COVID-19 Vaccine, mRNA (Moderna) (Systemic)

Nucleoside-modified mRNA vaccine used to stimulate active immunity to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

Class: 80:12 • Vaccines (AHFS primary)

Brands*:

**also available generically*

Special Alerts:

Emergency Use Authorization (EUA) Changes for COVID-19 Vaccine (Moderna): On March 29, 2022, the EUA for the Moderna COVID-19 vaccine was reissued to permit use of the vaccine as a second booster dose at least 4 months after receipt of a first booster dose of any FDA-authorized or approved COVID-19 vaccine product to individuals ≥50 years of age and certain immunocompromised individuals ≥18 years of age (i.e., those who are solid organ transplant recipients or diagnosed with conditions considered to have an equivalent level of immunocompromise). A booster only presentation of the Moderna COVID-19 vaccine is also available in multiple dose vials with dark blue caps and labels with a purple border. The booster dose only presentation of the Moderna COVID-19 vaccine is *not* authorized for use as the primary vaccination series. On June 17, 2022, the EUA for Spikevax® and the Moderna COVID-19 vaccine was reissued to permit use of the vaccine as a 2-dose primary vaccination series in individuals 12–17 years of age; an additional (third) primary series dose also was authorized for administration at least 1 month following the second dose of the COVID-19 vaccine (Moderna or Spikevax®) in certain immunocompromised individuals 12–17 years of age (i.e., those who are solid organ transplant recipients or diagnosed with conditions considered to have an equivalent level of immunocompromise). The Moderna COVID-19 vaccine also was authorized for use as a 2-dose primary vaccination series in individuals 6 months to 11 years of age; an additional (third) primary series dose also was authorized for administration at least 1 month following the second dose of the COVID-19 vaccine (Moderna) in certain immunocompromised individuals 6 months to 11 years of age (i.e., those who are solid organ transplant recipients or diagnosed with conditions considered to have an equivalent level of immunocompromise). For additional information, consult the EUA at https://www.fda.gov/media/144636/download and the fact sheets at https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/spikevax-and-moderna-covid-19-vaccine

National Alert Network (NAN) Alert Regarding Influenza and COVID-19 Vaccine Mix-ups: On October 15, 2021, the National Alert Network (NAN) issued an alert to make vaccine providers aware of reports of accidental mix-ups between the influenza (flu) and COVID-19 vaccines. The alert is based on 16 cases reported to the Institute for Safe Medication Practices (ISMP) error reporting programs. Most of the reports ISMP has received involve administration of one of the COVID-19 vaccines instead of an influenza vaccine; in 3 cases, patients received an influenza vaccine instead of a COVID-19 vaccine. Because most of the errors were reported by consumers, details about the contributing factors were not provided in many cases. However, possible contributing factors include increased demand for vaccination services, the ability to administer the flu and COVID-19 vaccines during the same visit, syringes located next to each other, unlabeled syringes, distractions, and staffing shortages. The alert provides recommendations for preventing such vaccine mix-ups. For additional information, consult the NAN alert at https://www.ismp.org/sites/default/files/attachments/2021-10/NAN-20211015.pdf.

On January 31, 2022, COVID-19 Vaccine (Moderna) received full FDA approval for active immunization to prevent coronavirus disease 2019 (COVID-19) caused by SARS-CoV-2 in individuals 18 years of age or older. An emergency use authorization (EUA) for the Moderna COVID-19 vaccine is still in effect and authorizes use of the vaccine as an additional (third) primary dose in certain immunocompromised individuals, and as a single homologous booster dose in individuals who have completed the primary series of this vaccine or as a single heterologous booster dose in individuals who have completed primary vaccination with another authorized or approved COVID-19 vaccine.

Uses

Prevention of Coronavirus Disease 2019 (COVID-19)

- Being investigated and used for prevention of COVID-19† caused by SARS-CoV-2.
- Although efficacy and safety not definitely established, COVID-19 vaccine (Moderna) is available under an FDA emergency use authorization (EUA) for active immunization to prevent COVID-19 in individuals ≥18 years of age.
- The EUA authorizes use as a 2-dose primary vaccination series, as an additional (third) primary dose in certain immunocompromised individuals, and as a single homologous booster dose in individuals who have completed the primary series of this vaccine or as a single heterologous booster dose in individuals who have completed primary vaccination with another authorized or approved COVID-19 vaccine.
- On December 18, 2020, FDA issued the initial EUA that permitted use of the Moderna COVID-19 vaccine in individuals ≥18 years of age. The EUA was amended and reissued multiple times since then as the scope of authorization changed. For the most current version, consult the Moderna COVID-19 vaccine EUA letter of authorization at https://www.fda.gov/media/144636/download.
- The EUA requires that the vaccine be administered as authorized; vaccination providers should comply with terms and training required by CDC's COVID-19 vaccination program.
- The EUA includes certain mandatory requirements (e.g., providing the recipient or caregiver with information consistent with the EUA fact sheet).
- Consult the Moderna COVID-19 vaccine EUA fact sheet for healthcare providers (https://www.fda.gov/media/144637/download), and EUA fact sheet for recipients and caregivers (https://www.fda.gov/media/144638/download) for additional information.
- Consult the CDC's Advisory Committee on Immunization Practices (ACIP) interim recommendations and clinical considerations for use of COVID-19 vaccines, including dosage and administration, specific populations and situations, and cautionary information.
- There currently are 3 different COVID-19 vaccines available for use in the US, including 2 mRNA vaccines (Moderna COVID-19 vaccine and Pfizer-BioNTech COVID-19 vaccine) and a viral-vectored vaccine (Janssen COVID-19 vaccine). COVID-19 vaccination is currently recommended for individuals ≥5 years of age in the US for prevention of COVID-19; however, the age groups approved or authorized to receive vaccination vary by vaccine product. In most situations, ACIP states that the mRNA vaccines are preferred over the Janssen COVID-19 vaccine for primary and booster vaccination because of the risks associated with the Janssen vaccine; however, the Janssen COVID-19 vaccine may be offered in certain situations. In patients eligible for an additional (third) primary mRNA COVID-19 vaccine dose (e.g., certain immunocompromised individuals), ACIP states the same mRNA vaccine product should generally be used.

Dosage and Administration

General

Pretreatment Screening

- Screen all individuals for contraindications and precautions prior to vaccination.

Patient Monitoring

- *Monitor all individuals who receive a COVID-19 vaccine for immediate adverse reactions according to CDC (ACIP) guidelines.* ACIP states that the following individuals should be observed for 30 minutes after receiving the vaccine: those with a history of immediate allergic reaction of any severity to a non-COVID-19 vaccine or injectable therapy; those with a contraindication to a different type of COVID-19 vaccine (i.e., viral vector); those with a history of a non-severe, immediate allergic reaction to a previous dose of COVID-19 vaccine; and those with a history of anaphylaxis due to any cause. All other individuals should be observed for 15 minutes. A longer period of observation may be indicated for some individuals based on clinical concern (e.g., vaccine recipient develops pruritus and swelling at the injection site during the observation period).
- Instruct vaccine recipients to seek immediate medical care if they develop signs or symptoms of an allergic reaction after the observation period is complete. (See Hypersensitivity Reactions under Cautions.)

Premedication and Prophylaxis

- Antipyretics or analgesics (e.g., acetaminophen, nonsteroidal anti-inflammatory agents) may be taken for the treatment of postvaccination local or systemic symptoms, if medically appropriate. However, routine premedication for the purpose of preventing postvaccination symptoms in individuals receiving a COVID-19 vaccine is *not* currently recommended because information regarding possible impact on antibody response to the vaccine is not available at this time.
- Premedication with antihistamines prior to vaccination to prevent allergic reactions is *not* recommended; antihistamines do not prevent anaphylaxis and may mask cutaneous symptoms, which could lead to a delay in the diagnosis and management of anaphylaxis. (See Hypersensitivity Reactions under Cautions.)

Dispensing and Administration Precautions

- Appropriate medications and supplies for managing immediate allergic reactions *must* be immediately available in the event that an acute anaphylactic reaction occurs following administration of COVID-19 vaccines. Healthcare personnel who are trained and qualified to recognize signs and symptoms of anaphylaxis and administer IM epinephrine should be available at vaccination sites at all times. Vaccination locations that anticipate vaccinating large numbers of people (e.g., mass vaccination clinics) should plan adequate staffing and supplies (including epinephrine) for assessment and management of anaphylaxis. (See Hypersensitivity Reactions under Cautions.)
- Syncope (vasovagal or vasodepressor reaction; fainting) may occur following administration of parenteral vaccines; such reactions usually occur within 15 minutes following vaccine administration and are reported most frequently in adolescents and young adults. Take appropriate measures to decrease the risk of injury if the vaccine recipient becomes weak or dizzy or loses consciousness (e.g., instruct individual to sit or lie down during and for 15 minutes after vaccination). If syncope occurs, observe the vaccine recipient until symptoms resolve.

Other General Considerations

- At the time the first COVID-19 vaccine dose is administered, a vaccination record card that provides the date when the recipient needs to return for additional vaccine dose(s) should be give to the vaccine recipient or their caregiver; vaccine recipients should be counseled on the importance of completing the 2-dose primary vaccination series and receiving a booster dose to optimize protection against COVID-19.
- Provide vaccine recipients or their caregivers with information on CDC's v-safe program, a voluntary smartphone-based tool that uses text messaging and web surveys to monitor for adverse effects in individuals who have received a COVID-19 vaccine.
- Prior to vaccination, counsel vaccine recipients or their caregivers on local and systemic adverse effects that may occur following vaccination. Unless a contraindication to vaccination exists, ACIP recommends that vaccine recipients should be encouraged to complete the 2-dose vaccination series of the Moderna COVID-19 vaccine even if they experience local or systemic adverse effects following the first dose since this optimizes protection.
- Individuals who receive COVID-19 vaccines should follow current CDC guidance to protect themselves and others. This may include wearing a mask in certain settings with substantial or high levels of viral transmission; following applicable federal, state, local, tribal, or territorial laws, rules, and regulations; and following CDC travel guidance and any applicable local business or workplace guidance.

Administration

IM Administration

Administer *only* by IM injection into the deltoid. Confirm dosing volume prior to administration (0.5 mL for a primary series dose or 0.25 mL for a booster dose).

The Moderna COVID-19 vaccine is supplied as a frozen suspension in multiple-dose vials that *must* be shipped and stored (long-term) at a temperature between -50 to -15°C. For short-term storage, may store unopened multiple-dose vials of the vaccine in a refrigerator (2–8°C) for up to 30 days prior to first use. (See Storage under Stability.)

Prior to use, remove the vials from the freezer and thaw either in a refrigerator (2–8°C) or at room temperature (15– 25°C). If thawed under refrigeration, allow vials to stand at room temperature for 15 minutes before use. (See Thawing under Dosage and Administration.)

Do not dilute the Moderna COVID-19 vaccine.

Swirl vials of vaccine gently after thawing and between withdrawal of each dose; do *not* shake.

Use aseptic technique and an appropriate syringe and needle, preferably with a low dead-volume syringe and/or needle, to prepare the dose; administer immediately following preparation.

To administer a primary series dose, withdraw 0.5 mL of thawed Moderna COVID-19 vaccine; to administer a booster dose, withdraw 0.25 mL of the thawed vaccine from the vial.

Moderna COVID-19 vaccine is supplied in 2 different multiple-dose vial presentations (5.5 mL and 7.5 mL vial); primary series doses (0.5 mL) and booster doses (0.25 mL) may be extracted from either vial. When extracting only primary series doses, a maximum of eleven 0.5-mL doses (range: 10–11 doses) can be withdrawn from the 5.5 mL vial and a maximum of fifteen 0.5-mL doses (range: 13–15 doses) can be withdrawn from the 7.5 mL vial. When extracting booster doses only or a combination of primary series and booster doses from either vial, do not exceed a maximum of 20 doses; do not puncture the vial stopper more than 20 times.

Because the vaccine does not contain preservatives, it is critical that any vaccine remaining in the vial that does not constitute a full 0.5-mL or 0.25-mL dose be discarded and *not* be pooled with vaccine from other vials to obtain a dose. Discard the vial and any remaining vaccine once the vial stopper has been punctured 20 times.

Thawing

Thawing in a refrigerator (2–8°C): Thaw multiple-dose vials containing 5.5 mL or 7.5 mL for 2.5 or 3 hours, respectively, in a refrigerator. May store unopened vials in the refrigerator for up to 30 days prior to first use.

Thawing at room temperature (15–25°C): Allow multiple-dose vials containing 5.5 mL or 7.5 mL to sit at room temperature for 1 or 1.5 hours, respectively, to thaw. May store unopened vials for up to 24 hours at 8–25°C.

Thawed Moderna COVID-19 vaccine should appear as a white to off-white suspension and may contain white or translucent product-related particles; do *not* use if it is discolored or contains other particles.

Thawed vaccine *must* not be refrozen.

Dosage

Each 0.5-mL primary series dose contains 100 mcg of mRNA. Each 0.25 mL booster dose contains 50 mcg of mRNA.

A 2-dose regimen of the Moderna COVID-19 vaccine is considered a complete primary vaccination series. Individuals should not receive more than one complete vaccination series for active immunization against COVID-19, with the exception of individuals who have received a hematopoietic cell transplant or chimeric antigen (CAR)-T-cell therapy.

Individuals are considered fully vaccinated against COVID-19 ≥2 weeks after receiving the second dose of a 2-dose vaccination series of an mRNA vaccine.

Doses for the primary vaccination series and an additional primary dose, if indicated, should be completed with the same vaccine product.

ACIP states that in *exceptional* situations when the mRNA COVID-19 vaccine used for the first dose cannot be determined or is not available, may administer any available mRNA COVID-19 vaccine approved or authorized by FDA with a minimum interval of 28 days between doses to complete the mRNA COVID-19 vaccination series. If 2 doses of *different* mRNA COVID-19 vaccines are administered for the primary series in such situations (or inadvertently), the primary series is considered complete.

Additionally, ACIP states that, in limited, *exceptional* situations when an individual received the first dose of an mRNA COVID-19 vaccine but is unable to complete the vaccination series with either the same or different mRNA COVID-19 vaccine (e.g., due to a contraindication), may consider giving a single dose of the Janssen COVID-19 vaccine at least 28 days after the dose of mRNA COVID-19 vaccine.

For booster doses, ACIP states that use of an mRNA COVID-19 vaccine is preferred in individuals ≥ 18 years of age even for those who received the Janssen COVID-19 vaccine for their single-dose primary series. However, if an mRNA vaccine cannot be given, offering the Janssen COVID-19 vaccine as a booster is preferable to not providing any COVID-19 vaccine booster. In individuals 12–17 years of age, only the Pfizer BioNTech COVID-19 vaccine can be used for the booster dose.

Adults

Table 1. Moderna COVID-19 Vaccine Primary Series, Additional Primary Dose, and Booster Dose Recommendations

	PRIMARY SERIES	ADDITIONAL PRIMARY DOSE	BOOSTER DOSE
Indicated population	**All individuals ≥18 years of age**	**Immunocompromis individuals ≥18 years of age**	**All individuals ≥18 years of age**
Dose	**100 mcg**	**100 mcg**	**50 mcg**
Injection volume	**0.5 mL**	**0.5 mL**	**0.25 mL**
Recommended doses and interval	**2 doses, administered 28 days apart**	**1 dose, administered ≥28 days after completion of primary series**	**1 dose, administered ≥5 months after completion of primary series (including additional dose)**

Primary Vaccination Series

IM: FDA EUA that permits use for prevention of COVID-19† states that adults ≥18 years of age should receive two 0.5-mL doses of the vaccine administered 1 month (28 days) apart.

>*Additional Primary Dose in Immunocompromised Adults*

IM: FDA EUA permits administration of an additional primary dose† of 0.5-mL at least 28 days after the second dose in solid organ transplant recipients or those diagnosed with conditions considered to have an equivalent level of immunocompromise. (See Individuals with Altered Immunocompetence under Cautions.)

>*Booster Dose*

IM: FDA EUA permits administration of a single homologous booster dose† of 0.25 mL at least 5 months after completion of the primary vaccination series in individuals ≥18 years of age.

FDA EUA permits administration of a single heterologous booster dose† of 0.25 mL following completion of primary vaccination with another authorized or approved COVID-19 vaccine. Follow the dosing interval recommended by the vaccine product used for the primary vaccination series. For example, those who received a single-dose Janssen primary series can receive an mRNA COVID-19 vaccine booster dose at least 2 months (8 weeks) after completing their Janssen COVID-19 primary series.

Cautions

Contraindications

- Known history of severe allergic reaction (e.g., anaphylaxis) to any component of the vaccine. (See Actions.)

ACIP considers the following to be contraindications to vaccination with *both* mRNA vaccines (Moderna COVID-19 vaccine and Pfizer-BioNTech COVID-19 vaccine):

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose of an mRNA COVID-19 vaccine or severe allergic reaction to a component of the vaccine (e.g., polyethylene glycol [PEG]).
- Known (diagnosed) allergy to a component of the vaccine (e.g., PEG).

Warnings/Precautions

Sensitivity Reactions

Hypersensitivity Reactions

Hypersensitivity reactions reported in 1.5% of vaccine recipients and 1.1% of placebo recipients in the ongoing phase 3 trial evaluating the Moderna COVID-19 vaccine; hypersensitivity events reported in the vaccine group and likely related to vaccination included injection site rash and injection site urticaria.

Although immediate allergic reactions not reported to date in clinical trials evaluating the Moderna COVID-19 vaccine, severe allergic reactions, including anaphylaxis, reported rarely following administration of mRNA COVID-19 vaccines outside of clinical trials.

Following issuance of the FDA EUA for the Moderna COVID-19 vaccine, safety monitoring data identified 10 cases of anaphylaxis among 4,041,396 individuals in the US who received the first dose of the vaccine (2.5 cases per million vaccine doses administered).

From December 21, 2020 to January 10, 2021, safety monitoring data identified 43 cases of nonanaphylactic allergic reactions in individuals who received the first dose of the Moderna COVID-19 vaccine.

Delayed-onset local reactions (e.g., erythema, induration, pruritus, tenderness) around the injection site area reported in some vaccine recipients. ACIP states that delayed-onset local reaction after the first dose of an mRNA COVID-19 vaccine is *not* a contraindication or precaution to administration of the second vaccine dose. Therefore, individuals with such injection site reactions after the first dose of an mRNA COVID-19 vaccine should receive the second dose of the same vaccine at the recommended interval, preferably in the opposite arm.

If a hypersensitivity reaction, including anaphylaxis, occurs following COVID-19 vaccination, report the case to VAERS. (See EUA Requirements for Postvaccination Monitoring and Mandatory Vaccine Adverse Event Reporting under Cautions.)

Because anaphylactic reactions reported rarely following administration of COVID-19 vaccines, ACIP issued interim guidance with contraindications and precautions for use of COVID-19 vaccines pending further investigation.

History of severe allergic reaction (e.g., anaphylaxis) after a previous dose of an mRNA COVID-19 vaccine or any of its components (e.g., PEG): ACIP considers this a **contraindication** to vaccination with the mRNA COVID-19 vaccines. ACIP states consideration may be given to using an alternative COVID-19 vaccine (Janssen COVID-19 vaccine) in such individuals. However, because of potential cross-reactive hypersensitivity between ingredients in mRNA COVID-19 vaccines and the Janssen COVID-19 vaccine (including PEG and polysorbate 80, respectively), consider consultation with an allergist-immunologist to help determine if the individual can safely receive the Janssen COVID-19 vaccine.

Known (diagnosed) allergy to a component of the vaccine (e.g., PEG): ACIP considers this a **contraindication** to vaccination with the mRNA COVID-19 vaccines. ACIP states consideration may be given to using an alternative COVID-19 vaccine (Janssen COVID-19 vaccine) in such individuals. However, because of potential cross-reactive hypersensitivity between ingredients in mRNA COVID-19 vaccines and the Janssen COVID-19 vaccine (including PEG and polysorbate 80, respectively), consider consultation with an allergist-immunologist to help determine if the individual can safely receive the Janssen COVID-19 vaccine.

History of any immediate allergic reaction to any other vaccine or injectable therapy (i.e., IM, IV, or sub-Q vaccines or therapies): ACIP considers this a **precaution**, but not a contraindication, to COVID-19 vaccination. ACIP states that history of allergic reaction to sub-Q immunotherapy for allergies (i.e., allergy shots) is **not** a contraindication or precaution to COVID-19 vaccination.

History of immediate allergic reaction to a vaccine or injectable therapy that contains multiple components (one or more of which is a component of a COVID-19 vaccine), but it is not known which component elicited the reaction: ACIP considers this a **precaution**, but not a contraindication, to the COVID-19 vaccine.

History of allergic reactions (including severe allergic reactions) not related to COVID-19 vaccines, other vaccines, or injectable therapies: ACIP states that food, pet, insect, venom, or environmental allergies and allergic reactions to oral medications (including the oral equivalents of injectable medications) are **not** a contraindication or precaution to COVID-19 vaccination. Latex allergy is **not** a contraindication or precaution since vial stoppers of COVID-19 vaccines are not made with natural rubber latex. Allergies to eggs or gelatin are **not** a contraindication or precaution since COVID-19 vaccines do not contain eggs or gelatin. In addition, a family history of allergies is **not** a contraindication or precaution to COVID-19 vaccination.

History of delayed-onset local reactions (e.g., erythema, induration, pruritus) around the injection site area after first dose of an mRNA COVID-19 vaccine: ACIP states that these local reactions are **not** a contraindication or precaution for administration of second dose of mRNA COVID-19 vaccine. Such individuals should receive second dose using the same mRNA COVID-19 vaccine used for first dose at the recommended interval, preferably in the opposite arm.

If a **precaution** for COVID-19 vaccination is identified, ACIP recommends performing a risk assessment to help decide whether the individual should be vaccinated.

ACIP states to observe the following individuals for 30 minutes after vaccination: those with a history of an immediate allergic reaction of any severity to any other vaccine or injectable therapy, those with a contraindication to a different type of COVID-19 vaccine (i.e., viral vector), those with a history of a non-severe, immediate allergic reaction to a previous dose of COVID-19 vaccine, and those with a history of anaphylaxis due to any cause not considered a contraindication; observe all other individuals for 15 minutes. Instruct vaccine recipients to seek immediate medical care if they develop signs or symptoms of an allergic reaction after their observation period ends and they have left the vaccination site.

Appropriate medications and supplies to manage immediate allergic reactions (e.g., epinephrine) *must* be immediately available in the event that an acute anaphylactic reaction occurs following administration of a COVID-19 vaccine. Early recognition of clinical signs and symptoms of anaphylaxis is important. Immediately treat individuals with suspected anaphylaxis with IM epinephrine.

ACIP interim guidance regarding management of anaphylaxis are available at the CDC website at https://www.cdc.gov/vaccines/covid-19/clinicalconsiderations/managing-anaphylaxis.html and https://www.cdc.gov/vaccines/covid-19/info-by-product/clinical-considerations.html.

When confronted with a complex COVID-19 vaccine safety question that is not readily addressed by ACIP guidance, US healthcare personnel or health departments can request a clinical consultation from the Clinical Immunization Safety Assessment COVIDvax project (https://www.cdc.gov/vaccinesafety/ensuringsafety/monitoring/cisa/index.html).

Lymphadenopathy

Lymphadenopathy, lymphadenitis, lymph node pain, injection-site lymphadenopathy, axillary swelling/tenderness, and axillary mass reported in clinical trials evaluating COVID-19 vaccine (Moderna).

Unilateral axillary adenopathy, including palpable axillary mass, identified through self-detection or incidentally on breast imaging in individuals who received an mRNA COVID-19 vaccine outside of clinical trials. Consider vaccine-induced hyperplastic axillary adenopathy in differential diagnosis if unilateral axillary adenopathy identified on breast imaging in individuals who recently received an mRNA COVID-19 vaccine. Some experts suggest scheduling routine screening mammography or ultrasound prior to first dose of an mRNA COVID-19 vaccine or 4–6 weeks following second dose of the vaccine, if possible, and if this would not unduly delay appropriate care.

Consider that increased axillary lymph node or deltoid uptake has been detected on positron emission tomography (PET) or other imaging performed in individuals who recently received an mRNA vaccine.

Myocarditis and Pericarditis

Rare reports of acute myocarditis or pericarditis in recipients of mRNA COVID-19 vaccines. Symptom onset typically within 2–7 days (range: 0–40 days) after receipt of a dose of an mRNA COVID-19 vaccine. Reported more frequently after the second vaccine dose than the first dose. Increased risk observed with the Moderna COVID-19 vaccine as compared to other authorized

or approved COVID-19 vaccines. Risk of myocarditis with booster doses has been relatively lower than the second dose of the primary series based on limited evidence.

Data to date indicate myocarditis and pericarditis following vaccination with an mRNA COVID-19 vaccine occurred predominantly in males <40 years of age; the risk is highest among males 18–24 years of age. In some reported cases, patients were hospitalized and responded to medications and rest with rapid improvement or resolution of symptoms. Additional data needed regarding potential for long-term sequelae.

Consider the possibility of myocarditis and pericarditis in the differential diagnosis for any individual, particularly males 12–29 years of age, who develop acute chest pain, shortness of breath, or palpitations after receipt of an mRNA COVID-19 vaccine. During initial evaluation of suspected cases, query the individual about prior COVID-19 vaccination and pertinent medical, travel, and social history; in addition, consider assessing ECG, troponin levels, and inflammatory markers such as C-reactive protein and erythrocyte sedimentation rate. Consider expert consultation regarding diagnosis, management, and follow-up.

Inform individuals receiving an mRNA COVID-19 vaccine, especially males 12–29 years of age, about the possibility of myocarditis or pericarditis after receiving the vaccine and the possibility of myocarditis or pericarditis occurring following SARS-CoV-2 infection and advise them to seek medical care if symptoms of myocarditis or pericarditis occur after vaccination.

If myocarditis or pericarditis occurs after receipt of a COVID-19 vaccine, report the case to VAERS. (See EUA Requirements for Postvaccination Monitoring and Mandatory Vaccine Adverse Event Reporting under Cautions.)

Individuals who developed myocarditis or pericarditis after a dose of an mRNA COVID-19 vaccine: Because it is unclear whether such individuals are at increased risk of further adverse cardiac effects following a subsequent dose of the vaccine, experts recommend deferring subsequent doses until additional safety data are available. ACIP states there may be certain circumstances when administration of a subsequent dose can be considered, taking into account the individual's personal risk of severe acute COVID-19 (e.g., age, underlying conditions), level of COVID-19 in the community and personal risk of infection, availability of additional data on risk of myocarditis or pericarditis in such situations, and availability of additional data on long-term outcomes. Those who choose to receive a subsequent dose should wait until their episode of myocarditis or pericarditis has completely resolved, including resolution of symptoms attributed to myocarditis or pericarditis with no evidence of ongoing heart inflammation or sequelae as determined by the individual's clinical team, which may include a cardiologist, and special testing to assess cardiac recovery.

Individuals with a history of myocarditis or pericarditis unrelated to mRNA COVID-19 vaccination (e.g., prior to COVID-19 vaccination): Data are limited regarding the safety and efficacy of COVID-19 vaccines in such individuals. FDA states that a decision to administer the Moderna COVID-19 vaccine to an individual with a history of myocarditis or pericarditis should take into account the individual's clinical circumstances. ACIP states that any COVID-19 vaccine approved or authorized by FDA can be administered after the episode of myocarditis or pericarditis unrelated to COVID-19 vaccination has completely resolved, including resolution of symptoms attributed to myocarditis or pericarditis with no evidence of ongoing heart inflammation or sequelae as determined by the individual's clinical team, which may include a cardiologist, and special testing to assess cardiac recovery.

Thrombocytopenia

Very rare reports of thrombocytopenia, including immune thrombocytopenia (ITP), in recipients of mRNA COVID-19 vaccines (Moderna COVID-19 vaccine or Pfizer-BioNTech COVID-19 vaccine) during post-authorization surveillance. As of February 4, 2021, >18 million doses of the Pfizer-BioNTech COVID-19 vaccine and >16 million doses of the Moderna COVID-19 vaccine had been administered in the US, and FDA had identified 15 cases of thrombocytopenia in recipients of the Pfizer-BioNTech COVID-19 vaccine and 13 cases in recipients of the Moderna COVID-19 vaccine (reporting rates of 0.8 per million doses for both mRNA vaccines). FDA stated that this number of post-vaccination cases of thrombocytopenia does not suggest a safety concern attributable to mRNA COVID-19 vaccines.

As of April 24, 2021, data from the Vaccine Safety Datalink (VSD) regarding reports of cerebral venous sinus thrombosis (CVST) in recipients of mRNA COVID-19 vaccines identified 11 CVST cases (3 in recipients of the Pfizer-BioNTech vaccine and 8 in recipients of the Moderna vaccine). However, only 6 were considered to be potential incident cases of CVST since 5 of the cases were ruled out based on patient history (e.g., history of head injury, history of cavernous sinus syndrome); thrombocytopenia was not reported in any of these patients. At the time of this analysis, 6.3 million doses of mRNA COVID-19 vaccines had been administered at the healthcare organizations included in the VSD network, and there were no confirmed cases of CVST with thrombocytopenia in recipients of the Pfizer-BioNTech COVID-19 vaccine or Moderna COVID-19 vaccine.

Concomitant Illness

Base decision to administer or delay vaccination in an individual with a current or recent febrile illness on the severity of symptoms and etiology of the illness.

ACIP states that a moderate or severe acute illness is a precaution for administration of vaccines and recommends that a risk assessment be performed with potential deferral of vaccination. Deferring vaccination until an individual has recovered avoids superimposing adverse effects of the vaccine on the underlying illness or mistakenly concluding that a manifestation of the underlying illness resulted from vaccination.

Individuals with Current SARS-CoV-2 Infection

ACIP recommends deferring COVID-19 vaccination in individuals with known *current* SARS-CoV-2 infection until they have recovered from the acute illness (if symptomatic) and until criteria for discontinuance of isolation have been met.

Individuals with Prior SARS-CoV-2 Infection

Available data suggest that COVID-19 vaccines can be given safely to individuals with evidence of *prior* SARS-CoV-2 infection.

Data not available to date regarding safety and efficacy of administering COVID-19 vaccines to individuals who have received passive antibody therapy with investigational SARS-CoV-2-specific monoclonal antibodies or investigational COVID-19 convalescent plasma as part of treatment of COVID-19. (See Specific Drugs under Drug Interactions.)

Individuals with a History of Multisystem Inflammatory Syndrome

Data not available to date regarding safety and efficacy of COVID-19 vaccines in adults or children with a history of multisystem inflammatory syndrome (MIS-A or MIS-C, respectively). ACIP recommends weighing theoretical concerns about a dysregulated immune response against the known risks of COVID-19 following reinfection and the benefits of protection following COVID-19 vaccination.

ACIP states that individuals with a history of MIS-A or MIS-C may choose to be vaccinated. The benefits of COVID-19 vaccination are thought to outweigh the risks in those with a history of MIS-C, if the following criteria are met: achievement of clinical recovery (including return to normal cardiac function), 90 days have passed since the diagnosis of MIS-C, individual resides in an area of high or substantial community transmission of SARS-CoV-2 (or otherwise have an increased risk for exposure and transmission), and onset of MIS-C preceded any COVID-19 vaccination.

ACIP states that individuals with a history of MIS-A or MIS-C should consider deferring COVID-19 vaccination until they have recovered from their illness and for 90 days after the date MIS-A or MIS-C was diagnosed, recognizing that the risk of reinfection and, therefore, the benefit from vaccination might increase with time following the initial infection.

If MIS-A or MIS-C associated with a confirmed SARS-CoV-2 infection develops after receipt of a COVID-19 vaccine, consider referral to a specialist in infectious diseases, rheumatology, or cardiology. US healthcare providers and health departments can also request a clinical consultation from the Clinical Immunization Safety Assessment COVIDvax project (https://www.cdc.gov/vaccinesafety/ensuringsafety/monitoring/cisa/index.html).

If MIS-A or MIS-C occurs following COVID-19 vaccination, report the case to VAERS. (See EUA Requirements for Postvaccination Monitoring and Mandatory Vaccine Adverse Event Reporting under Cautions.)

Individuals with Underlying Medical Conditions

ACIP states that individuals with altered immunocompetence or certain underlying medical conditions may receive any COVID-19 vaccine approved or authorized by FDA, unless they have a contraindication to the vaccine. Current FDA-approved or FDA-authorized COVID-19 vaccines are not live vaccines, so they may be safely administered to immunocompromised individuals.

US healthcare providers and health departments can request a clinical consultation from the Clinical Immunization Safety Assessment COVIDvax project (https://www.cdc.gov/vaccinesafety/ensuringsafety/monitoring/cisa/index.html) if they have concerns about vaccinating individuals with certain underlying medical conditions.

Individuals with Altered Immunocompetence

Individuals with altered immunocompetence, including those receiving immunosuppressive therapy, may have diminished immune responses to vaccines. Counsel such individuals regarding the potential for reduced immune response to COVID-19 vaccines and the need to continue to follow public health preventive measures such as wearing a mask and social distancing.

Moderately or severely immunocompromised individuals (e.g., solid organ transplant recipients taking immunosuppressive therapy, those with solid tumor or hematologic malignancies undergoing active treatment) may have reduced immune responses following a 2-dose vaccination series with an mRNA COVID-19 vaccine compared with those who are not immunocompromised.

Administration of an additional dose of mRNA COVID-19 vaccine after the initial 2-dose vaccination series may enhance immune responses to the vaccine in some immunocompromised individuals.

ACIP recommends that individuals who are moderately or severely immunocompromised follow booster recommendations for the general population.

Individuals with Autoimmune Conditions

ACIP states that individuals with autoimmune conditions may receive any COVID-19 vaccine approved or authorized by FDA, unless they have a contraindication.

Recommendations for individuals with altered immunocompetence apply to individuals with autoimmune conditions who are immunocompromised because of drug therapy (e.g., high-dose corticosteroids, biologic agents). (See Individuals with Altered Immunocompetence under Cautions.)

Individuals with Liver Disease

American Association for the Study of Liver Diseases (AASLD) released a consensus statement regarding use of COVID-19 vaccines in individuals with chronic liver disease or a liver transplant. These experts state vaccination against COVID-19 is strongly recommended because of increased risk of morbidity and mortality in adults with chronic liver disease, especially those with cirrhosis.

AASLD also recommends that those with chronic liver disease receiving treatment with prednisone, antimetabolites, or biologic therapies and those with hepatocellular carcinoma who receive an mRNA COVID-19 vaccine should receive a third (additional) dose of the vaccine administered ≥28 days after the 2-dose primary series.

Consult AASLD consensus statement for additional guidance on use of COVID-19 vaccines in individuals with chronic liver disease.

Individuals with a History of Guillain-Barré Syndrome (GBS)

To date, GBS not reported in clinical trials evaluating mRNA COVID-19 vaccines.

ACIP states that individuals with a history of GBS may receive any COVID-19 vaccine approved or authorized by FDA, unless they have a contraindication.

If GBS occurs following COVID-19 vaccination, report the case to VAERS. (See EUA Requirements for Postvaccination Monitoring and Mandatory Vaccine Adverse Event Reporting under Cautions.)

Individuals with a History of Bell's Palsy

Although a causal relationship not established, several cases of Bell's palsy reported in COVID-19 vaccine trials.

Cases of Bell's palsy (facial paralysis) reported in the ongoing phase 3 trial evaluating the Moderna COVID-19 vaccine. FDA states that available data are insufficient to determine a causal relationship with the vaccine.

ACIP states that individuals with a history of Bell's palsy may receive COVID-19 vaccination, unless they have a contraindication.

If Bell's palsy occurs following COVID-19 vaccination, report the case to VAERS. (See EUA Requirements for Postvaccination Monitoring and Mandatory Vaccine Adverse Event Reporting under Cautions.)

Individuals with Increased Bleeding Risk

Advise individuals who have bleeding disorders or are receiving anticoagulant therapy about the risk of hematoma from IM injections.

ACIP states that IM vaccines may be given to individuals who have bleeding disorders if a clinician familiar with the patient's bleeding risk determines that the preparation can be administered IM with reasonable safety. In these cases, use a fine needle (23 gauge or smaller) to administer the vaccine and apply firm pressure to the injection site (without rubbing) for ≥2 minutes. In individuals receiving therapy for hemophilia, schedule IM vaccines for administration shortly after a dose of such therapy.

Individuals receiving anticoagulation therapy presumably have the same bleeding risk as those with clotting factor disorders and should follow the same guidelines for IM administration. If possible, schedule IM vaccines prior to use of an anticoagulant so that the patient's risk of bleeding is not increased by the drug's therapeutic action.

History of Dermal Filler Use

Administration of an mRNA COVID-19 vaccine to individuals who have received injectable dermal fillers (e.g., hyaluronic acid dermal fillers) has infrequently resulted in swelling at or near the site of dermal filler injection (usually face or lips) starting 1–2 days after vaccination.

ACIP states that individuals who have received injectable dermal fillers may receive COVID-19 vaccination, unless they have a contraindication to the vaccine. Advise such individuals to contact their healthcare provider for evaluation if they develop swelling at or near site of dermal filler injection following vaccination.

Individuals Vaccinated Outside the US

Some individuals in the US may have previously received vaccination against COVID-19 in another country using a vaccine not approved or authorized by FDA and/or not listed for emergency use by WHO. ACIP provides guidance on COVID-19 vaccination in such patients

Limitations of Vaccine Effectiveness

May not protect all vaccine recipients against COVID-19. The risk of SARS-CoV-2 infection cannot be fully eliminated in fully vaccinated individuals while there is continued widespread community transmission of COVID-19.

Use of COVID-19 vaccines for outbreak management or for postexposure prophylaxis to prevent SARS-CoV-2 infection in individuals with a specific known exposure to the virus is unlikely to be effective and is not currently recommended.

FDA-approved or FDA-authorized COVID-19 vaccines are both efficacious and effective against symptomatic SARS-CoV-2 infection, including severe forms of disease. A substantial amount of data is available that has evaluated the effectiveness of COVID-19 vaccines in real world conditions.

Based on the unknown duration of vaccine-induced protection and unknown extent of protection against emerging SARS-CoV-2 variants, counsel individuals who receive COVID-19 vaccination and are considered fully vaccinated and those who have received a third primary dose or a booster dose of the vaccine to continue to follow current CDC interim guidance to protect themselves and others. Consult the CDC website at https://www.cdc.gov/coronavirus/2019-ncov/vaccines/fully-vaccinated-guidance.html.

Duration of Immunity

Duration of protection against SARS-CoV-2 infection following completion of the 2-dose vaccination series of COVID-19 vaccine (Moderna) not fully evaluated. The immunogenicity of COVID-19 vaccines has been demonstrated through 6 to 8 months after completion of the primary vaccine series. However, waning antibody levels and reduced neutralization of variants have been documented, which has contributed to current ACIP recommendations for single booster doses.

Improper Storage and Handling

Improper storage or handling of vaccines may reduce or destroy vaccine potency resulting in inadequate or no immune response in vaccinees. Inspect all vaccines on delivery and monitor during storage to ensure that recommended storage temperatures are maintained.

The Moderna COVID-19 vaccine must be shipped, stored, and handled under specific conditions at all times, including maintaining cold chain conditions and chain of custody, according to specifications in the EUA fact sheet for healthcare providers and guidance from the manufacturer and CDC. Do not administer vaccine that has been mishandled or has not been stored at the recommended temperatures. (See Storage under Stability.)

Contact the manufacturer at 866-663-3762 for guidance if there are concerns about mishandling or defective or damaged vaccine.

EUA Requirements for Postvaccination Monitoring and Mandatory Vaccine Adverse Event Reporting

Safety and efficacy not established for uses authorized under the FDA EUA.

Some data available regarding adverse effects associated with use of the vaccine. (See Common Adverse Effects under Cautions.) Additional adverse effects, some of which may be serious, may become apparent with more widespread use.

Monitor all vaccine recipients for immediate adverse reactions according to CDC (ACIP) guidelines.

Provide vaccine recipients or their caregivers with information on, and encourage participation in, CDC's voluntary smartphone-based tool (v-safe). Information on v-safe is available at https://www.cdc.gov/vsafe.

It is mandatory that vaccination providers administering the Moderna COVID-19 vaccine report all vaccine administration errors (even if not associated with an adverse event) and serious adverse events (irrespective of attribution to vaccination) that occur following vaccination and also report all cases of multisystem inflammatory syndrome (MIS) and COVID-19 that result in hospitalization or death in vaccine recipients to VAERS. Can complete and submit VAERS reports online at https://vaers.hhs.gov/reportevent.html or by faxing to 877-721-0366. Obtain information on submitting a VAERS report by calling 800-822-7967 or emailing info@vaers.org. To the extent feasible, also provide a copy of the VAERS form to the manufacturer (Moderna) at ModernaPV@modernatx.com (email), 866-599-1342 (fax), or 866-663-3762 (phone).

Consult FDA fact sheet for healthcare providers for the Moderna COVID-19 vaccine available at the FDA website and at https://www.modernatx.com/covid19vaccine-eua for requirements and instructions regarding reporting of adverse reactions and vaccination errors.

Interpretation of SARS-CoV-2 Testing in Vaccinated Individuals

Results of SARS-CoV-2 viral tests (nucleic acid amplification or antigen tests) not affected by prior COVID-19 vaccination.

Use a test that specifically evaluates IgM/IgG to the nucleocapsid protein to assess for evidence of prior infection in an individual with a history of COVID-19 vaccination (e.g., for public health surveillance or diagnosis of MIS-C or MIS-A).

Interpretation of Tuberculosis Tests in Vaccinated Individuals

ACIP states do *not* delay COVID-19 vaccination in situations when an immune-based method of tuberculosis testing (i.e., intradermal tuberculin skin test [TST] or serum interferon gamma release assay [IGRA]) is required or indicated.

ACIP states that TST or IGRA testing can be administered without regard to timing of COVID-19 vaccination.

Specific Populations

Pregnancy

Data insufficient to date regarding use of the Moderna COVID-19 vaccine in pregnant women to inform vaccine-associated risks during pregnancy.

A developmental toxicity study in female rats did not reveal evidence of vaccine-related adverse effects on female fertility, fetal development, or postnatal development.

Available data suggest that, while the absolute risk is low, pregnant and recently pregnant women with COVID-19 are at increased risk of severe illness, including illness resulting in hospitalization, admission to an intensive care unit (ICU), mechanical ventilation, extracorporeal membrane oxygenation (ECMO), or death compared with women who are not pregnant. Pregnant and recently pregnant women with comorbidities such as obesity and diabetes mellitus

may be at even higher risk of severe COVID-19. Additionally, pregnant women with COVID-19 are at increased risk of preterm birth and may be at an increased risk of adverse pregnancy complications or outcomes, such as preeclampsia, coagulopathy, and stillbirth.

Post-authorization surveillance safety data are accumulating regarding COVID-19 vaccination during pregnancy and clinical trials evaluating safety and efficacy of COVID-19 vaccines in pregnant women are underway or planned. Early data from VAERS, v-safe active surveillance, and v-safe pregnancy registry have not identified any safety concerns in pregnant women who were vaccinated late in their pregnancy or in their infants; additional evidence has not found an increased risk for miscarriage with receipt of a mRNA vaccine before 20 weeks gestation. There is some evidence that pregnant women who receive an mRNA vaccine (Moderna COVID-19 vaccine or Pfizer-BioNTech COVID-19 vaccine) during pregnancy have immune responses comparable to those observed in nonpregnant individuals and may develop anti-SARS-CoV-2 antibody titers greater than those observed in women diagnosed with SARS-CoV-2 infection during pregnancy. The Moderna COVID-19 vaccine cannot cause SARS-CoV-2 infection in the pregnant woman or her fetus.

ACIP states vaccination against COVID-19 is recommended for pregnant women. These experts state that evidence regarding safety and efficacy of COVID-19 vaccines available from both animal and human studies indicates that benefits of vaccination against COVID-19 during pregnancy outweigh any known or potential risks. For purposes of decisions regarding administration of the primary vaccination series, ACIP states consider pregnant and recently pregnant women (up until at least 42 days following the end of pregnancy) in the same group as individuals with underlying medical conditions.

ACIP states that pregnant women are eligible for and can receive COVID-19 vaccination; based on current knowledge, COVID-19 vaccines unlikely to pose a risk to pregnant women or the fetus. ACIP does not state a preference for any specific COVID-19 vaccine in such women.

ACOG recommends that pregnant women be vaccinated against COVID-19. When recommending the COVID-19 vaccine to pregnant women, ACOG suggests that clinicians review available data on risks and benefits of vaccination, including risks of not getting vaccinated, in the context of the individual's current health status and risk of exposure (e.g., possibility for exposure at work or home) and possibility for exposing high-risk household members. In addition, take into account the individual's values and perceived risk of various outcomes; autonomous decision-making should be respected and supported.

ACIP and ACOG state that a conversation between the pregnant woman and her clinical team may assist with decisions regarding use of COVID-19 vaccines; however, such a conversation is not required and written permission is not needed prior to vaccination.

ACIP and ACOG recommend that women who become pregnant after receiving the first dose of an mRNA COVID-19 vaccination series should receive the second dose according to the usual schedule, unless contraindicated.

ACOG states do not withhold Rh_o(D) immune globulin when indicated in an individual who is planning to receive or recently received a COVID-19 vaccine. (See Specific Drugs under Interactions.)

Adverse effects similar to those reported in non-pregnant individuals can occur following COVID-19 vaccination in pregnant women. Advise pregnant women who experience fever following COVID-19 vaccination to take acetaminophen; may also offer acetaminophen as an option for pregnant women experiencing other postvaccination symptoms.

Pregnancy exposure registry established to monitor pregnancy outcomes in women exposed to the Moderna COVID-19 vaccine during pregnancy. Encourage women who are vaccinated with the Moderna COVID-19 vaccine during pregnancy to enroll in the registry by calling 866-663-3762.

Encourage women who receive a COVID-19 vaccine during pregnancy and those who become pregnant within 30 days after receiving a COVID-19 vaccine to participate in CDC's v-safe program. (See EUA Requirements for Postvaccination Monitoring and Mandatory Vaccine Adverse Event Reporting under Cautions.)

Females and Males of Reproductive Capacity

Routine pregnancy testing *not* recommended before receiving a COVID-19 vaccine.

ACIP states vaccination against COVID-19 recommended for women currently trying to become pregnant and those who might become pregnant in the future. Women trying to become pregnant do not need to avoid pregnancy after COVID-19 vaccination.

ACOG recommends vaccination for all eligible individuals, including those who may consider future pregnancy.

There is no evidence that any FDA-approved or FDA-authorized COVID-19 vaccines affect current or future fertility. FDA states there is no scientific evidence to suggest that Moderna COVID-19 vaccine could cause infertility in women. In addition, infertility not known to occur as a result of natural COVID-19 disease, further demonstrating that immune responses to the virus, whether induced by infection or a vaccine, are not a cause of infertility.

Lactation

Limited data are available to assess whether COVID-19 vaccines have any effects on the breast-fed infant or on milk production.

FDA states that breast-feeding is not a contraindication to use of the Moderna COVID-19 vaccine; breast-feeding women should discuss benefits and risks of vaccination with their healthcare providers.

ACIP states that vaccination against COVID-19 recommended for lactating women. FDA-authorized COVID-19 vaccines administered to breast-feeding women cannot cause SARS-CoV-2 infection in women or their infants; therefore, breast-feeding women can receive COVID-19 vaccination.

ACOG recommends that lactating women be vaccinated against COVID-19. ACOG also states that theoretical concerns regarding safety of vaccinating lactating women do not outweigh potential benefits of the vaccine; there is no need for individuals who receive a COVID-19 vaccine to avoid initiating breast-feeding or to discontinue breast-feeding.

Although there is some evidence that antibodies that develop following vaccination with mRNA COVID-19 vaccines are present in breast milk, additional data needed to determine if these antibodies convey protection against SARS-CoV-2 infection in breast-fed infants.

Pediatric Use

Safety and efficacy of the Moderna COVID-19 vaccine not assessed in individuals <18 years of age.

FDA EUA permits use of the Moderna COVID-19 vaccine *only* in individuals ≥18 years of age.

Geriatric Use

Individuals ≥65 years of age were included in clinical trials evaluating the Moderna COVID-19 vaccine and data from such individuals contribute to overall assessment of safety and efficacy of the vaccine.

At the time of FDA's safety and efficacy analysis of data from the ongoing phase 3 trial for the EUA, 24.8% of participants were ≥65 years of age and 4.6% were ≥75 years of age. Subgroup efficacy analysis based on age indicated that vaccine efficacy in those ≥65 years of age was 86.4% compared with 95.6% in those 18 to <65 years of age. No overall notable differences in safety profiles between participants ≥65 years of age and younger adults.

Common Adverse Effects

Local adverse effects following administration of primary vaccination series in clinical trials: Injection site pain (92%), axillary swelling/tenderness (19.8%), swelling (14.7%), erythema (10%).

Systemic adverse effects following administration of primary vaccination series in clinical trials: Fatigue (70%), headache (64.7%), myalgia (61.5%), arthralgia (46.4%), chills (45.4%), nausea/vomiting (23%), fever (15.5%).

Local and systemic adverse effects were usually reported within the first 1–2 days after a vaccine dose, had a median duration of 2–3 days, and were reported more frequently after the second dose of the 2-dose vaccination series. Use of antipyretic or pain medication within 7 days after receiving the first or second vaccine dose reported in 23.3 or 57.3%, respectively, of those 18–64 years of age and in 17.9 or 41.9%, respectively, of those ≥65 years of age.

Solid organ transplant recipients: Data indicate adverse event profile following a third dose of the Moderna COVID-19 vaccine in adult transplant recipients (heart, kidney, kidney-pancreas, liver, lung pancreas) similar to that following the second dose; no grade 3 or 4 adverse events reported.

Local adverse effects following administration of booster dose in clinical trials: Injection site pain (76.3–86%), axillary swelling/tenderness (5.3–24.8%), swelling (2.6–6.2%), and erythema (2.6–5.4%).

Systemic adverse effects following administration of booster dose in clinical trials: Fatigue (47.4–62%), headache (42.1–58.9%), myalgia (47.4–49.6%), arthralgia (39.5–41.9%), chills (18.4–40.3%), nausea/vomiting (7.9–12.4%), and fever (5.4–7.0%).

Interactions

Vaccines

Data not available to date to assess safety and immunogenicity of concomitant administration of COVID-19 vaccine (Moderna) with other vaccines.

Extensive experience with non-COVID-19 vaccines demonstrated that immunogenicity and adverse event profiles are generally similar whether vaccines are administered concomitantly or alone. However, it is not known whether reactogenicity of COVID-19 vaccines is increased when administered concomitantly with other vaccines, including those known to be more reactogenic (e.g., adjuvanted vaccines). Base decisions to administer a COVID-19 vaccine concomitantly with other vaccine(s) on whether routine immunizations with the other vaccines have been delayed or missed, the individual's risk of vaccine-preventable disease (e.g., during an outbreak or occupational exposures), and reactogenicity profiles of the vaccines.

ACIP states that COVID-19 vaccines may be administered without regard to timing of other vaccines, including simultaneous administration on the same day. If a COVID-19 vaccine is administered concomitantly with other vaccines, give each parenteral vaccine at a different injection site and, if possible, separate injection sites by ≥1 inch. ACIP states that, although >1 vaccine can be given IM into the deltoid muscle in adolescents and adults, give COVID-19 vaccines and vaccines likely to cause a local reaction in different limbs, if possible.

Specific Drugs

Drug	Interaction	Comments
Antithrombotic Agents		ACIP does not recommend taking aspirin or an

		anticoagulant before vaccination with any currently FDA-approved or FDA-authorized COVID-19 vaccination, unless they are taking these drugs as part of their routine medications.
Antiviral agents	Antiviral agents given at any interval before or after COVID-19 vaccination unlikely to impair development of vaccine-induced protective antibody responses	
COVID-19 convalescent plasma	Limited data are available; not known whether prior receipt of such antibody therapy interferes with immune response to the vaccine	To avoid potential interference with vaccine immune response, ACIP recommends deferring COVID-19 vaccination for ≥90 days after such antibody therapy if received for treatment and ≥30 days if received for post-exposure prophylaxis based on estimated half-life of SARS-CoV-2 antibody therapies and evidence suggesting reinfection uncommon in first 90 days after initial infection; however, COVID-19 vaccination not contraindicated in those who received passive antibody therapy within the past 90 days and COVID-19 vaccine doses received <90 days after receipt of passive antibody therapy do not need to be repeated If COVID-19 subsequently develops in a vaccinated individual, ACIP states prior receipt of COVID-19 vaccine should not affect treatment decisions, including use of SARS-CoV-2 antibody therapies, or timing of such treatment
Immune globulin and antibody therapies *not* specific for SARS-CoV-2 (e.g., immune globulin IV [IGIV], Rh_o[D] immune globulin)		May give COVID-19 vaccine concurrently with or at any interval before or after immune globulin or antibody therapies *not* specific for SARS-CoV-2; ACIP states there is no recommended minimum interval between receipt of antibody therapies not specific for SARS-CoV-2 and COVID-19 vaccination
Immunosuppressive agents (e.g., cancer chemotherapy, corticosteroids, radiation)	Possible decreased or suboptimal antibody responses to vaccines, including the Moderna COVID-19 vaccine Data insufficient to date to inform optimal timing of COVID-19 vaccination for individuals planning to receive immunosuppressive therapies	ACIP states that individuals receiving immunosuppressive therapy may receive COVID-19 vaccination if they have no contraindications to the vaccine Based on general best practices for vaccination of immunocompromised individuals, ACIP states COVID-19 vaccination should ideally be completed ≥2 weeks before initiation or resumption of immunosuppressive therapies, whenever possible; consider individual's risks related to their underlying condition and response to the vaccine if making decisions to delay immunosuppressive therapy to complete COVID-19 vaccination Revaccination with a primary vaccine series at least 3 months (12 weeks) after hematopoietic stem cell transplantation or CAR-T-cell therapy in individuals who previously received doses of COVID-19 vaccine prior to these treatments is recommended; an additional primary dose is recommended if the individual was revaccinated with an mRNA COVID-19 vaccine and continues to have moderate or severe immune compromise Corticosteroids given topically or by local injection (e.g., intra-articular, intrabursal, or tendon injection): COVID-19 vaccines may be administered without regard to timing of corticosteroid administration If COVID-19 subsequently develops in a vaccinated individual, ACIP states prior receipt of COVID-19 vaccine should not affect treatment decisions, including use of corticosteroids, or timing of such treatment
SARS-CoV-2-specific monoclonal antibodies (bamlanivimab and etesevimab, casirivimab and	Data not available; not known whether prior receipt of such antibody therapy interferes with	To avoid potential interference with vaccine immune response, ACIP recommends deferring

imdevimab, sotrovimab)	immune response to the vaccine	COVID-19 vaccination for ≥90 days after such antibody therapy if received for treatment and ≥30 days if received for post-exposure prophylaxis based on estimated half-life of SARS-CoV-2 antibody therapies and evidence suggesting reinfection uncommon in first 90 days after initial infection; however, COVID-19 vaccination not contraindicated in those who received passive antibody therapy within the past 90 days and COVID-19 vaccine doses received <90 days after receipt of passive antibody therapy do not need to be repeated If COVID-19 subsequently develops in a vaccinated individual, ACIP states prior receipt of COVID-19 vaccine should not affect treatment decisions, including use of SARS-CoV-2 antibody therapies, or timing of such treatment

Stability

Storage

Parenteral

Suspension, for IM Use

Supplied as a frozen suspension in multiple-dose vials that *must* be shipped and stored (long-term) at a temperature between -50 to -15°C.

Do *not* store the Moderna COVID-19 vaccine on dry ice or at temperatures less than -50°C.

If transport at -50 to -15°C not feasible, available data support transport of one or more thawed multiple-dose vials for up to 12 hours at 2–8°C when shipped using shipping containers that are qualified to maintain a temperature of 2–8°C and if such transport occurs under routine road and air transportation conditions with minimal shaking and vibration. Vials transported at 2–8°C should not be refrozen and should be stored at 2–8°C until use.

Store multiple-dose vials of the vaccine in the original carton to protect from light. Thawed vials may be handled in room light conditions.

Consult EUA fact sheet for healthcare providers for the Moderna COVID-19 vaccine and information provided by CDC and the manufacturer for information on storage, handling, and stability of the vaccine. Storage and handling information contained in the EUA fact sheet for healthcare providers supersedes storage and handling information on vaccine vials and carton labels. Various documents and videos describing shipping, storage, and handling requirements and procedures are available at the manufacturer's website at https://www.modernatx.com/covid19vaccine-eua/providers/storage-handling.

Prior to first use, may thaw and store multiple-dose vials of the Moderna COVID-19 vaccine in a refrigerator (2–8°C) for up to 30 days. May store unused (i.e., unpunctured) vials for up to 24 hours at 8–25°C.

After withdrawing first dose of vaccine from the multiple-dose vial, vial should be held between 2–25°C and *must* be discarded if not used within 12 hours after first vial entry.

Once thawed, do *not* refreeze.

Expiration dates are not marked on vials and cartons of the Moderna COVID-19 vaccine. Scan the QR code on the vial or carton to reach an online resource that provides the expiration date based on the lot number printed on the packaging. Alternatively, obtain expiration dates by entering the lot number at the manufacturer's website at https://www.modernatx.com/covid19vaccine-eua/providers/vial-lookup. Because it is possible that expiration dates may be extended as more stability data become available, contact the manufacturer prior to discarding vaccine to determine if the expiration date has been extended.

Actions

- Nucleoside-modified mRNA vaccine formulated in lipid nanoparticles (LNPs).
- The mRNA contained in the Moderna COVID-19 vaccine encodes a full-length spike (S) glycoprotein of SARS-CoV-2 stabilized in a prefusion conformation with 2 proline substitutions (S-2P). Following IM injection, the LNPs in the vaccine enable delivery of the mRNA into host cells where it is released and translated to the encoded S antigen of SARS-CoV-2. The S antigen elicits an immune response to provide protection against SARS-CoV-2.
- Data from clinical trials in healthy adults indicate dose-dependent antibody responses to a 2-dose regimen of the Moderna COVID-19 vaccine, with antibody responses boosted after the second dose. The vaccine induces both binding and neutralizing antibodies at levels comparable to or higher than those reported in convalescent serum obtained from individuals who have recovered from COVID-19; antibody responses in adults ≥56 years of age are similar to those reported in adults 18–55 years of age. The vaccine also directly activates T-cells, which eliminate infected cells and support B-cell responses; the T-cell response is predominantly type 1 helper (Th1).
- COVID-19 vaccine (Moderna) available for use under the FDA EUA is provided as a frozen suspension in multiple-dose vials. Following thawing as directed by the manufacturer, each 0.5-mL dose of the Moderna COVID-19 vaccine contains 100 mcg of mRNA encoding the S glycoprotein of SARS-CoV-2. Each dose also contains 4 different lipids (SM-102, PEG 2000 dimyristoyl glycerol [DMG], cholesterol, and 1,2-distearoyl-sn-glycero-3-phosphocholine [DSPC]), tromethamine, tromethamine hydrochloride, acetic acid, sodium acetate, and sucrose. Each 0.25 mL dose of COVID-19 vaccine (Moderna) contains half of these ingredients.
- Does not contain preservatives; vial stoppers are not made with natural rubber latex.

Advice to Patients

- Prior to administration of COVID-19 vaccine (Moderna), provide the vaccine recipient or their caregiver with information consistent with the Fact Sheet for Recipients and Caregivers: Emergency Use Authorization (EUA) of the Moderna COVID-19 Vaccine to Prevent Coronavirus Disease 2019 (COVID-19) in Individuals 18 Years of Age or Older and given a copy of the fact sheet or directed to the manufacturer's website at https://www.modernatx.com/covid19vaccine-eua to obtain the fact sheet.
- At the time that the first dose of the Moderna COVID-19 vaccine is administered, inform the vaccine recipient or their caregiver that the vaccine is administered in a series of 2 doses given 1 month (28 days) apart and advise them of the importance of receiving the second dose of the 2-dose vaccination series to optimize protection against COVID-19. Give the vaccine recipient or their caregiver a vaccination card that provides the date when the recipient needs to return for the second vaccine dose and inform them of the importance of bringing the card when they return for the second dose.
- Inform individuals who are immunocompromised that they should receive a third dose of the Moderna COVID-19 vaccine at least 1 month (28 days) after the second dose. Advise such individuals that the third dose may still not provide full immunity to COVID-19 and they should continue to follow preventative measures (e.g., wearing a mask, physically distancing).
- Provide the vaccine recipient or their caregiver with information on, and encourage participation in, CDC's voluntary smartphone-based tool (v-safe) that uses text messaging and web surveys to check in with individuals who have received a COVID-19 vaccine to identify potential adverse effects; live telephone follow-up is provided if a medically important health impact is reported. Information on v-safe is available at https://www.cdc.gov/vsafe.
- Inform vaccine recipients or their caregivers that FDA authorized the emergency use of the Moderna COVID-19 vaccine, which is an investigational vaccine that has not received FDA approval, for use in individuals ≥18 years of age. Advise them that clinical trials have shown that a 2-dose series of the vaccine can prevent COVID-19; however, the duration of protection following vaccination is unknown and the vaccine may not protect everyone who receives it.
- Provide vaccine recipients or their caregivers with information on available alternative vaccines and the risks and benefits of those alternatives.
- Inform vaccine recipients or their caregivers about the significant known and potential risks and benefits of the Moderna COVID-19 vaccine, and the extent to which such risks and benefits are unknown. Inform them that local adverse effects (injection site pain, swelling, redness; tenderness and swelling of lymph nodes in the injected arm) and systemic adverse effects (fatigue, headache, muscle pain, joint pain, chills, nausea and vomiting, fever) have been reported in recipients of the Moderna COVID-19 vaccine.
- Inform vaccine recipients or their caregivers that myocarditis (inflammation of the heart muscle) and pericarditis (inflammation of the lining outside the heart) have been reported rarely in some recipients of the Moderna COVID-19 vaccine with symptom onset usually within a few days after the second vaccine dose. Importance of immediately seeking medical attention if chest pain, shortness of breath, or fast-beating, fluttering, or pounding heart occurs.

- Importance of vaccine recipient informing the vaccination provider of any allergies or fever. Advise vaccine recipients or their caregivers that there is a remote chance that the vaccine could cause a severe allergic reaction and such reactions would usually occur within a few minutes to 1 hour after receiving a dose of the vaccine and may include difficulty breathing, swelling of the face and throat, fast heartbeat, bad rash all over the body, and dizziness and weakness.
- Importance of vaccine recipient informing the vaccination provider if they have had a severe allergic reaction to any ingredient in the vaccine (e.g., PEG) or if they had a severe allergic reaction after receiving the first dose of the 2-dose vaccination series; importance of such individuals *not* receiving the vaccine. (See Contraindications under Cautions.)
- Importance of vaccine recipient informing vaccination provider if they previously received any other COVID-19 vaccine, have any medical conditions (e.g., bleeding disorders, myocarditis or pericarditis, immunocompromising diseases), or are receiving anticoagulants or immunosuppressive therapy.
- Importance of women informing clinicians if they are or plan to become pregnant or plan to breast-feed.

Preparations

Excipients in commercially available drug preparations may have clinically important effects in some individuals; consult specific product labeling for details.

COVID-19 vaccine (Moderna) is not commercially available. FDA issued an emergency use authorization (EUA) for the Moderna COVID-19 vaccine that permits use of the vaccine as a 2-dose primary vaccination series in adults ≥18 years of age†, as a third primary dose† in certain immunocompromised adults, and as a single booster dose† after completion of the primary vaccination series with the same vaccine or another FDA-approved or FDA-authorized COVID-19 vaccine as specified in the EUA. Allocation of the vaccine for use under the EUA is being directed by the US government. The vaccine will be supplied directly from the manufacturer or authorized US distributor(s) and distributed to emergency response stakeholders as directed by the US government, including the CDC and/or other designee.

COVID-19 Vaccine, mRNA (Moderna)

Parenteral

Suspension, for IM use

100 mcg (of mRNA) per 0.5-mL dose	**Moderna COVID-19 Vaccine**, ModernaTX

† Use is not currently included in the labeling approved by the US Food and Drug Administration.