaccine protection range: 61% - 97%	0.39 - 0.03	1/512 – 1/6666
Medium risk 1%	1%	nrAD vaccine protection range: 16% - 75%	0.84 - 0.25	1/119 – 1/400
		mRNA vaccine protection range: 61% - 97%	0.39 – 0.03	1/256 – 1/3333
High risk 5%	5%	nrAD vaccine protection range: 16% - 75%	0.84 – 0.25	1/23 – 1/80
		mRNA vaccine protection range: 61% - 97%	0.39 – 0.03	1/51 – 1/666
Superspreader event 10%	10%	nrAD vaccine protection range: 16% - 75%	0.84 – 0.25	1/11 – 1/40
		mRNA vaccine protection range: 61% - 97%	0.39 – 0.03	1/25 – 1/333

¹ Estimate of type of COVID-19 cases (symptomatic ~80%) is a conservative estimate derived from a meta-analysis on the proportion of asymptomatic case and potential range for community transmission. Byambasuren O, Cardona M, Bell K, Clark J, McLaws M-L, Glasziou P. Estimating the extent of asymptomatic COVID-19 and its potential for community transmission: systematic review and meta-analysis. Official Journal of the Association of Medical Microbiology and Infectious Disease Canada. 2020;5(4):223-234. <https://jammi.utpjournals.press/doi/pdf/10.3138/jammi-2020-0030>

² Estimates for attack rate derived from study data and stratified to estimate range from low risk to superspreader event risk. from Abbas et al. which identified HCW risk to range from ~2-8%. Abbas, M., Robalo Nunes, T., Martischang, R. et al. Nosocomial transmission and outbreaks of coronavirus disease 2019: the need to protect both patients and healthcare workers. Antimicrob Resist Infect Control 10, 7 (2021). <https://doi.org/10.1186/s13756-020-00875-7>

³ Study data applied to all infections and asymptomatic infections: nonreplicating adenovirus vaccines - AZ: 16% after 3 weeks, (25-60% after 12 weeks, NS); Janssen: 75% after 12 weeks (PCR and/or serology without previous symptoms). mRNA vaccines - Moderna: 61% from 3 weeks after dose 1; Pfizer BioNTech (Hall et al., 2021): 97% 21 days after dose 1; Pfizer BioNTech (Dagen et al., 2021): 29% effectiveness 15 days after dose 1 in HCW

2. Additional Study Descriptions (not included in COVID-END report)

a. HCW risk studies

The first study is an ongoing COVID-19 surveillance study of HCWs with q2weekly assessments of risk, vaccine status, symptoms, and nasal or nasal plus oral swabs (Hall et al., 2021). A subset also had twice weekly rapid testing, so case ascertainment was likely very high. The vaccine effectiveness overall was 72% from 21 days after dose one and 86% after two doses (most were adhering to the dosing schedule quite closely). Protection was noted from day 10 post first dose in these data. The study took place over two months and involved 23,320 HCWs in 104 hospitals, of whom 35% were previously documented SARS-CoV-2 positive. The intensity of exposure in this study was quite high, with 977 infections documented in 15,160 previously unvaccinated participants over 2 months which is roughly 6% of the unvaccinated HCW cohort acquiring infection over 2 months.

Also, of practical relevance in those testing positive, the unvaccinated group had a higher proportion with “classic” symptoms at 63%: 14% had other symptoms, 5% were asymptomatic and 17% unknown. In the vaccinated group only 40% had classic symptoms, 13% had other symptoms, 13% were asymptomatic, and 31% had unknown – therefore asymptomatic or non-classic symptoms comprised 26% of the post vaccine test positive. This may have implications for symptom-based screening in vaccinated individuals, suggesting the need to include generalized and milder symptoms as a rationale to seek testing.

Another observational HCW study by Amit et al. (2021) in Israel documented vaccine effectiveness of 75% from 15 to 28 days after dose one of the PfbNT vaccine in HCWs and was higher against symptomatic infection (reaching 90% day 22-28). Asymptomatic test positive data was limited as it was not active surveillance and sampling. However, 10 of 19 infections occurring in vaccines after day 15, and 5 of 7 infections occurring after day 22 were asymptomatic. The reasons they were tested was not given, although one might posit this was part of exposure investigation. Baseline status was not assessed so prolonged RT-PCR positivity post infection was not ruled out. This was a cohort of 9,109 vaccine eligible HCWs with active daily symptom reporting and availability of same-day testing, so the overall rate of asymptomatic swab positivity was 0.2%. The Ct values of these positives were not given. The overall infection rate in the whole cohort for the 2-month study was 1.9%.

2.b) Pathophysiologic Considerations from virologic, immunologic and epidemiologic studies in natural infection

Virologic, immunologic and epidemiologic analysis of individuals who had persistent RT-PCR positivity but developed measurable immune responses suggested that asymptomatic individuals with viral shedding after natural infection are unlikely to be a significant source of transmission (no infections in 757 close contacts of 26 RT-PCR positive individuals) (Vibholm et al., 2021). COVID-19 therapy trials of neutralizing anti-spike monoclonal antibody treatments show rapid clearance of virus from the nasopharynx after administration of these therapies.

As noted, lower viral loads in positive SARS-CoV-2 tests after vaccination were observed in a lab-based population study in Israel. This may be expected to reduce transmission risk, as a recent epidemiologic investigation using quantitative viral loads showed the index case viral load to be is a major driver of transmission, with only 32% of index cases responsible for transmission, and an attack rate of 12% in contacts of index cases with a viral load $<10^6$ and 25% in contacts of index cases with a viral load of 10^{10} (Marks et al., 2021). A preprint (Bjorkman et al., 2021) of university roommate transmission showed that index cases who transmitted infection had an average viral load 6.5 log higher than those who did not. Transmission from asymptomatic students to roommates occurred in 20% of rooms with an infected student, with a lower mean Ct (E gene) of 26.2 in transmission index cases versus 28.9, (median 26.11 in transmission index cases versus 29.32).

In total, these observations suggest that viral carriage is likely reduced by developing immune responses against SARS-CoV-2, and that any residual viral detection may not be associated as strongly with transmission given current observations of lower viral loads/higher Ct values post vaccination and consistent data showing correlation of that with reduced transmission risk in natural infection. There were no studies of cultivatable virus carriage after vaccination identified yet.

Appendix

List of Abbreviations

AZ	Oxford AstraZeneca vaccine
CDC	Centres for Disease Control and Prevention
Ct	Cycle threshold
COVID-19	Coronavirus Disease 2019
mRNA	Messenger ribonucleic acid
PfBNT	Pfizer BioNTech vaccine
PPE	Personal protective equipment
RCT	Randomized controlled trial
RT-PCR	Reverse transcription polymerase chain reaction
SARS-Cov-2	Severe Acute Respiratory Syndrome Coronavirus 2
WHO	World Health Organization

Definitions and Terms

- Vaccination refers to administering a vaccine to produce immunity, and immunization is the process by which a person is protected from disease through vaccination. Immunized and vaccinated are considered largely interchangeable terms, with “vaccinated” preferred in this report - but “immunized” may be used especially where study results are quoted.**
- Fully vaccinated/vaccinated:**
 - Two dose vaccines:**
 - Current mRNA vaccines, Moderna and Pfizer 2 doses required – 2 weeks after last dose
 - Nonreplicating Adenovirus Vaccine, AstraZeneca/Covishield 2 doses required 2 weeks after last dose
 - One dose vaccine:**
 - Nonreplicating Adenovirus Vaccine, Janssen- Johnson & Johnson requires only one dose – 3 weeks after dose
- Partially vaccinated/vaccinated:**
 - Between one dose of 2 two dose series and the post second dose 2- or 3-week period noted above.
Or
 - Within 3 weeks of the one dose in a single dose vaccine.

Comments on these definitions:

- Time post-vaccine dose at which protection is assumed will be reassessed with evolving data. It is noted that considerable protection is observed in partially vaccinated persons depending on the time elapsed since the initial dose, from 3 weeks after dose one of mRNA vaccine and from 2-3 months after dose 1 of Astra Zeneca vaccine.
- If the duration of protection is found to be limited then a booster dose may be required to maintain protection. Both the duration of protection and, thus, the recommendation for further doses remain unclear at this time.
- The allowed/optimal interval of time between doses in a two dose schedule is subject to ongoing policy review with some emerging data suggesting the need to modify the interval for specific patient subgroups.

Appendix I. Jurisdictional Review of Quarantine Processes for Vaccinated Persons Exposed to COVID-19

Source (with citation)	Purpose/Summary	Conclusions/Recommendations
<p>Centers for Disease Control and Prevention (CDC)(a). Interim Clinical Considerations for Use of mRNA COVID-19 Vaccines Currently Authorized in the United States. https://www.cdc.gov/vaccines/covid-19/info-by-product/clinical-considerations.html</p>	<ul style="list-style-type: none"> • Last updated February 10, 2021 • Updated quarantine recommendations for vaccinated persons. Fully vaccinated persons who meet criteria will no longer be required to quarantine following an exposure to someone with COVID-19. Additional considerations for patients and residents in healthcare settings are provided 	<ul style="list-style-type: none"> • Vaccinated persons with an exposure to someone with suspected or confirmed COVID-19 are not required to quarantine if they meet all of the following criteria: <ul style="list-style-type: none"> - Are fully vaccinated (i.e., ≥2 weeks following receipt of the second dose in a 2-dose series, or ≥2 weeks following receipt of one dose of a single-dose vaccine); - Are within 3 months following receipt of the last dose in the series; - Have remained asymptomatic since the current COVID-19 exposure • *Persons who do not meet all 3 of the above criteria should continue to follow current quarantine guidance after exposure to someone with suspected or confirmed COVID-19. • Fully vaccinated persons who do not quarantine should still watch for symptoms of COVID-19 for 14 days following an exposure. If they experience symptoms, they should be clinically evaluated for COVID-19, including SARS-CoV-2 testing, if indicated. In addition, vaccinated persons should continue to follow current guidance to protect themselves and others, including all other SARS-CoV-2 testing recommendations and requirements, and state, territorial, tribal, and local travel recommendations or requirements. <p>Vaccinated healthcare personnel, patients, and residents in healthcare settings:</p> <ul style="list-style-type: none"> • These criteria could also be applied when considering work restrictions for fully vaccinated healthcare personnel with higher-risk exposures, as a strategy to alleviate staffing shortages. Of note, exposed healthcare personnel would not be required to quarantine outside of work • Vaccinated inpatients and residents in healthcare settings should continue to quarantine following an exposure to someone with suspected or confirmed COVID-19 <ul style="list-style-type: none"> - Exception is due to the unknown vaccine effectiveness in this population, the higher risk of severe disease and death, and challenges with social distancing in healthcare settings. Although not preferred, healthcare facilities could consider waiving quarantine for vaccinated patients and residents as a strategy to mitigate critical issues (e.g., lack of space, staff, or PPE to safely care for exposed patients or residents) when other options are unsuccessful or unavailable. These decisions could be made in consultation with public health officials and infection control experts.

<p>CDC(c). Science Brief: Background Rationale and Evidence for Public Health Recommendations for Fully Vaccinated People. https://www.cdc.gov/coronavirus/2019-ncov/more/fully-vaccinated-people.html</p>	<ul style="list-style-type: none"> • Last updated March 8, 2021 • Summarize evidence available through March 3, 2021 for the currently authorized COVID-19 vaccines (administered according to the recommended schedules) and additional considerations used to inform public health recommendations for fully vaccinated people, including: <ul style="list-style-type: none"> • Vaccine efficacy and effectiveness against SARS-CoV-2 infection • Vaccine performance against emerging SARS-CoV-2 variant strains • Impact of prevention measures in the context of vaccination • Population attitudes and behaviors towards vaccination and prevention measures 	<ul style="list-style-type: none"> • Adherence to prevention measures, such as wearing masks and physical distancing, will continue to be important in the context of vaccine implementation • Rapidly increasing vaccination rates may allow for the phasing out of some prevention measures as coverage increases • There may be certain activities that can be performed after vaccination, such as nursing home visitation, as long as other measures are maintained • Prevention measures will continue to be important for all people, regardless of vaccination status, especially during this period of vaccine deployment • As vaccination coverage increases, a balanced, stepwise approach to phasing out certain prevention measures in fully vaccinated people, ideally those that are the most disruptive to individuals and society, can be taken • Information about activities that fully vaccinated people can safely undertake must be communicated in a clear and unambiguous fashion • Maintaining a requirement to continue all prevention measures after vaccination may disincentivize vaccine uptake
<p>CDC(b). Interim Public Health Recommendations for Fully Vaccinated People. https://www.cdc.gov/coronavirus/2019-ncov/vaccines/fully-vaccinated-guidance.html</p>	<ul style="list-style-type: none"> • Last updated March 8, 2021 • First set of public health recommendations for fully vaccinated people. This guidance will be updated and expanded based on the level of community spread of SARS-CoV-2, the proportion of the population that is fully vaccinated, and the rapidly evolving science on COVID-19 vaccines. <p>* People are considered fully vaccinated for COVID-19 ≥ 2 weeks after they have received the second dose in a 2-dose series (Pfizer-BioNTech or Moderna), or ≥ 2 weeks after they have received a single-dose vaccine (Johnson and Johnson [J&J]/Janssen).</p> <p>* This guidance applies to COVID-19 vaccines currently authorized for emergency use by the Food and Drug Administration: Pfizer-BioNTech, Moderna, and Johnson and Johnson [J&J]/Janssen COVID-19 vaccines</p> <p>* Recommendations apply to non-healthcare settings</p>	<ul style="list-style-type: none"> • Fully vaccinated people can: <ul style="list-style-type: none"> - Visit with other fully vaccinated people indoors without wearing masks or physical distancing - Visit with unvaccinated people from a single household who are at low risk for severe COVID-19 disease indoors without wearing masks or physical distancing - Refrain from quarantine and testing following a known exposure if asymptomatic • For now, fully vaccinated people should continue to: <ul style="list-style-type: none"> - Take precautions in public like wearing a well-fitted mask and physical distancing - Wear masks, practice physical distancing, and adhere to other prevention measures when visiting with unvaccinated people who are at increased risk for severe COVID-19 disease or who have an unvaccinated household member who is at increased risk for severe COVID-19 disease - Wear masks, maintain physical distance, and practice other prevention measures when visiting with unvaccinated people from multiple households - Avoid medium- and large-sized in-person gatherings - Get tested if experiencing COVID-19 symptoms - Follow guidance issued by individual employers - Follow CDC and health department travel requirements and recommendations • Indoor visits between fully vaccinated people who do not wear masks or physically distance from one another are likely low risk • Indoor visits between fully vaccinated people and unvaccinated people who do not wear masks or physically distance from one another are likely low risk for the vaccinated people; Therefore, the level of precautions taken should be determined by the characteristics of the unvaccinated people, who remain unprotected against COVID-19

		<ul style="list-style-type: none"> - If the unvaccinated people are from a single household that does not have individuals at risk of severe COVID-19, they can visit with fully vaccinated people indoors, without anyone wearing masks, with a low risk of SARS-CoV-2 transmission - If any of the unvaccinated people or their household members are at increased risk of severe COVID-19, all attendees should take precautions including wearing a well-fitted mask, staying at least 6 feet away from others, and visiting outdoors or in a well-ventilated space - If the unvaccinated people come from multiple households, there is a higher risk of SARS-CoV-2 transmission among them. Therefore, all people involved should take precautions including wearing a well-fitted mask, staying at least 6 feet away from others, and visiting outdoors or in a well-ventilated space • All people, regardless of vaccination status, should adhere to current guidance to avoid medium- or large-sized in-person gatherings (e.g., sporting events, concerts, festivals, conferences, parades, or weddings) and to follow any applicable local guidance restricting the size of gatherings • Fully vaccinated people engaging in social activities in public settings (e.g., indoor restaurant dining) should continue to follow all guidance for these settings including wearing a well-fitted mask, maintaining physical distance (at least 6 feet), avoiding crowds, avoiding poorly ventilated spaces, covering coughs and sneezes, and washing hands frequently • At this time, CDC is not updating travel recommendations and requirements • Recommendations for Isolation, Quarantine and Testing: <ul style="list-style-type: none"> - Any fully vaccinated person who experiences symptoms consistent with COVID-19 should isolate themselves from others, be clinically evaluated for COVID-19, and tested for SARS-CoV-2 if indicated - Fully vaccinated people with no COVID-like symptoms do not need to quarantine or be tested following an exposure to someone with suspected or confirmed COVID-19, as their risk of infection is low; should still monitor for symptoms for 14-days following an exposure - Fully vaccinated residents of non-healthcare congregate settings (e.g., correctional and detention facilities, group homes) should continue to quarantine for 14 days and be tested for SARS-CoV-2 following an exposure to someone with suspected or confirmed COVID-19 – because residential congregate settings may face high turnover of residents, a higher risk of transmission, and challenges in maintaining recommended physical distancing - Fully vaccinated employees of non-healthcare congregate settings and other high-density workplaces (e.g., meat and poultry processing and manufacturing plants) with no COVID-like symptoms
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		do not need to quarantine following an exposure; however testing following an exposure and through routine workplace screening programs (if present) is still recommended
World Health Organization (WHO)	<ul style="list-style-type: none"> As of March 2, 2021, no publicly-available considerations and/or guidance on the quarantine requirements for vaccinated individuals exposed to COVID-19 	
Alberta Health. COVID-19 VACCINE Questions & answers for the public and health-care practitioners. https://www.alberta.ca/assets/documents/covid-19-vaccine-q-and-a-health-care-practitioners.pdf	<ul style="list-style-type: none"> Last updated February 2021 Guidelines on frequently asked questions about the COVID-19 vaccination process for the general public and health care practitioners 	<p>Post-Immunization:</p> <ul style="list-style-type: none"> All individuals, including those immunized with COVID-19 vaccine, should continue to follow public health measures for prevention and control of COVID-19 infection and transmission. This includes masking when in public, maintaining physical distancing, practicing diligent hand hygiene, and staying home when sick. Will I have to quarantine if I received the vaccine and then am a close contact of someone who was positive for COVID-19? <ul style="list-style-type: none"> Yes, continue to follow all public health measures, including quarantining if you are informed that you are a close contact of a COVID-19 case for the reasons stated above Will I have to quarantine if I received the vaccine and am returning to Canada from an international destination? <ul style="list-style-type: none"> Yes, continue to follow all public health measures, including all federal and provincial quarantine requirements If I am immunized outside of Canada, do I still need a negative test to return to Canada? Quarantine in a Government of Canada-approved hotel? Take a COVID-19 molecular test on arrival? <ul style="list-style-type: none"> Yes, regardless of immunization status, travelers must present proof of a negative COVID-19 test result (either paper or electronic) to an airline prior to boarding a flight to Canada. Travelers must also reserve a room in a Government of Canada-approved isolation hotel, and must take a COVID-19 molecular test on arrival.
British Columbia Centre for Disease Control (BCCDC). Getting a Vaccine. http://www.bccdc.ca/health-info/diseases-conditions/covid-19/covid-19-vaccine/getting-a-vaccine	<ul style="list-style-type: none"> Last updated March 1, 2021 Information about what to expect when getting a COVID-19 vaccine and considerations if one has additional health conditions 	<p>After the vaccine:</p> <ul style="list-style-type: none"> Extremely important to continue to practice all the preventive measures that have been recommended, including washing your hands, maintaining a safe physical distance, wearing a mask, and staying home when sick Everyone who receives the vaccine will still need to follow public health guidance and abide by orders from the Provincial Health Officer
Government of Ontario. Getting a COVID-19 vaccine in Ontario.	<ul style="list-style-type: none"> Website content and information updated regularly Information and guidelines on the COVID-19 vaccine in Ontario 	<ul style="list-style-type: none"> Until vaccines are widely available for everyone to receive two doses and enough people are vaccinated to stop the spread, we all must: <ul style="list-style-type: none"> Continue to follow local public health advice and restrictions

https://covid-19.ontario.ca/getting-covid-19-vaccine-ontario		<ul style="list-style-type: none"> - Take the necessary health precautions, like practicing physical distancing, washing hands and using masks or face coverings - Stay home-only go out for necessities
<p>Travel Canada. Mandatory Quarantine or Isolation. https://travel.gc.ca/travel-covid/travel-restrictions/isolation</p>	<ul style="list-style-type: none"> • Last updated February 21, 2021 • New quarantine requirements for travel to Canada 	<ul style="list-style-type: none"> • If you can enter Canada and you have no symptoms, you must quarantine for a minimum of 14 days • You are not excluded from quarantine even if you have: <ul style="list-style-type: none"> - tested negative for COVID-19 - been vaccinated for COVID-19 • recovered from COVID-19
<p>Minnesota Department of Health. COVID-19 Recommendations for Health Care Workers. https://www.health.state.mn.us/diseases/coronavirus/hcp/hcwrecs.pdf</p>	<ul style="list-style-type: none"> • Last updated February 21, 2021 • Recommendations for health care workers suspected of (or confirmed as having) COVID-19, living with a person suspected of having COVID-19, or who have been exposed to a patient, co-worker, or social contact with COVID-19 	<ul style="list-style-type: none"> • MDH recommends that HCW with high-risk exposures participate in voluntary quarantine for 14 days after the exposure date • If a health care facility has exhausted all other staffing options and is experiencing a staffing shortage, asymptomatic HCW who have experienced a high-risk exposure but not tested positive for COVID-19 may be asked to return to work during the voluntary quarantine period. HCW who return to work in that time must wear a medical-grade facemask for source control at all times • Vaccinated HCWs are not required to quarantine outside of work if asymptomatic following COVID-19 exposure, are fully vaccinated (> 2weeks following receipt of final vaccine dose), and within 3 months following receipt of final vaccine dose • Recommendations are relevant for vaccinated or unvaccinated HCW who have had a high-risk workplace exposure to COVID-19 and HCW with household, intimate or close community contacts who have confirmed or suspected COVID-19 <ul style="list-style-type: none"> - HCW should quarantine from work for 14 days following a high-risk exposure - HCW who have received a SARS-CoV-2 vaccination are still required to follow the 14-day quarantine guidance listed below following a high-risk exposure. HCW should not be vaccinated if they are currently in a 14-day quarantine <p>Facilities should ask exposed HCW to return to work in the following order:</p> <ul style="list-style-type: none"> • Vaccinated HCW with high-risk exposure to a patient, resident, co-worker, social contact, recent return from non-essential travel or household member. Vaccinated HCW must meet all of the following criteria <ul style="list-style-type: none"> - Are fully vaccinated (i.e., ≥2 weeks following receipt of the second dose in a 2-dose series, or ≥2 weeks following receipt of one dose of a single-dose vaccine). - Are within 3 months following receipt of the last dose in the series • HCW (unvaccinated or >3 months following receipt of last vaccine dose in the series) with high-risk exposure to a patient, resident, or co-worker • HCW (unvaccinated or >3 months following receipt of last vaccine dose in the series) with high-risk exposure to a social contact or recent return from non-essential travel • HCW (unvaccinated or >3 months following receipt of last vaccine dose in the series) with high-risk exposure to a household member; HCW with a household exposure

		should only return if able to isolate from the positive household member
<p>Timeout News. Here are all the countries that are letting in vaccinated travelers. https://www.timeout.com/news/here-are-all-the-countries-that-are-letting-in-vaccinated-travellers-020321</p>	<ul style="list-style-type: none"> Last updated February 18, 2021 Status of jurisdictional requirements for proof of vaccination as an alternative to existing testing and quarantine requirements <p>*Primary source/jurisdictional documents could not be located online; media source provided</p>	<ul style="list-style-type: none"> Poland, which has announced that anyone who's been vaccinated against Covid-19 will now be exempt from a mandatory quarantine on arrival – only for those individuals from specified EU (and other) countries Iceland and Romania waving strict testing and quarantine requirements if travelers can show vaccination certificate Cyprus (from March 1) to allow vaccinated travelers Seychelles to allow vaccinated travelers from any country who can prove they've had a final dose of any vaccine at least 2 weeks pre-arrival
<p>BAL Global. COVID-19: Quarantine exemption announced for vaccinated travelers https://www.balglobal.com/bal-news/qatar-covid-19-quarantine-exemption-announced-for-vaccinated-travelers/</p>	<ul style="list-style-type: none"> Last updated February 25, 2021 Status of quarantine requirements for vaccinated Qatari citizens and residents <p>*Primary source/jurisdictional documents could not be located online; media source provided</p>	<ul style="list-style-type: none"> Qatari citizens and residents must meet the following conditions to be exempt from quarantine requirements: <ul style="list-style-type: none"> Fourteen days must have elapsed since receiving the second vaccination Individuals must have been vaccinated in Qatar, not in foreign countries A negative COVID-19 PCR test result must be presented upon returning to Qatar or after being in touch with someone who has tested positive for COVID-19 The quarantine exemption period begins 14 days after the second vaccination and lasts three months from that date

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