

April 2022 ~ Resource #380429

COVID-19 Vaccines

(Updated June 1, 2022)

The chart below provides dosing, storage, adverse effects, and efficacy information for COVID-19 vaccines available or submitted for approval in the US and/or Canada. The American Society of Health System Pharmacists has resources related to COVID-19 vaccines at <https://www.ashp.org/COVID-19/Vaccines?loginreturnUrl=SSOCheckOnly>. See end of the chart for links to the **fact sheets** and **product labeling**.

VACCINE ^c	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
<p>BNT162b2 (Pfizer-BioNTech)/mRNA (Comirnaty)^c</p> <p>PURPLE cap¹⁷⁻¹⁹ (NOT for ages 5 to 11 years^a)</p> <p>US: approved for ages ≥ 16 years;¹⁹ EUA for ages 12 to 15 years; third dose for immunocompromised^f; and boosters (see comments)¹⁷</p> <p>Canada: approved¹⁸</p> <p>Dilution needed: 1.8 mL NS/vial.¹⁷⁻¹⁹</p>	<p>Primary vaccination for ≥ 12 years: Two 0.3 mL (30 mcg) IM doses 3 weeks apart (Canada: 8-week interval preferred).^{*17-20}</p> <p>Immunocompromised^f: As above, plus 3rd dose ≥ 28 days after the 2nd dose (Canada: 4 to 8 weeks after the second dose).^{17,20}</p> <p>*CDC: An 8-week interval between the first two doses may increase efficacy, but stick with labeled interval for those who need rapid protection (e.g., age ≥ 65 years, immunocompromised).²⁵</p>	<p>First booster, ≥ 12 years: 0.3 mL (30 mcg) IM ≥ 5 months (Canada: ≥ 6 months) after last primary dose.^{7,17,18}</p> <p>Second booster (US), ≥ 50 years: 0.3 mL (30 mcg) IM ≥ 4 months after the first booster.¹⁷ Canada: see footnote j.</p> <p>Immunocompromised, ≥ 12 years^f: 0.3 mL (30 mcg) IM ≥ 3 months (Canada ≥ 6 months) after last primary series dose (first booster). Second booster (US) ≥ 4 months after first booster.^{17,20}</p>	<p>Shipping/long-term storage (ultra-low temp freezer, freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C): 1 month thawed/undiluted vials (includes transport [up to 12 hours]); 6 hours once diluted (vial or pre-drawn syringe)^{10,17-19}</p> <p>Room Temp (up to 25°C): 2 hours, thawed/undiluted, 6 hours once diluted (vial or pre-drawn syringe)^{10,17-19}</p>	<ul style="list-style-type: none"> • Efficacy: see footnote i. • Lymphadenopathy (16%) may interfere with imaging (e.g., mammography) for four to six weeks after vaccination.²⁸ • See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about myocarditis/pericarditis. • EUA also for use as a heterologous first booster for adults (≥ 18 years), and as a heterologous second booster.¹⁷

VACCINE ^e	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
<p>BNT162b2 (Pfizer-BioNTech)/ mRNA (Comirnaty)^c GRAY cap^{13,18,27} (NOT for ages 5 to 11 years^a) US: approved for ages ≥16 years;²⁷ EUA for ages 12 to 15 years; third dose for immunocompromised^f; and boosters (homologous or heterologous)¹³ Canada: approved¹⁸ Do NOT dilute.^{13,18,27}</p>	See above.	See above.	<p>Shipping/long-term storage (ultra-low temp freezer, freezer): See footnote d. Refrigerator (2°C to 8°C): 10 weeks (unpunctured vial).^{13,18,27} Room Temp (up to 25°C): 12 hours (unpunctured vial).^{13,18,27} Discard vials 12 hours after first puncture.^{13,18,27} Vaccine should not be used after 12 months from date of manufacture.^{13,18}</p>	See above.
<p>BNT162b2 for 5 through 11 years of age (Pfizer-BioNTech)/ mRNA ORANGE cap and label with orange border^{18,30} US: EUA Canada (Comirnaty): approved Requires dilution with 1.3 mL of NS per vial.^{18,30}</p>	<p>Primary vaccination for 5 to 11 years: Two 0.2 mL (10 mcg) IM doses 3 weeks apart (Canada: ≥8-week interval preferred).^{18,20,30} Immunocompromised: as above, plus 3rd dose ≥28 days after the second dose.³⁰ (Canada: 4- to 8-week interval preferred between each of the three doses.²⁰)</p>	<p>First Booster (US): 0.2 mL (10 mcg) IM ≥5 months after last primary dose.³⁰</p>	<p>Shipping/long-term storage (ultra-low temp freezer, freezer): See footnote d. Refrigerator (2°C to 8°C) (option if vials arrive frozen or refrigerated): 10 weeks undiluted; 12 hours once diluted (vial).^{18,30} Room Temp (up to 25°C): 12 hours undiluted, 12 hours once diluted (vial).^{18,30} Stable in pre-drawn syringe for 24 hours, with no more than 12 hours at room temperature (up to 30°C).¹⁰ Vaccine should not be used after 12 months from date of manufacture.^{18,30}</p>	<ul style="list-style-type: none"> • Efficacy: see footnote i. • See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about myocarditis/pericarditis.

VACCINE ^e	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
<p>mRNA-1273 (Moderna)/ mRNA (Spikevax)^g</p> <p>US: approved (<i>Spikevax</i>) for primary two-dose series²¹</p> <p>US: EUA for third dose, boosters (homologous or heterologous)²</p> <p>Canada: approved²²</p>	<p>Primary vaccination for ≥18 years (Canada, ≥12 years): Two 0.5 mL (100 mcg) IM doses 1 month (4 weeks) apart (Canada: 8-week interval preferred)*^{2,20,21,22,25}</p> <p>6 to 11 years (Canada): Two 0.25 mL (50 mcg) IM doses 4 weeks apart (≥8-week interval preferred).^{1,22}</p> <p>Immunocompromised: as above plus 3rd dose ≥1 month (≥4 weeks) (Canada: 4 to 8 weeks) after the second dose.^{2,20,22,25}</p> <p>*CDC: An 8-week interval between the first two doses may increase efficacy, but stick with labeled interval for those who need rapid protection (e.g., age ≥65 years, immunocompromised).²⁵</p>	<p>First Booster, ≥18 years (Canada, ≥12 years^b): 0.25 mL (50 mcg), ≥5 months (Canada: ≥6 months) after last primary dose^{2,7,22}</p> <p>Second Booster (US), ≥50 years: 0.25 mL (50 mcg), ≥4 months after first booster.²</p> <p>Canada: see footnote j.</p> <p>Immunocompromised: as above, but in Canada, 100 mcg (0.5 mL) instead of 50 mcg (0.25 mL) can be used if ≥18 years.²⁰</p> <p>US: immunocompromised adults ≥18 years can get a first booster 3 months after the last primary dose, and a second booster 4 months after the first booster.²⁵</p>	<p>Shipping/long-term storage (freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C): 30 days after thawing (prior to first use).^{2,21,22} After 30 days, contact manufacturer for guidance before discarding.⁶</p> <p>In-use vial/pre-drawn syringe: 12 hours.^{2,10,21} (Canada In-use vial: 24 hours.)²²</p> <p>Room temperature (8°C to 25°C): Unused vial: 24 hours.^{2,21,22} In-use vial/pre-drawn syringe: 12 hours.^{2,10,21} (Canada In-use vial: 24 hours.)²²</p>	<ul style="list-style-type: none"> • Efficacy: see footnote i. • Lymphadenopathy (16%) may interfere with imaging (e.g., mammography) for four to six weeks after vaccination.²⁸ • See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about myocarditis/pericarditis. • Delayed-type hypersensitivity reaction (e.g., large, red area near injection site) reported most often about a week after first shot. May be itchy, painful, warm, or swollen, and can also involve fingers, elbow, or palm. Not a contraindication to subsequent vaccination.¹⁵

VACCINE ^e	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
<p>mRNA-1273 (Moderna)/ mRNA “Booster presentation” 50 mcg in 0.5 mL</p> <p>Dark BLUE cap and a label with a purple border⁴</p> <p>US: EUA for boosters (homologous or heterologous)⁴</p>	N/A	<p>First Booster (US) (≥18 years): 0.5 mL (50 mcg), ≥5 months after last primary dose⁴</p> <p>Second Booster (US), ≥50 years: 0.5 mL (50 mcg), ≥4 months after first booster.⁴</p> <p>Immunocompromised: as above, but immunocompromised adults can get first booster 3 months after the last primary dose.²⁵</p>	<p>Shipping/long-term storage (freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C): 30 days after thawing (prior to first use).⁴ After 30 days, contact manufacturer for guidance before discarding.⁶ In-use vial: 12 hours.⁴</p> <p>Room temperature (8°C to 25°C): Unused vial: 24 hours.⁴ In-use vial: 12 hours.⁴ Total room temperature storage time must not exceed 24 hours.⁴</p>	<ul style="list-style-type: none"> • Efficacy: see footnote i. • Lymphadenopathy (16%) may interfere with imaging (e.g., mammography) for four to six weeks after vaccination.²⁸ • See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about myocarditis/pericarditis.
<p>Ad26.COV2.S Janssen (J&J)/ Viral vector (non-replicating)</p> <p>US: EUA for adults for whom other vaccines are not available or appropriate, or if they refuse other vaccines.⁹</p> <p>Canada: approved. mRNA vaccine preferred for primary series and booster.²⁰</p>	<p>Primary vaccination for ≥18 years: One 0.5 mL IM dose^{9,24}</p> <p>Immunocompromised: as above, plus 2nd dose, (mRNA vaccine) ≥28 days later^{20,25}</p>	<p>First Booster^h (mRNA vaccine): ≥2 months (Canada: ≥6 months) after the first dose.^{9,20}</p> <p>Second Booster (US), ≥50 years, or people 18 to 49 years who received Janssen as both their primary and booster: mRNA booster ≥4 months after first booster.²⁵</p> <p>Canada: see footnote j.</p> <p>Immunocompromised: as above, but if Moderna is chosen for first booster, use a dose of 100 mcg if Moderna 50 mcg was used in the primary series.²⁵</p>	<p>Shipping/long-term storage (freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C): Up to 11 months (Canada: up to 6 months), not to exceed mfr expiration date (unused vial).^{24,31} In-use vial/pre-drawn syringe: 6 hrs.^{9,10,24}</p> <p>Room temperature (9°C to 25°C): Unused vial: 12 hours.^{9,24} In-use vial/pre-drawn syringe: 2 hours (Canada: 3 hours).^{9,10,24}</p>	<ul style="list-style-type: none"> • Efficacy: see footnote i. • See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about thrombosis with thrombocytopenia syndrome (TTS) and other rare side effects of viral vector COVID-19 vaccines.

VACCINE ^e	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
<p>ChAdOx1-S (AstraZeneca)/Viral vector (non-replicating) (Vaxzevria) Phase III data published.</p> <p>Canada: approved</p> <p>mRNA vaccine preferred²⁰</p>	<p>Primary vaccination for ≥18 years of age: Two 0.5 mL IM doses 4 to 12 weeks apart (≥8-week interval preferred)^{16,20}</p> <p>Immunocompromised: As above plus 3rd dose (mRNA vaccine) ≥28 days later²⁰</p>	<p>Booster: mRNA vaccine ≥6 months after last primary dose.²⁰</p> <p>Second booster: see footnote j.</p>	<p>Refrigerator (2°C to 8°C): Mfr expiration date (unused vial); 48 hours (punctured vial)¹⁶</p> <p>Room temperature (≤30°C): 6 hours (punctured vial). Vial can be re-refrigerated, but the cumulative storage at room temperature cannot exceed 6 hours, and the total cumulative storage time cannot exceed 48 hours¹⁶</p>	<ul style="list-style-type: none"> • Efficacy: see footnote i. • See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about thrombosis with thrombocytopenia syndrome (TTS) and other rare side effects of viral vector COVID-19 vaccines.
<p>NVX-CoV2373 (Novavax)/Recombinant protein subunit, adjuvanted (Nuvaxovid)</p> <p>US: EUA under review¹⁴</p> <p>Canada: approved</p> <p>mRNA vaccine preferred²⁰</p>	<p>Primary vaccination for ≥18 years of age: Two 0.5 mL IM doses three weeks apart (8-week interval preferred)^{8,20}</p> <p>Immunocompromised: safety and efficacy not established.²⁰</p>	<p>Booster: mRNA vaccine (preferred) ≥6 months after last primary dose.²⁰</p> <p><i>Nuvaxovid</i> can be used off-label as a booster for adults unable or unwilling to receive an mRNA vaccine.²⁰</p> <p>Second booster: see footnote j.</p>	<p>Refrigerator (2°C to 8°C): 6 hours (punctured vial).⁸</p> <p>Room temperature (≤25°C): 6 hours (punctured vial).⁸</p>	<ul style="list-style-type: none"> • Efficacy: see footnote i.
<p>Covifenz (Medicago)/Recombinant spike protein in plant-based virus-like particles, adjuvanted</p> <p>Canada: approved</p>	<p>Primary vaccination for 18 to 64 years of age: Two 0.5 mL IM doses 21 days apart (8-week interval preferred)^{11,26}</p>	<p>Booster: mRNA vaccine ≥6 months after last primary dose.¹¹</p> <p>Second booster: see footnote j.</p>	<p>Refrigerator (2°C to 8°C): Until expiration date on vaccine and adjuvant vials (unpunctured).²⁶</p> <p>In-use vial (mixed): 20°C to 30°C for 6 hours (do not refrigerate once mixed).²⁶</p>	<ul style="list-style-type: none"> • Efficacy: see footnote i. • Requires mixing of adjuvant and antigen before use (see product labeling for instructions).²⁶ • Produced using the genomic sequence of the spike protein of the original strain.²⁶ • May contain trace amounts of kanamycin or carbenicillin.²⁶

- a. The adult formulation of the Pfizer-BioNTech vaccine **CANNOT** be used for children 5 to 11 years of age by using a dose-adjusted volume. This is because this volume (10 mcg = 0.1 mL) is too small for an intramuscular injection. The pediatric formulation delivers 10 mcg in 0.2 mL.²⁹
- b. **Canada:** For Moderna, 100 mcg (0.5 mL) instead of 50 mcg can be used as the booster in high-risk adults.²⁰
- c. **Comirnaty** and the Pfizer-BioNTech COVID-19 vaccine authorized (EUA) for ages ≥ 12 years of age can be used interchangeably when prepared according to their respective instructions for use.²⁵
- d. See product labeling for storage in ultra-low freezer, freezer, and thawing before use, if applicable. Pfizer vaccine storage and dry ice safety handling resources at <https://www.cvdvaccine-us.com>.
- e. Tips to **minimize vaccine waste** include:^{10,23}
 - Maintain the cold chain to prevent waste due to inappropriate storage conditions.
 - Maximize doses drawn from multidose vials using:
 - low dead-volume syringes/needles.
 - techniques to minimize leakage (e.g., multiple puncture locations in the rubber stopper, instead of the same location over and over [this can create a larger hole]).
 - Draw up an appropriate number of syringes based on expected vaccination appointments for the day.
 - Monitor appointment cancellations and no shows throughout the day. Then draw up afternoon doses based on the revised appointment list.
 - Use syringes in order of expiration time, starting with the earliest expiration date.
 - Maintain a waiting list to contact people at the end of the day if there are extra doses available.
- f. **US:** Immunocompromise= solid organ transplant patients or similar level of immunocompromise. For a full list of CDC-recommended conditions, see <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/recommendations/immuno.html>.
Canada: See a full list of **immunocompromising conditions**, see the Canadian Immunization Guide: <https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-3-vaccination-specific-populations/page-8-immunization-immunocompromised-persons.html>. **Ontario** Ministry of Health recommendations for the third dose are available at https://www.health.gov.on.ca/en/pro/programs/publichealth/coronavirus/docs/vaccine/COVID-19_vaccine_third_dose_recommendations.pdf.
- g. **Spikevax** and the authorized (EUA) **RED** cap Moderna COVID-19 vaccine with a label with a light blue border can be used interchangeably to provide primary series doses or booster doses.²
- h. **Janssen (US):** has EUA for booster, but mRNA is preferred.^{9,25}
- i. **Efficacy:** Clinical trials were conducted prior to the emergence of Omicron.²⁰ Evidence suggests lower efficacy against symptomatic infection by Omicron and its variants due to immune escape.²⁰ **mRNA** vaccines are still highly effective at protecting boosted adults against hospitalization, need for mechanical ventilation, or death.^{5,12}
- j. In **Canada**, check local guidance for administration of a second booster. NACI recommends that in general, jurisdictions provide a second booster six months after the previous booster when appropriate based on local epidemiology.³ A shorter interval may be indicated in older adults. Also consider timing in regard to recent COVID-19 infection.³ Targeted populations include people ≥ 70 years and Indigenous Peoples.³ Use Pfizer, Moderna 50 mcg (or 100 mcg per clinical judgment [e.g., age ≥ 70 years of age; age ≥ 30 years in congregate settings]), or *Nuvaxovid* (for adults unable or unwilling to receive an mRNA vaccine).^{3,20}

Abbreviations: EUA = Emergency Use Authorization; IM = intramuscular; NS = normal saline; UK = United Kingdom

The CDC has interim recommendations for **COVID-19 vaccine administration errors and deviations** available at <https://www.cdc.gov/vaccines/covid-19/downloads/covid19-vaccine-errors-deviations-poster.pdf>.

Fact Sheets and Product Labeling

- *Comirnaty* (PURPLE cap) prescribing information (US): <https://www.fda.gov/vaccines-blood-biologics/comirnaty>
- *Comirnaty* (GREY cap) prescribing information (US): <https://www.fda.gov/vaccines-blood-biologics/comirnaty>
- Pfizer-BioNTech vaccine EUA fact sheet (**12 years of age and older**) for healthcare professionals (US): <https://www.fda.gov/media/153713/download>
- Pfizer-BioNTech vaccine EUA fact sheet (**12 years of age and older**) for patients (US): <https://www.fda.gov/media/153716/download>
- Pfizer-BioNTech vaccine EUA fact sheet (**12 years of age and older-Do Not Dilute**) for healthcare professionals (US): <https://www.fda.gov/media/153715/download>
- Pfizer-BioNTech vaccine EUA fact sheet (**5 through 11 years of age**) for healthcare professionals (US): <https://www.fda.gov/media/153714/download>
- Pfizer-BioNTech vaccine EUA fact sheet (**5 through 11 years of age**) for patients (US): <https://www.fda.gov/media/153717/download>
- *Spikevax* prescribing information (US): <https://www.fda.gov/vaccines-blood-biologics/spikevax>
- Moderna vaccine EUA fact sheet for healthcare professionals (US) (**Primary series and booster dose**): <https://www.fda.gov/media/157233/download>
- Moderna vaccine EUA fact sheet for healthcare professionals (US) (**Booster dose only presentation**): <https://www.fda.gov/media/157232/download>
- Moderna vaccine EUA fact sheet for patients (US): <https://www.fda.gov/media/144638/download>
- Janssen (J&J) vaccine EUA fact sheet for healthcare professionals (US): <https://www.fda.gov/media/146304/download>
- Janssen (J&J) vaccine fact sheet for patients (US): <https://www.fda.gov/media/146305/download>
- Current Canadian product monographs for Covid-19 vaccines available in Canada can be found at Health Canada's Drug Product Database (<https://health-products.canada.ca/dpd-bdpp/index-eng.jsp>).

Users of this resource are cautioned to use their own professional judgment and consult any other necessary or appropriate sources prior to making clinical judgments based on the content of this document. Our editors have researched the information with input from experts, government agencies, and national organizations. Information and internet links in this article were current as of the date of publication.

References

- National Advisory Committee on Immunization (NACI). An Advisory Committee Statement (ACS). Recommendations on the use of Moderna Spikevax COVID-19 vaccine in children 6 to 11 years of age. March 17, 2022. <https://www.canada.ca/en/public-health/services/immunization/national-advisory-committee-on-immunization-naci/recommendations-use-moderna-spikevax-covid-19-vaccine-children-6-11-years-age.html>. (Accessed April 3, 2022).
- FDA. Fact sheet for healthcare providers administering vaccine (vaccination providers). Emergency use authorization (EUA) of the Moderna COVID-19 vaccine to prevent coronavirus disease 2019 (COVID-19). March 29, 2022. <https://www.fda.gov/media/157233/download>. (Accessed April 3, 2022).
- National Advisory Committee on Immunization (NACI). An Advisory Committee Statement (ACS). Initial guidance on a second booster dose of COVID-19 vaccines in Canada. April 5, 2022. <https://www.canada.ca/content/dam/phac-aspc/documents/services/immunization/national-advisory-committee-on-immunization-naci/naci-guidance-second-booster-dose-covid-19-vaccines.pdf>. (Accessed April 5, 2022).
- FDA. Fact sheet for healthcare providers administering vaccine (vaccination providers). Emergency use authorization (EUA) of the Moderna COVID-19 vaccine to prevent coronavirus disease 2019 (COVID-19). Booster dose only presentation. March 29, 2022. <https://www.fda.gov/media/157232/download>. (Accessed April 3, 2022).
- Tenforde MW, Self WH, Gaglani M, et al. Effectiveness of mRNA Vaccination in Preventing COVID-19-Associated Invasive Mechanical Ventilation and Death - United States, March 2021-January 2022. *MMWR Morb Mortal Wkly Rep.* 2022 Mar 25;71(12):459-465.
- CDC. Moderna COVID-19 vaccine questions. Last reviewed March 23, 2022. <https://www.cdc.gov/vaccines/covid-19/info-by-product/moderna/moderna-faqs.html>. (Accessed April 3, 2022).
- Government of Canada. Summary of National Advisory Committee on Immunization (NACI) statement of April 12, 2022. Updated guidance on a first booster dose of COVID-19 vaccines in Canada. <https://www.canada.ca/content/dam/phac-aspc/documents/services/immunization/national-advisory-committee-on-immunization-naci/naci-summary-april-12-2022.pdf>. (Accessed April 13, 2022).
- Product monograph for Nuvaxovid. Novavax. Gaithersburg, MD 20878. March 2022.
- FDA. Fact sheet for healthcare providers administering vaccine (vaccination providers). Emergency use authorization (EUA) of the Janssen COVID-19 vaccine to prevent coronavirus disease 2019 (COVID-19). May 5, 2022. <https://www.fda.gov/media/146304/download>. (Accessed May 18, 2022).
- USP. COVID-19 vaccine handling toolkit: operational considerations for healthcare practitioners. Version 5.0. November 2021. <https://www.usp.org/covid-19/vaccine-handling-toolkit>. (Accessed April 2, 2022).
- Government of Canada. Recommendations of the use of Medicago COVID-19 vaccine (Covifenz). March 11, 2022. <https://www.canada.ca/en/public-health/services/immunization/national-advisory-committee-on-immunization-naci/recommendations-use-medicago-covid-19-vaccine.html>. (Accessed April 13, 2022).
- Taylor CA, Whitaker M, Anglin O, et al. COVID-19-Associated Hospitalizations Among Adults During SARS-CoV-2 Delta and Omicron Variant Predominance, by Race/Ethnicity and Vaccination Status - COVID-NET, 14 States, July 2021-January 2022. *MMWR Morb Mortal Wkly Rep.* 2022 Mar 25;71(12):466-473.
- FDA. Fact sheet for healthcare providers administering vaccine (vaccination providers). Emergency use authorization (EUA) of the Pfizer-Biontech Covid-19 vaccine to prevent coronavirus disease 2019 (COVID-19) for 12 years of age and older-do not dilute. April 13, 2022. <https://www.fda.gov/media/153715/download>. (Accessed April 21, 2022).
- Wall Street Journal. Novavax's COVID-19 vaccine moves closer to FDA authorization decision. March 6, 2022. <https://www.wsj.com/articles/novavaxs-covid-19-vaccine-moves-closer-to-fda-authorization-decision-11646562601>. (Accessed April 5, 2022).
- Blumenthal KG, Freeman EE, Saff RR, et al. Delayed large local reactions to mRNA-1273 vaccine against SARS-CoV-2. *N Engl J Med* 2021;384:1273-7.
- Product monograph for Vaxzevria. AstraZeneca Canada. Mississauga, ON L4Y 1M4. November 2021.
- FDA. Fact sheet for healthcare providers administering vaccine (vaccination providers). Emergency use authorization (EUA) of the Pfizer-Biontech COVID-19 vaccine to prevent coronavirus disease 2019 (COVID-19) for 12 years of age and older. Dilute before use. Revised March 29, 2022. <https://www.fda.gov/media/153713/download>. (Accessed April 1, 2022).
- Product monograph for Comirnaty. Pfizer Canada. Kirkland, QC H9J 2M5. April 2022.
- Product information for Comirnaty (purple cap). Pfizer. New York, NY 10017. December 2021.
- Government of Canada. COVID-19 vaccine: Canadian Immunization Guide. Date modified: April 12, 2022. <https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-4-active-vaccines/page-26-covid-19-vaccine.html#t4>. (Accessed April 13, 2022).
- Product information for Spikevax. Moderna US. Cambridge, MA 02139. January 2022.
- Product monograph for Spikevax. Moderna Therapeutics. Cambridge, MA 02139. March 2022.

23. Coppock K. ISMP provides recommendations for avoiding COVID-19 vaccination administration errors. January 15, 2021. <https://www.pharmacytimes.com/view/ism-mp-provides-recommendations-for-avoiding-covid-19-vaccination-administration-errors>. (Accessed April 3, 2022).
24. Product monograph for Janssen COVID-19 vaccine. Janssen. Toronto, ON M3C 1L9. March 2022.
25. CDC. Interim clinical considerations for use of COVID-19 vaccines currently approved or authorized in the United States. Last updated April 21, 2022. <https://www.cdc.gov/vaccines/covid-19/clinical-considerations/covid-19-vaccines-us.html>. (Accessed April 21, 2022).
26. Product monograph for Covifenz. Medicago. Quebec, CA G1V 3V9. February 2022.
27. Product information for Comirnaty (gray cap). Pfizer. New York, NY 10017. December 2021.
28. NCCN: Cancer and COVID-19 Vaccination. Recommendations of the National Comprehensive Cancer Network (NCCN) Advisory Committee on COVID-19 vaccination and pre-exposure prophylaxis. Version 5.0. January 4, 2022. https://www.nccn.org/docs/default-source/covid-19/2021_covid-19_vaccination_guidance_v5-0.pdf?sfvrsn=b483da2b_110. (Accessed April 13, 2022).
29. American Pharmacists Association. COVID-19 vaccination in adolescents and children. February 28, 2022. <https://www.pharmacist.com/Practice/COVID-19/COVID-19-Vaccines/Adolescents-Children>. (Accessed April 1, 2022).
30. FDA. Fact sheet for healthcare providers administering vaccine (vaccination providers). Emergency use authorization (EUA) of the Pfizer-Biontech COVID-19 vaccine to prevent coronavirus disease 2019 (COVID-19) for 5 through 11 years of age. Dilute before use. May 17, 2022. <https://www.fda.gov/media/153714/download>. (Accessed May 18, 2022).
31. FDA. Amended Emergency Use Authorization-Concurrence. Janssen COVID-19 vaccine. April 7, 2022. <https://www.fda.gov/media/157554/download>. (Accessed April 10, 2022).

Cite this document as follows: Clinical Resource, COVID-19 Vaccines. Pharmacist's Letter/Prescriber's Letter. April 2022. [380429]

—To access hundreds more clinical resources like this one, visit [trchealthcare.com](https://www.trchealthcare.com) to log in or subscribe—