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Canada

Vaccine Confidence InfoBulletin

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Providing credible and timely information on vaccines to health care providers and public health decision makers to support vaccine confidence. Thank you for being a trusted source of vaccine information for individuals and communities across Canada.

In this issue

Trending topics

Recommendations on the use of a first booster dose of Pfizer-BioNTech Comirnaty® COVID-19 vaccine in children 5 to 11 years of age

On August 19, 2022, the Public Health Agency of Canada (PHAC) released recommendations from the National Advisory Committee on Immunization (NACI) on the use of a first booster dose of the Pfizer-BioNTech Comirnaty® (10 mcg) COVID-19 vaccine in children 5 to 11 years of age. This guidance is based on current evidence and NACI's expert opinion.

NACI published the following recommendations on the use of a booster dose of the Pfizer-BioNTech Comirnaty® (10 mcg) COVID-19 vaccine in children 5 to 11 years of age:

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...Trending topics continued

- For children 5 to 11 years of age who have an underlying medical condition that places them at high risk of severe illness due to COVID-19, including children who are immunocompromised, NACI recommends that a booster dose of the Pfizer-BioNTech Comirnaty® (10 mcg) COVID-19 vaccine should be offered at least 6 months after completion of a primary series. (Strong NACI recommendation).

- For all other children 5 to 11 years of age, NACI recommends that a booster dose of the Pfizer-BioNTech Comirnaty® (10 mcg) COVID-19 vaccine may be offered at least 6 months after completion of a primary series in the context of heightened epidemiological risk. (Discretionary NACI recommendation).

For the full statement, including supporting evidence and rationale, please see NACI Statement: Recommendations on the use of a first booster dose of Pfizer-BioNTech Comirnaty® COVID-19 vaccine in children 5 to 11 years of age.

Recommendations on the use of bivalent Omicron-containing mRNA COVID-19 vaccines

On September 1, 2022, PHAC released recommendations from NACI on the use of bivalent Omicron-containing mRNA COVID-19 vaccines. This guidance updates NACI's June 29 interim guidance on planning considerations for a fall 2022 COVID-19 vaccine booster program in Canada to include the authorized use of Moderna Spikevax™ Bivalent (50 mcg) COVID-19 vaccine and the changing epidemiology of COVID-19. This guidance is based on current evidence and NACI's expert opinion.

With regards to the product offered:

- For adults 18 years and over who are recommended to receive a fall booster dose, NACI recommends that the authorized dose of a bivalent Omicron-containing mRNA COVID-19 vaccine should be offered. If the bivalent Omicron-containing mRNA COVID-19 vaccine is not readily available, an original mRNA COVID-19 vaccine should be offered to ensure timely protection. (Strong NACI Recommendation).

- For adolescents 12-17 years of age with moderately to severely immunocompromising conditions and/or who have biological or social risk factors that place them at high risk of severe outcomes from COVID-19, NACI recommends that the authorized dose of a bivalent, Omicron-containing mRNA COVID-19 vaccine may be offered off-label. (Discretionary NACI Recommendation).

For the full statement, including supporting evidence and rationale, please see NACI Statement: Recommendations on the use of bivalent Omicron-containing mRNA COVID-19 vaccines.

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Back to school: COVID-19 pediatric vaccination communications toolkit

Parents may have questions about keeping their children's vaccinations against COVID-19 up-to-date. The Back to School: COVID-19 Pediatric Vaccination Communications Toolkit can provide up-to-date and consistent messaging when speaking to parents about COVID-19 pediatric vaccines.

Featured article

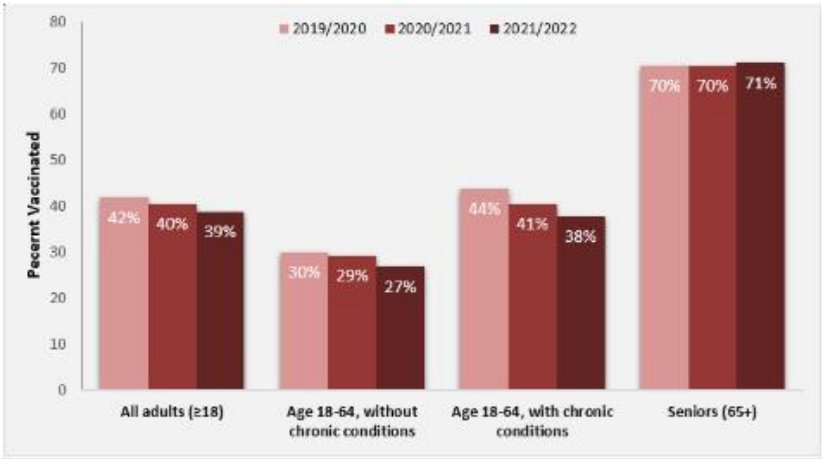
Leveraging lessons learned from projects funded by the PHAC Immunization Partnership Fund (IPF) to support seasonal influenza vaccine uptake

Differences in influenza and COVID-19 vaccine uptake in Canada

Although most people with an influenza infection will recover within a week to 10 days, some people are at greater risk of severe complications, such as pneumonia, or even death [1]. Worldwide, annual epidemics result in approximately one billion cases of influenza, three to five million cases of severe illness, and 290,000 to 650,000 deaths [1], [2]. Although the burden of influenza can vary from year to year, it is estimated that there are an average of 12,200 hospitalizations related to influenza and approximately 3,500 deaths attributable to influenza annually in Canada [1] [3], [4].

As part of the National Immunization Strategy, Canada's goal is to have 80% of those at higher risk of complications from influenza vaccinated [5], [6]. This includes seniors (65 years of age and older) and adults aged 18-64 years with chronic medical conditions [5], [6]. Data from the 2021-2022 Seasonal Influenza Vaccination Coverage Survey shows that Canada is not meeting these goals, especially among those with chronic medical conditions [6]. In the 2021/22 influenza season, nearly 4 in 10 Canadian adults aged 18-64 years with chronic medical conditions received the influenza vaccine [6]. Vaccination coverage among seniors (71%) is closer to the target of 80%; however, no significant improvement has been observed in this age group in the last 3 years. These findings indicate that current strategies are not moving the needle on influenza vaccine uptake [6].

Figure 1. Seasonal flu vaccination coverage, 2019-2020 to 2021-2022 flu seasons [6]



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Conversely, Canada has been a global leader in COVID-19 vaccine uptake, with a primary series vaccination rate of 86% in those 5 years of age and over [7]. In age groups at higher risk of severe outcomes, vaccination rates are even more impressive. More than 99% of those over 80 years of age have completed a primary series, and 90% have received at least one booster dose [7]. In people 70-79, those rates are 98% and 88% respectively [7].

COVID-19 vaccines and influenza vaccines face similar challenges related to vaccine confidence. In particular, both vaccines demonstrate relatively low effectiveness at preventing infection, but are highly effective at preventing severe illness [1]. Additionally, complacency regarding the diseases they protect against seems to be a key driver of low vaccine uptake. The Seasonal Influenza Vaccination Coverage Survey findings highlighted complacency as a key barrier and perceived susceptibility as a key motivator to influenza vaccine uptake [6]. Similarly, complacency regarding COVID-19 is associated with low uptake of primary series and booster doses [8], [9].

PHAC's Immunization Partnership Fund (IPF) projects may provide inspiration for how learnings related to COVID-19 vaccine uptake can be applied in practice or to influenza vaccination campaigns across the country to support influenza vaccine uptake.

PHAC IPF supported projects

The PHAC IPF is a grants and contributions program which supports community-based efforts to increase vaccine acceptance and uptake among Canadians. There are over one hundred projects currently active in communities across Canada, which are all evidence- and equity-based.

Click here to learn more about the Immunization Partnership Fund.

Several themes have emerged from IPF projects that highlight effective approaches to address vaccine uptake. These include leveraging long-term community relationships, dismantling barriers to accessing vaccinations, considering cultural safety and creating a positive vaccination experience for those with needle fear and anxiety.

Leveraging community relationships

Leveraging trust and long-term relationships within communities is an effective strategy for successful vaccination uptake, as trust in the messenger of vaccine information is a key component of vaccine confidence [9] [10] [11]. For example, to increase uptake of COVID-19 vaccines, the Dr. Peter Centre implemented a low-barrier micro-contribution funding structure with projects that leveraged trusted community members and unique communication delivery methods to meaningfully address vaccine hesitancy and access barriers. Examples included hosting a vaccination clinic at a local community barbeque and promoting vaccine services through community theatre. Similarly, Rexdale Community Health Centre has been successful in leveraging existing relationships within its community in Toronto by promoting vaccination clinics through locations such as local Caribbean restaurants, and working with racially diverse clinicians to identify, develop, and share culturally relevant COVID-19 vaccine

information. As a well-known organization with strong ties to the local urban Indigenous population in its community, the Mainline Program based out of the Mi'kmaw Native Friendship Centre (MNFC) in Halifax has been successful at hosting community clinics created for urban Indigenous people. Similar approaches to leveraging community relationships may be applicable to influenza vaccine campaigns.

Implementation suggestions

- Collaborate with racially diverse clinicians to develop and share culturally relevant vaccine information.
- Offer vaccination clinics at familiar community-based locations to put people at ease and help them to feel more comfortable asking questions from experts within their community. Suggestions include community health centres, restaurants, community barbeques, etc.
- Partner with community vaccine champions to share resources and inform best practices for supporting the community.

Dismantling access barriers

A key challenge to vaccine uptake, particularly within marginalized communities or among high-risk individuals, is vaccine access. Access barriers can include availability of and comfort with technology, transportation, language barriers, and clinic hours that conflict with work hours. In response, some IPF projects have provided vaccination clinics that do not require pre-booked appointments or have provided assistance in booking by phone. Select IPF projects have mitigated transportation barriers by scheduling home visits, providing Uber or taxi vouchers, and providing direct in-community vaccination. Lessons learned from IPF projects indicate that language accessibility can be improved by bringing on multilingual clinic staff and by providing translated evidence-based vaccination information from trusted sources. To address the challenges related to vaccination clinic hours, some IPF projects have offered after-hours clinics, mobile or pop-up clinics at convenient community locations, or even childcare to assist families in getting their vaccinations. Community Health Centres (CHCs) supported through the Canadian Association of Community Health Centres (CACHC) Community Vaccination Promotion National Project, provided mobile and pop-up clinics, bus ticket and taxi vouchers, and culturally-appropriate visuals and resources translated into six languages.

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Implementation suggestions

- Hosting vaccination clinics, including a mobile or pop-up clinics, in convenient and accessible locations that are familiar to the community and that can be easily reached by public transportation.
- Coordinate outreach clinics and home visits for those at high-risk who may have limited access to vaccination.
- Have multilingual staff, onsite translators/interpreters or telephone translation services available and offer clinic resources in multiple languages and in multiple formats (print, digital, etc.).
- Engage people across multiple channels (face-to-face outreach and digitally).
- Offer a combination of walk-in and appointment-based clinics during a wide range of hours. Provide the option for clients to book ahead online or by phone and send appointment reminders.

Improving cultural safety

Improving cultural safety mitigates historically-informed hesitancies that many vulnerable and racialized populations hold towards vaccination. Regina Treaty/Status Indian Services (RT/SIS) Inc. successfully held over 48 walk-in community COVID-19 vaccination clinics at a well-known and trusted urban Indigenous facility. RT/SIS implemented culturally sensitive practices as a key factor to building trust between community members (Status Indigenous people living in Regina treaty land) and the healthcare system. Practices included activities such as providing access to Elders and community leaders, sharing meals, cultural training of the nurses by First Nations People, and daily smudge ceremonies at COVID-19 vaccination clinics.

Implementation suggestions

- Offer clinics in culturally safe locations (for example, Friendship Centres).
- Increase cultural awareness to build trust with patients by providing cultural awareness training to health care personnel.
- Consult with community leaders regarding the needs and preferences of the community being served.

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Creating a positive vaccination experience

Providing comfortable vaccine experiences for those with fear and anxiety-based hesitancy can help create positive vaccination experiences and increase willingness to receive vaccines. The University of Toronto's CARD™ system is a vaccine delivery framework that improves the safety of vaccine delivery by reducing immunization stress-related responses (e.g., fear, pain, headache, dizziness and fainting) [12]. The acronym CARD™ stands for *Comfort, Ask, Relax, Distract*, with each letter category providing evidence-based activities that health care providers can 'play' to improve the vaccination experience [12]. It can be leveraged by health care providers to support their patients in reducing pain, fear, fainting, and vaccination-related symptoms before, during and after vaccination to make the experience a positive one [13].

A pre-post implementation study showed that the CARD™ framework reduces immunization stress-related responses, addresses vaccine hesitancy related to stress-related reactions, and demonstrates the feasibility of implementing the CARD™ system in mass vaccination clinics among individuals aged 12 years of age and older [14].

Implementation suggestions

Visit these key resources to learn more about how CARD™ can be applied in your practice:

- About Kids Health (SickKids) - for resources videos, handouts and activities that can be used to implement CARD™ in your practice.
- Webcast - Needle fear, pain and vaccines: Introduction to the CARD™ system as a framework for vaccination delivery.
- Webcast - Implementing the CARD™ system into practice: Experiences from the Centre for Addiction and Mental Health (CAMH).

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Science spotlight

Providing explanations of the science underpinning vaccine guidance and public health response.

Hybrid immunity and COVID-19

Key terms

- **Infection-induced immunity** is defined as the "immune protection in an unvaccinated individual after one or more SARS-CoV-2 infections" [15].
- **Vaccine-induced immunity** is defined as the "immune protection in an individual who has not been previously infected with SARS-CoV-2 but has completed a primary series of any COVID-19 vaccine, or has also received a booster vaccination" [15].
- **Hybrid immunity** is defined as the "immune protection in individuals who have had one or more doses of a COVID-19 vaccine and experienced at least one SARS-CoV-2 infection before or after the initiation of vaccination" [15].
- **Cell-mediated immunity** (or cellular immunity) "provides protection through the activation of T-cells which can destroy infected host cells or stimulate other immune cells to directly destroy pathogens" [16].
- **Antibody-mediated immunity** (or humoral immunity) "provides protection through the activation of B-cells which produce antibodies" [16].

It is estimated that half of all Canadians have contracted COVID-19 [17] as Canada recently faced a 7th COVID-19 wave, fueled largely by the highly immune evasive BA.4 and BA.5 variants [18]. As provinces and territories prepare to roll out additional COVID-19 vaccine booster doses, and vaccine authorizations have recently expanded to offer vaccines to children 6 months to 5 years of age, understanding the protection offered from hybrid immunity is increasingly salient.

Many of those previously infected and vaccinated will wonder what their degree of protection may be. Additionally, unvaccinated but previously infected individuals may question the advantages of being vaccinated following infection. This may be a key decision point for parents of young children, a demographic that have had some of the highest infection rates in the most recent Omicron wave [17].

Emerging evidence demonstrates that hybrid immunity may provide superior protection against COVID-19 compared to vaccination or previous infection alone [15]. In a vaccinated individual, infection acts as a "dose" to increase neutralizing antibodies and may induce broader antibodies that respond better to variants. Evidence is emerging that vaccinated individuals who had been infected also demonstrate increased T-cell proliferation and broadened T-cell responses [19] as well as increased neutralizing

antibodies, compared to those without a history of infection [20]. Hybrid immunity may provide better protection against reinfection with variants of concern (including Omicron) [19]. It should be noted, however, that infection-induced responses vary much more widely than vaccine-induced, thus reliance on infection-induced immunity alone is risky. Vaccination is still the safest and most reliable way to induce protection against severe COVID-19.

Immunity induced by vaccination or infection wanes against COVID-19 to varying degrees. Humoral immunity, which relies on antibodies, wanes most quickly, while cellular immunity is better preserved, regardless of how immunity was acquired. Additionally, T-cells are less susceptible to immune evasion by variants, likely due to a wider range of epitopes available for T-cell recognition [19]. T-cell defences, which mobilize cytotoxic capabilities and help to optimize production of antibodies from B-cells, are potential explanations for protection against severe disease from COVID-19 [19], [21].

While all sources of immunity can provide strong and durable protection against severe outcomes, hybrid immunity appears to be demonstrating superior protection against severe outcomes due to COVID-19 [22], [23]. Furthermore, immunity was boosted by a third dose even in those with a previous COVID-19 infection [19]. Timing of previous infection with vaccination can maximize benefits to individuals, with emerging evidence suggesting that a longer interval between infection and vaccination provides optimal protection, as is the case with longer intervals between vaccine doses [24], [25], [26]. The National Advisory Committee on Immunization (NACI) recommends boosting 6 months following infection, however an interval of at least 3 months may be warranted based on epidemiologic risk and operational considerations for jurisdictions [25].

More evidence is needed to better understand the characteristics of and impacts of hybrid immunity and to identify the duration of protection from hybrid immunity. COVID-19 vaccination, including obtaining a booster dose regardless of previous immunity status, continues to be important in reducing the impact of COVID-19 on our healthcare system and in mitigating severe outcomes. Those reluctant to vaccinate due to previous infection should be advised of the advantages of being vaccinated to improve immunity.

Key resource

- The World Health Organization: Interim statement on hybrid immunity and increasing population seroprevalence rates
    - The WHO provided a statement on the current understanding of hybrid immunity, highlighting gaps in evidence and potential implications for vaccination programs.

In the clinic

Providing current recommendations, resources and vaccination best practices for immunizers.

Comparison table of the Moderna Spikevax™ COVID-19 vaccines

Table 1 represents a comparison of the Moderna Spikevax™ COVID-19 vaccine products authorized for use in Canada. This resource provides a brief overview of the different vaccine characteristics, such as vial cap colour, label border, presentation, doses per vial, age, primary series doses, booster doses, potential allergens, route of administration, and syringe and needle selection. This may be used as a quick reference for health care providers to help select the appropriate vaccine product for their clients.

Table 1 - Moderna Spikevax™ COVID-19 vaccine product comparison[a][b][c][d][e]

Moderna Spikevax® COVID-19 Vaccines									
Vial cap colour / label border/ presentation	**Red vial cap (0.20 mg/mL)[f]**				**Royal Blue vial cap (0.10 mg/mL)[g]**				
	Light blue label border **(original)**				Purple label border **(original)**				Green label border **(original and Omicron B.1.1.529 (BA.1)**
Doses per vial	100 mcg - 5 mL / 10 doses per vial 50 mcg – 5 mL / 20 doses per vial				50 mcg - 2.5 mL / 5 doses per vial 25 mcg – 2.5 mL / 10 doses per vial				50 mcg (25 mcg 1273 + 25 mcg .529) – 2.5 mL / 5 doses per vial
Age[h]	6 months to 5 years	6 to 11 years	12 to 17 years	18 years & older	6 months to 5 years	6 to 11 years	12 to 17 years	18 years & older	18 years & older
Primary series doses	N/A	0.25 mL (50 mcg)	0.5 mL (100 mcg)	0.5 mL (100 mcg)	0.25 mL (25 mcg)	0.5 mL (50 mcg)	N/A	N/A	N/A
Booster doses	N/A	N/A	N/A	0.25 mL (50 mcg)	N/A	N/A	N/A	0.5 mL (50 mcg)	0.5 mL (50 mcg)
Potential allergens	• Polyethylene glycol (PEG) • Tromethamine (trometamol or Tris)								
Route of administration	• Intramuscular (IM)								
Syringe and needle selection[i]	• Preferentially use a low dead-volume syringe and/or needle • 22 to 25-gauge needle for administration								

[a] Moderna Spikevax COVID-19 vaccine
[b] COVID-19 vaccine: Canadian Immunization Guide
[c] Moderna Spikevax (COVID-19 Vaccine, mRNA) Product Monograph
[d] storage-handling-dosage-admin.pdf (modernacovid19global.com)
[e] Spikevax_Bivalent_DASH_EN.pdf (modernacovid19global.com)
[f] The 0.20 mg/mL presentation is not intended for preparation of the 25 mcg dose.
[g] The 0.10 mg/mL presentation is not intended for preparation of the 100 mcg dose.
[h] Age indication as per product monograph
[i] Refer to the Canadian Immunization Guide for needle selection guidelines: https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-1-key-immunization-information/page-8-vaccine-administration-practices.html#t3

For more information on Moderna Spikevax™ COVID-19 vaccine products, visit:

- Moderna Spikevax™ (elasomeran mRNA vaccine) website: Resources for Canadian Healthcare Professionals and Patients
- Health Canada COVID-19 vaccines and treatments portal: Spikevax™ (elasomeran)
- COVID-19 vaccine: Canadian Immunization Guide
- National Advisory Committee on Immunization (NACI): Statements and publications

Community spotlight

Putting the spotlight on innovative projects and best practices from communities across Canada.

Digital Public Square (DPS) – combating mis/disinformation through gamification

Digital Public Square (DPS) is a not-for-profit organization dedicated to rethinking and redesigning the way technology is used with the goal of creating vibrant and healthy community spaces. With support from the PHAC IPF, DPS has developed Know it or Not, an educational tool that seeks to combat mis/disinformation amplified by the COVID-19 pandemic to help people tell truth from fiction when it comes to vaccine information.

"Know it or Not" is a free, online game that aims to build critical inquiry, digital literacy, and knowledge about health and safety as it relates to COVID-19 vaccines. As participants play the game, they're presented with real, fact-checked responses that debunk commonly shared COVID-19 mis/disinformation.

DPS, in collaboration with MediaSmarts, has also developed bilingual digital literacy modules for educators based on the "Know it or Not" game. These include:

- Do Sharks Love Ice Cream? (Grades 7-9) - An interactive module that educates students on how science news articles are written, and how to read them with a critical eye.
- Consensus or Conspiracy? (Grades 9-12) - An interactive module that educates students on scientific consensus and conventional wisdom, and the harms associated with fringe theories and conspiracy theories.

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Do you have patients with questions about commonly shared COVID-19 mis/disinformation?
Encourage them to play Know it or Not to explore the latest verified data on COVID-19 vaccines.

Do you know an educator?
Encourage them to visit the lesson plans for Do Sharks Love Ice Cream? and Consensus or Conspiracy? to learn more.

PHAC webinars and webcasts for health care providers

PHAC, in collaboration with the Canadian Vaccination Evidence Resource and Exchange Centre (CANVax) and the National Collaborating Centre for Infectious Diseases (NCCID), offers expert-led webinars and webcasts focused on providing health care providers with clinical guidance and information related to key vaccine topics.

Webcasts are video resources.

Webinars are live events, with an audience and question & answer period. These live events are recorded and later posted for viewing.

Live webinar coming soon

Seasonal Influenza Immunization 2022-2023 – click to register now

Wednesday, September 28, 2022 from 1 p.m. to 2 p.m. EST

Dr. Jesse Papenburg and Dr. Robyn Harrison discuss the National Advisory Committee on Immunization (NACI) recommendations on seasonal influenza vaccine use for the 2022-2023 season. The webinar will address the role of health care providers in vaccine uptake and will include an overview of antiviral treatment of influenza.

Webinar and webcast watch list

Webinar – New COVID-19 vaccine for children 6 month to 5 years: NACI recommendations

Dr. Marina Salvadori discusses the NACI recommendations on the COVID-19 vaccine for children 6 months to 5 years of age, COVID-19 boosters for children and adolescents, and the new bivalent original strain/omicron booster.

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Webcast - Implementing the CARD™ system into practice: Experiences from the Centre for Addiction and Mental Health (CAMH)

Expert Erin LeDrew provides health care professionals with strategies and approaches for implementing CARD™ in their practice or clinic by sharing practical examples of how CARD™ has been implemented by the Centre for Addiction and Mental Health (CAMH).

Contact Vaccine Confidence

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Have questions or feedback to share? Email us: vaccination@phac-aspc.gc.ca

Please note that any medical questions should be directed to your local health care provider and any urgent medical questions should be directed to 911 or your local emergency department.

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Annex

References

[1] Public Health Agency of Canada, "Canadian Immunization Guide Chapter on Influenza and Statement on Seasonal Influenza Vaccine for 2022–2023," 8 6 2022. [Online]. Available: https://www.canada.ca/en/public-health/services/publications/vaccines-immunization/canadian-immunization-guide-statement-seasonal-influenza-vaccine-2022-2023.html . [Accessed 13 7 2022].

[2] World Health Organization, "Influenza (Seasonal)," 6 11 2018. [Online]. Available: http://www.who.int/mediacentre/factsheets/fs211/en/. [Accessed 13 7 2022].

[3] D. Schanzer, A. Mcgeer and K. Morris, "Statistical Estimates of Respiratory Admissions Attributable to Seasonal and Pandemic Influenza for Canada," *Influenza and other respiratory viruses,* vol. 7, no. 5, pp. 799-808, 2013.

[4] D. Schanzer, C. Sevenhuysen, B. Winchester and T. Mersereau, "Estimating influenza deaths in Canada, 1992-2009," *PloS one,* vol. 8, no. 11, p. e80481, 2013.

[5] Government of Canada, "National Immunization Strategy," 31 12 2021. [Online]. Available: https://www.canada.ca/en/public-health/services/immunization-vaccine-priorities/national-immunization-strategy.html . [Accessed 13 7 2022].

[6] Government of Canada, "Seasonal Influenza (Flu) Vaccination Coverage Survey results, 2021-2022," 11 7 2022. [Online]. Available: https://www.canada.ca/en/public-health/services/immunization-vaccines/vaccination-coverage/seasonal-influenza-survey-results-2021-2022.html. [Accessed 23 8 2022].

[7] Government of Canada, "COVID-19 vaccination in Canada," 27 6 2022. [Online]. Available: https://health-infobase.canada.ca/covid-19/vaccination-coverage/. [Accessed 9 9 2022].

[8] N. E. MacDonald, J. Comeau, È. Dubé, J. Graham, M. Greenwood, S. Harmon, J. McElhaney, M. McMurty, A. Middleton, A. Steenbeek and A. Taddio, " Enhancing COVID-19 Vaccine Acceptance in Canada: An RSC Policy Briefing," Royal Society of Canada, 2021.

[9] Impact Canada, "Wave 16: COSMO Canada," Government of Canada, 2021. [Online]. Available: https://impact.canada.ca/cosmo-canada/Wave-16. [Accessed 16 8 2022].

[10] O. Olson, C. Berry and N. Kumar, "Addressing Parental Vaccine Hesitancy towards Childhood Vaccines in the United States: A Systematic Literature Review of Communication Interventions and Strategies," *Vaccines,* vol. 8, no. 4, p. 590, 2020.

[11] J. A. Simonetti and M. L. Anderson, "When the messenger affects the message: Trustworthiness in the context of COVID vaccination," *Journal of Hospital Medicine,* pp. 1-3, 2022.

[12] About Kids Health, "What is CARD? A guide for health-care providers," [Online]. Available: https://assets.aboutkidshealth.ca/AKHAssets/CARD_HCP_What_is_CARD.pdf?hub=cardhcpedu#card. [Accessed 12 08 2022].

[13] Government of Canada, "Vaccination pain management for children: Guidance for health care providers," 08 11 2021. [Online]. Available: https://www.canada.ca/en/public-health/services/immunization-vaccines/pain-management-children-guidance-health-care-providers.html. [Accessed 12 08 2022].

[14] M. Tetui, K. Grindrod, N. Waite, J. VanderDoes and A. Taddio, "Integrating the CARD (Comfort Ask Relax Distract) system in a mass vaccination clinic to improve the experience of individuals

during COVID-19 vaccination: a pre-post implementation study," *Human vaccines & immunotherapeutics,* p. 2089500, 2022.

[15] World Health Organization, "Interim statement on hybrid immunity and increasing population seroprevalence rates," 1 6 2022. [Online]. Available: https://www.who.int/news/item/01-06-2022-interim-statement-on-hybrid-immunity-and-increasing-population-seroprevalence-rates. [Accessed 22 7 2022].

[16] Government of Canada, "Basic immunology and vaccinology: Canadian Immunization Guide," 2020. [Online]. Available: https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-1-key-immunization-information/page-14-basic-immunology-vaccinology.html. [Accessed 8 2022].

[17] COVID-19 Immunization Task Force, "COVID-19 Seroprevalence Report: Report #22," 2022.

[18] Government of Canada, "COVID-19 Epidemiology," 22 7 2022. [Online]. Available: https://health-infobase.canada.ca/covid-19/. [Accessed 27 7 2022].

[19] S. C. Moore and al., "Evolution of long-term hybrid immunity in healthcare workers after different COVID-19 vaccination regimens: a longitudinal observational study," *medRxiv,* pp. 1-49, 2022.

[20] L. Stamatatos, J. Czarostki, Y.-H. Wan, L. J. Homad, V. Rubin, H. Glantz, M. Neradilek, E. Seydoux, M. F. Jennewein, A. J. MacCamy, J. Feng, G. Mize, S. C. De Rosa and A. L. M. P. Finzi, "mRNA vaccination boosts cross-variant neutralizing antibodies elicited by SARS-CoV-2 infection," *Science,* vol. 372, no. 6549, pp. 1413-1418, 2021.

[21] T. Nyberg and al., "Comparative analysis of the risks of hospitalisation and death associated with SARS-CoV-2 omicron (B.1.1.529) and delta (B.1.617.2) variants in England: a cohort study," *The Lancet,* vol. 399, pp. 1303-1312, 2022.

[22] H. N. Altarawneh, H. Chemaitelly, H. H. Ayoub, P. Tang, M. R. Hasan, H. M. Yassine, H. A. Al-Khatib, M. K. Smatti, P. Coyle and Z. Al-Kanaani, "Effect of prior infection, vaccination, and hybrid immunity against symptomatic BA.1 and BA.2 Omicron infections and severe COVID-19 in Qatar (Preprint)," *medRxiv,* 22 March 2022.

[23] M. G. Max Gordon, T. Tecleab, W. Christ, M. Forsell, M. Phillipson, P. Nilsson, S. Mangsbo, S. Hober, M. Åberg, J. Klingström and C. Thålin, "Vaccination plus previous infection: protection during the omicron wave in Brazil," *The Lancet,* vol. 22, no. 7, pp. 945-946, 2022.

[24] P. R. Wratil and al., "Three exposures to the spike protein of SARS-CoV-2 by either infection or vaccination elicit superior neutralizing immunity to all variants of concern," *Nature Medicine,* vol. 28, pp. 1-24, 2022.

[25] National Advisory Committee on Immunization (NACI), "Interim guidance on planning considerations for a fall 2022 COVID-19 vaccine booster program in Canada," Public Health Agency of Canada, 29 6 2022. [Online]. Available: https://www.canada.ca/content/dam/phac-aspc/documents/services/immunization/national-advisory-committee-on-immunization-naci/naci-guidance-planning-fall-2022-covid-19-vaccine-booster.pdf. [Accessed 20 7 2022].

[26] D. M. Skowronski and et al., "Two-dose SARS-CoV-2 vaccine effectiveness with mixed schedules and extended dosing intervals: test-negative design studies from British Columbia and Quebec, Canada," *Clinical Infectious Diseases,* pp. 1-31, 2022.

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