

COVID-19 Vaccine, mRNA (Moderna)

80:12 • Vaccines (AHFS primary)

Special Alerts:

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>.

The American Society of Health-System Pharmacists, Inc. represents that the information provided in the accompanying monograph was formulated with a reasonable standard of care, and in conformity with professional standards in the field. Readers are cautioned that COVID-19 Vaccine (Moderna) is not an approved vaccine for prevention of coronavirus disease 2019 (COVID-19) caused by SARS-CoV-2, but rather, is being investigated for and is currently available under an FDA emergency use authorization (EUA) for active immunization to prevent COVID-19 in individuals 18 years of age or older. The American Society of Health-System Pharmacists, Inc. makes no representations or warranties, express or implied, including, but not limited to, any implied warranty of merchantability and/or fitness for a particular purpose, with respect to the information contained in the accompanying monograph, and specifically disclaims all such warranties. Readers of this information are advised that ASHP is not responsible for the continued currency of the information, for any errors or omissions, and/or for any consequences arising from the use of the information contained in the monograph in any and all practice settings. Readers are advised that decisions regarding use of drugs are complex medical decisions requiring the independent, informed decision of an appropriate health care professional, and that the information contained in the monograph is provided for informational purposes only. The entire monograph for a drug should be reviewed for a thorough understanding of the drug's actions, uses and side effects. The American Society of Health-System Pharmacists, Inc. does not endorse or recommend the use of any drug. The information contained in the monograph is not a substitute for medical care.

■ COVID-19 vaccine (Moderna) is a nucleoside-modified mRNA vaccine used to stimulate active immunity to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

Uses

■ Prevention of Coronavirus Disease 2019 (COVID-19)

COVID-19 vaccine (Moderna) is an mRNA vaccine being investigated and used for the prevention of coronavirus disease 2019† (COVID-19) caused by SARS-CoV-2.

Although efficacy and safety of COVID-19 vaccine (Moderna) have not been definitely established, the vaccine is available under an FDA emergency use authorization (EUA) for active immunization to prevent COVID-19 in individuals 18 years of age or older.

The US Centers for Disease Control and Prevention (CDC) Advisory Committee on Immunization Practices (ACIP) issued interim recommendations for use of the Moderna COVID-19 vaccine for prevention of COVID-19 in individuals 18 years of age or older.

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). ACIP does not state a preference for any specific COVID-19 vaccine approved or authorized by FDA when the vaccines are used within the scope of their respective biologics license application (BLA) or EUA and states that individuals should be encouraged to receive the earliest vaccine available to them. However, the Moderna COVID-19 vaccines is *not* interchangeable with other COVID-19 vaccines, including the Pfizer-BioNTech COVID-19 vaccine or the Janssen COVID-19 vaccine. (See Dosage under Dosage and Administration.)

Emergency Use Authorization

On December 18, 2020, FDA issued the initial EUA for COVID-19 vaccine (Moderna) that permitted use of a 2-dose series of the vaccine to prevent COVID-19 in individuals 18 years of age or older. On August 12, 2021, FDA reissued the EUA to authorize administration of a third dose of the Moderna COVID-19

vaccine in individuals 18 years of age or older who are solid organ transplant recipients or diagnosed with conditions considered to have an equivalent level of immunocompromise.

The EUA requires that the vaccine be administered by vaccination providers as described in the EUA (see Dosage under Dosage and Administration) and that vaccination providers participate and comply with the terms and training required by CDC's COVID-19 vaccination program, including monitoring and complying with CDC and/or emergency response stakeholder vaccine management requirements (e.g., requirements concerning obtaining, tracking, and handling vaccine) and requirements concerning reporting of vaccine administration data to CDC and state/local jurisdiction's Immunization Information System (IIS) or other designated systems.

FDA issued the EUA for COVID-19 vaccine (Moderna) after concluding that emergency use of the vaccine for the prevention of COVID-19 met the criteria for issuance of an EUA for the following reasons: SARS-CoV-2 can cause a serious or life-threatening disease or condition, including severe respiratory illness; based on the totality of scientific evidence available to FDA, it is reasonable to believe that the Moderna COVID-19 vaccine may be effective in preventing COVID-19 and, when used under the conditions described in the authorization, the known and potential benefits outweigh the known and potential risks; and there are no adequate, approved, and available alternatives to the emergency use of the vaccine to prevent COVID-19.

Initial issuance of the EUA for COVID-19 vaccine (Moderna) was based on FDA review of safety and efficacy data from an ongoing phase 3 clinical trial that included approximately 30,000 adults randomized 1:1 to receive the vaccine or saline placebo. FDA authorization of a third dose of COVID-19 vaccine (Moderna) in individuals 18 years of age or older who are solid organ transplant recipients or diagnosed with conditions considered to have an equivalent level of immunocompromise was based on a review of safety and efficacy data from a double-blind, randomized, placebo-controlled study that included 60 solid organ transplant recipients who received a 3-dose regimen of COVID-19 vaccine (Moderna) and safety and efficacy data from a single-arm study that included 99 solid organ transplant recipients who received a third dose of a different mRNA vaccine (COVID-19 vaccine [Pfizer-BioNTech]) approximately 2 months after the second dose of that vaccine. (See Clinical Experience under Uses.)

The EUA for the Moderna COVID-19 vaccine authorizes that distribution of the vaccine will be controlled by the US government for use consistent with the terms and conditions of the EUA. (See Restricted Distribution under Preparations.)

To mitigate the risks of the vaccine, the EUA requires that vaccination providers administering the Moderna COVID-19 vaccine comply with certain mandatory requirements. These requirements include providing the recipient or caregiver with information consistent with the EUA fact sheet for recipients and caregivers and ensuring that all vaccination administration errors and all serious adverse events potentially attributable to the vaccine are reported as specified in the EUA fact sheet for healthcare providers. (See EUA Requirements for Postvaccination Monitoring and Mandatory Vaccine Adverse Event Reporting under Cautions.)

For additional information, the Moderna COVID-19 vaccine EUA letter of authorization (<https://www.fda.gov/media/144636/download>), 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>) should be consulted.

Clinical Experience

Adults.

Efficacy and safety of COVID-19 vaccine (Moderna) for the prevention of COVID-19 are being evaluated in an ongoing multicenter, randomized, double-blind, placebo-controlled, phase 3 clinical trial in adults 18 years of age or older with no known history of SARS-CoV-2 infection (NCT04470427; mRNA-1273-P301; COVE study). At the time of FDA's efficacy review of the vaccine for the EUA, the efficacy analysis population had been followed for a median of 9 weeks after the second dose and data indicated that the Moderna COVID-19 vaccine was 94.1% effective in preventing symptomatic, laboratory-confirmed COVID-19 occurring at least 14 days after the second dose of the 2-dose vaccination series compared with placebo.

The phase 3 trial enrolled adults 18 years of age or older who were randomized 1:1 to receive 2 IM doses given 28 days apart of the Moderna COVID-19 vaccine (100 mcg for each dose) or normal saline placebo, and randomization was stratified by age and risk criteria into 3 groups (18 to less than 65 years of age without comorbidities [not at risk for progression to severe COVID-19], 18 to less than 65 years of age with comorbidities [at risk for progression to severe COVID-19], 65 years of age and older with or without comorbidities). The study allowed for inclusion of participants with stable preexisting medical conditions, defined as disease not requiring significant change in therapy or hospitalization for worsening disease during the 3 months before enrollment, as well as participants with stable human immunodeficiency virus (HIV) infection; immunocompromised individuals and those with a known history of SARS-CoV-2 infection were excluded. The primary efficacy end point is efficacy of the vaccine in preventing laboratory-confirmed, symptomatic COVID-19 (as defined in the protocol) with onset at least 14 days after the second dose in participants with negative SARS-CoV-2 status at baseline. Among the 28,207 per-protocol participants

included in the primary efficacy analysis (14,134 in the vaccine group and 14,073 in the placebo group), there were 11 cases of symptomatic COVID-19 with onset at least 14 days after the second dose among vaccine recipients and 185 cases among placebo recipients; this corresponds to 94.1% vaccine efficacy.

Additional primary efficacy analyses indicated that vaccine efficacy generally was consistent across subgroups defined by age, sex, race, ethnicity, and risk for severe disease. Vaccine efficacy in participants 65 years of age or older was 86.4% compared (See Geriatric Use under Cautions.) with 95.6% in younger adults.

Per the phase 3 study protocol, secondary efficacy end points include prevention of severe COVID-19, asymptomatic COVID-19, death due to COVID-19, and COVID-19 occurring at least 14 days after the first dose. At the time of FDA's efficacy review for the EUA, there were a total of 30 cases of severe COVID-19 (as defined in the protocol) reported at least 14 days after the second dose (9 required hospitalization, 1 fatality) in the per-protocol participants and these severe cases all occurred in the placebo group, suggesting benefit of the vaccine in preventing severe COVID-19. Data were insufficient to assess other secondary end points. (See Limitations of Vaccine Effectiveness under Cautions.)

Immunocompromised Adults.

Efficacy and safety of administration of a third dose of the Moderna COVID-19 vaccine were evaluated in a double-blind, randomized, placebo-controlled trial that included 120 solid organ transplant recipients (NCT04885907). Individuals included in the study were adults who had previously received various solid organ transplants (heart, kidney, kidney-pancreas, liver, lung, pancreas), had a functioning graft, had no history of COVID-19, and previously had received a 2-dose vaccination series of the Moderna COVID-19 vaccine administered at the recommended interval; exclusion criteria included treatment with immune globulin IV (IGIV) in the previous 4 weeks, treatment with rituximab in the previous 6 months, and treatment for acute rejection in the previous 30 days. Patients were randomized 1:1 to receive a third dose of the Moderna COVID-19 vaccine or saline placebo approximately 2 months after the second vaccine dose (60 transplant recipients in each group). At baseline (i.e., prior to the third vaccine dose), immunosuppressive therapy, the degree of immunosuppression, existing levels of anti-SARS-CoV-2 antibodies, and other patient characteristics were similar between both groups (median age was 66.6 years, median time from transplantation to the third vaccine dose was 3.16 years); immunosuppressive therapy included prednisone (77%), calcineurin inhibitors (98%), mycophenolate (75%), azathioprine (10%), and sirolimus (9%). The primary outcome was the percentage of patients with anti-SARS-CoV-2 antibodies at 4 weeks indicating a significant immune response (defined as titer of antibody against the spike protein receptor-binding domain [RBD] of 100 units/mL or greater). Results indicated that anti-RBD antibody levels at 4 weeks after the third vaccine dose were 100 units/mL or greater in 55% of those who received a third dose of the Moderna COVID-19 vaccine compared with 17.5% of those who received placebo. The trial had short follow-up and lacked sufficient power to detect differences in clinical outcomes following the third vaccine dose in solid organ transplant recipients.

Dosage and Administration

■ General

Appropriate medications and supplies used to assess and manage immediate allergic reactions *must* be immediately available in the event that an acute anaphylactic reaction occurs following administration of COVID-19 vaccines, including COVID-19 vaccine (Moderna). 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.)

Prior to administration of each dose of the Moderna COVID-19 vaccine, all individuals should be screened for contraindications and precautions to vaccination. Those with a contraindication should not receive the Moderna COVID-19 vaccine. (See Contraindications and see Warnings/Precautions under Cautions.)

All individuals who receive a COVID-19 vaccine should be monitored for immediate adverse reactions according to CDC (ACIP) guidelines. When individuals with no contraindications to vaccination with an mRNA COVID-19 vaccine receive the Moderna COVID-19 vaccine, ACIP states that those with a history of an immediate allergic reaction of any severity to any other vaccine or injectable therapy and those with a history of anaphylaxis due to any cause not considered a contraindication should be observed for 30 minutes after receiving the vaccine, and that 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., vaccinee develops pruritus and swelling confined to the injection site during their observation period). Vaccine recipients should be instructed 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. (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. Appropriate measures should be taken to decrease the risk of injury if a patient becomes weak or dizzy or loses consciousness (e.g., vaccinees should sit or lie down during and for 15 minutes after vaccination). If syncope occurs, the patient should be observed until symptoms resolve.

COVID-19 vaccine (Moderna) is administered in a series of 2 doses given 1 month (28 days) apart. (See Dosage under Dosage and Administration.) At the time that the first dose of the Moderna COVID-19 vaccine is administered, vaccine recipients or their caregivers should be given a vaccination record card that provides the date when the recipient needs to return for additional vaccine dose(s) and counseled on the importance of completing the 2-dose primary vaccination series to optimize protection against COVID-19.

Vaccine recipients or their caregivers should be provided with information on, and encouraged to participate in, 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. (See EUA Requirements for Postvaccination Monitoring and Mandatory Vaccine Adverse Event Reporting under Cautions.)

Prior to vaccination, vaccine recipients or their caregivers should be counseled about local and systemic adverse effects that may occur following vaccination. (See Cautions and see Advice to Patients.) Unless an individual has a contraindication to vaccination with an mRNA COVID-19 vaccine (see Contraindications under Cautions), ACIP recommends that vaccinees 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.

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.)

Individuals who receive COVID-19 vaccine (Moderna) and are considered partially or fully vaccinated against COVID-19 (see Dosage under Dosage and Administration) and those who have received a third primary dose of the vaccine should follow current CDC guidance to protect themselves and others. For fully vaccinated individuals, this may include wearing a mask in certain settings with substantial or high levels of viral transmission; following application federal, state, local, tribal, or territorial laws, rules, and regulations; and following CDC travel guidance and any applicable local business or workplace guidance. (See Limitations of Vaccine Effectiveness under Cautions.)

■ Administration

COVID-19 vaccine (Moderna) is administered *only* by IM injection into the deltoid.

Although data are not available regarding safety and immunogenicity of concomitant administration of the Moderna COVID-19 vaccine with other vaccine, ACIP states that COVID-19 vaccines may be administered without regard to timing of other vaccines. (See Vaccines under Drug Interactions.)

IM Injection

COVID-19 vaccine (Moderna) is supplied as a frozen suspension in multiple-dose vials.

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

Prior to use, the appropriate number of vials of frozen COVID-19 vaccine (Moderna) should be removed from the freezer and thawed either in a refrigerator (2–8°C) or at room temperature (15–25°C). If thawed under refrigeration, vials should be allowed to stand at room temperature for 15 minutes before use.

The Moderna COVID-19 vaccine should not be diluted.

Thawed, unused vials (i.e., unpunctured) may be stored for up to 24 hours at 8–25°C.

After the first dose of Moderna COVID-19 vaccine is withdrawn from the multiple-dose vial, the vial should be held between 2–25°C and *must* be discarded if not used within 12 hours after first vial entry. The date and time of first use should be recorded on the vial label.

Vials of vaccine should be swirled gently after thawing and between withdrawal of each dose and should *not* be shaken.

To administer a dose of the thawed Moderna COVID-19 vaccine, 0.5 mL of the vaccine should be withdrawn from the vial using aseptic technique and an appropriate syringe and needle and administered immediately.

Moderna COVID-19 vaccine is supplied in 2 different multiple-dose vial presentations. There are multiple-dose vials containing a maximum of eleven 0.5-mL doses (range: 10–11 doses) and multiple-dose vials containing a maximum of fifteen

0.5-mL doses (range: 13–15 doses). Depending on the type of syringes and needles used to withdraw doses from the multiple-dose vials, it may not be possible to extract more than 10 or more than 13 doses, respectively, from these vials. Each dose *must* contain 0.5 mL of the vaccine.

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 dose should be discarded and should *not* be pooled with vaccine from other vials to create a dose.

Thawing.

Thawing in a refrigerator (2–8°C): Multiple-dose vials of frozen Moderna COVID-19 vaccine containing 11 or 15 doses should be thawed for 2.5 or 3 hours, respectively, in a refrigerator. Unopened vials of the vaccine may be stored in a refrigerator (2–8°C) for up to 30 days prior to first use.

Thawing at room temperature (15–25°C): Multiple-dose vials of frozen Moderna COVID-19 vaccine containing 11 or 15 doses may be allowed to sit at room temperature for 1 or 1.5 hours, respectively, to thaw. Unopened vials of the vaccine may be stored for up to 24 hours at 8–25°C.

Thawed COVID-19 vaccine (Moderna) should appear as a white to off-white suspension and may contain white or translucent product-related particles. The thawed vaccine should *not* be used if it is discolored or contains other particles.

Vaccine that has been thawed *must* not be refrozen.

■ Dosage

COVID-19 vaccine (Moderna) is administered in a primary vaccination series of two 0.5-mL doses given 1 month (28 days) apart in adults 18 years of age or older†. Immunocompromised individuals (i.e., solid organ transplant recipients or those diagnosed with conditions considered to have an equivalent level of immunocompromise) may receive a third 0.5-mL primary dose‡ of the Moderna COVID-19 vaccine administered at least 28 days after the second dose.

Each 0.5-mL dose contains 100 mcg of mRNA (see Description).

A 2-dose regimen of 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 (i.e., a 2-dose regimen of an mRNA vaccine [Moderna COVID-19 vaccine or Pfizer-BioNTech COVID-19 vaccine] or a single dose of Janssen COVID-19 vaccine).

Individuals are considered fully vaccinated against COVID-19 at least 2 weeks after receiving a 2-dose vaccination series of an mRNA vaccine (Moderna COVID-19 vaccine or Pfizer-BioNTech COVID-19 vaccine) or at least 2 weeks after receiving a single dose of the Janssen COVID-19 vaccine. For public health purposes, ACIP states that administration of a third (additional) primary dose of an mRNA COVID-19 vaccine in individuals with moderate to severe immunocompromise or administration of a booster dose after the primary vaccination series is *not* required to be considered fully vaccinated. Those who have a contraindication to vaccination or who otherwise cannot complete a vaccination series are not considered fully vaccinated.

Clinicians should ensure that individuals who receive the first dose of the Moderna COVID-19 vaccine receive a second dose of the same vaccine at the recommended interval to complete the primary vaccination series.

The EUA that permits use of COVID-19 vaccine (Moderna) specifies an interval of 1 month (28 days) between the first and second vaccine doses. ACIP states that individuals should be scheduled to receive the second dose of the vaccine as close to the recommended day as possible, but not earlier than 1 month after the first dose; however, individuals who receive a second dose administered up to 4 days before or at any time after the recommended date can be considered fully vaccinated.

COVID-19 vaccine (Moderna) is *not* interchangeable with COVID-19 vaccine (Pfizer-BioNTech) or any other COVID-19 vaccine.

Safety and efficacy of a mixed vaccination series of mRNA COVID-19 vaccines have not been evaluated, and individuals who receive a dose of the Moderna COVID-19 vaccine should complete the series using the same vaccine. Every effort should be made to determine which mRNA COVID-19 vaccine was used for the first dose to ensure completion of the vaccination series using the same vaccine. ACIP states that in *exceptional* situations when the mRNA COVID-19 vaccine used for the first dose cannot be determined or is no longer available, any available FDA-approved or FDA-authorized mRNA COVID-19 vaccine may be administered using a minimum interval of 28 days between doses to complete the mRNA COVID-19 vaccination series. In situations where the same mRNA vaccine is temporarily unavailable, ACIP states that it is preferable to delay the second dose to allow completion of the vaccination series using the same mRNA COVID-19 vaccine rather than administering a mixed vaccination series composed of 2 different mRNA COVID-19 vaccines. If 2 doses of *different* mRNA COVID-19 vaccines are administered in such situations (or inadvertently), ACIP states that such individuals are considered fully vaccinated against COVID-19 at least 2 weeks after receipt of the second dose of mRNA vaccine.

Safety and efficacy regarding use of the viral-vectored vaccine (Janssen COVID-19 vaccine) after a dose of an mRNA COVID-19 vaccine have not been established. However, 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), a single dose of the Janssen COVID-19 vaccine administered at least 28 days after the first dose of mRNA COVID-19 vaccine may

be considered. (See Hypersensitivity Reactions under Cautions.) An individual who receives a dose of an mRNA COVID-19 vaccine followed by a single dose of the Janssen COVID-19 vaccine under such exceptional circumstances should be considered to have received complete single-dose vaccination with Janssen COVID-19 vaccine (not a mixed vaccination series) and is considered fully vaccinated against COVID-19 if at least 2 weeks have elapsed since the single dose of Janssen COVID-19 vaccine.

All vaccine administration errors and deviations from the currently recommended dosage and vaccination schedule should be reported to the vaccinee and the Vaccine Adverse Event Reporting System (VAERS). (See EUA Requirements for Postvaccination Monitoring and Mandatory Vaccine Adverse Event Reporting under Cautions.) Information on how to prevent and report COVID-19 vaccine administration errors and recommendations for specific actions to take if an administration error or deviation from the recommended vaccination schedule occurs are available at the CDC website at <https://www.cdc.gov/vaccines/covid-19/info-by-product/clinical-considerations.html>.

Adult Dosage

Primary Vaccination Series.

The FDA EUA that permits use of COVID-19 vaccine (Moderna) for the prevention of COVID-19† (see Emergency Use Authorization under Uses) states that adults 18 years of age or older should receive two 0.5-mL doses of the vaccine administered 1 month (28 days) apart.

The FDA EUA permits administration of a third primary dose of 0.5-mL of the Moderna COVID-19 vaccine at least 28 days after the second dose in adults who are solid organ transplant recipients or diagnosed with conditions considered to have an equivalent level of immunocompromise. (See Individuals with Altered Immunocompetence under Cautions.)

Cautions

■ Contraindications

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

ACIP considers the following to be contraindications to vaccination with *both* mRNA COVID-19 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]).
- Immediate allergic reaction of any severity after a previous dose of an mRNA COVID-19 vaccine or known (diagnosed) allergy to a component of the vaccine (e.g., PEG).

■ Warnings/Precautions

Sensitivity Reactions

Hypersensitivity Reactions.

At the time that FDA's safety and efficacy analysis of data from the ongoing randomized, double-blind, placebo-controlled, phase 3 trial evaluating COVID-19 vaccine (Moderna) was performed for the EUA, hypersensitivity reactions had been reported in 1.5% of vaccine recipients and 1.1% of placebo recipients, but there were no reports of anaphylactic or severe hypersensitivity reactions with close temporal relation to the vaccine. Hypersensitivity events reported in the vaccine group that were likely related to vaccination included injection site rash and injection site urticaria. The trial excluded participants with known or suspected history of allergic reaction to components of the Moderna COVID-19 vaccine, but did not exclude participants with other allergies.

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

Following issuance of the FDA EUA for the **Pfizer-BioNTech COVID-19 vaccine**, safety monitoring data identified 21 cases of anaphylaxis among 1,893,360 individuals in the US who received the first dose of the vaccine (11.1 cases per million vaccine doses administered); this included 17 cases in individuals with a documented history of allergies or allergic reactions to drugs or medical products, foods, or insect stings (7 with a history of anaphylaxis, including one after receipt of a dose of rabies vaccine and another after receipt of influenza vaccine). The median interval from receipt of the vaccine dose to onset of anaphylaxis symptoms was 13 minutes (range: 2–150 minutes); 15 of the 21 individuals with anaphylaxis (71%) had onset of symptoms within 15 minutes after receiving the dose and 19 (90%) were treated with epinephrine. No fatalities from anaphylaxis were reported; 17 individuals were treated in an emergency department and the other 4 were hospitalized (including 3 in an intensive care unit).

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); this included 9 cases in individuals with a documented history

of allergies or allergic reactions to drugs, contrast media, or food (5 with a history of anaphylaxis). The median interval from receipt of the vaccine dose to onset of symptoms was 7.5 minutes (range: 1–45 minutes); 9 of the 10 individuals had onset within 15 minutes and one had onset after 30 minutes. All 10 individuals were treated with epinephrine. No fatalities from anaphylaxis were reported; 4 individuals were treated in an emergency department and the other 6 were hospitalized (including 5 in an intensive care unit).

From December 21, 2020 to January 10, 2021, safety monitoring data for individuals who received the first dose of the Moderna COVID-19 vaccine identified 43 cases of nonanaphylactic allergic reactions; 26 of these cases (60%) were classified as nonserious. Commonly reported symptoms included pruritus, rash, itchy sensations in the mouth and throat, sensations of throat closure, and respiratory symptoms. The median interval from receipt of the vaccine dose to onset of symptoms was 15 minutes (range: less than 1 minute to 24 hours); in 30 cases (73%), onset of symptoms occurred within 30 minutes.

Delayed-onset local reactions (e.g., erythema, induration, pruritus, tenderness) around the injection site area have been reported in some vaccine recipients, including some clinical trial participants, after the first dose of an mRNA COVID-19 vaccine, including the Moderna COVID-19 vaccine. These local reactions may begin from a few days through the second week after the first dose and may be quite large. In some reported cases, such delayed-onset local reactions after the first vaccine dose resolved in a median of 6 days (range: 2–11 days), and some individuals had similar (but less severe) local reactions after the second dose of the vaccine. ACIP states that a 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 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, the case should be reported to VAERS. (See EUA Requirements for Postvaccination Monitoring and Mandatory Vaccine Adverse Event Reporting under Cautions.)

Because anaphylactic reactions have been reported rarely following administration of COVID-19 vaccines, ACIP has issued interim guidance with contraindications and precautions for use of COVID-19 vaccines pending further investigation. For the purposes of this interim guidance, ACIP states that an immediate allergic reaction to a vaccine or medication is defined as any hypersensitivity-related signs or symptoms such as urticaria, angioedema, respiratory distress (e.g., wheezing, stridor), or anaphylaxis occurring within 4 hours following administration. Vaccination providers should attempt to determine whether reactions reported following vaccination with an mRNA COVID-19 vaccine are consistent with allergic reactions that would contraindicate additional doses of the mRNA COVID-19 vaccine (see Hypersensitivity Reactions under Cautions) or are reactions commonly observed following vaccination, such as vasovagal reactions or postvaccination adverse effects, that are not considered contraindications to receiving the second dose of the 2-dose vaccination series.

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 both the Moderna COVID-19 vaccine and the Pfizer-BioNTech COVID-19 vaccine. ACIP states that consideration can 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), consultation with an allergist-immunologist should be considered to help determine if the individual can safely receive the Janssen COVID-19 vaccine. 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>) when making such decisions. Although safety and efficacy of administering the Janssen COVID-19 vaccine after an mRNA COVID-19 vaccine have not been established, ACIP states that, in those *exceptional* situations when an individual received the first dose of an mRNA COVID-19 vaccine but is unable to complete the series with either the same or different mRNA COVID-19 vaccine (e.g., due to a contraindication), a single dose of the Janssen COVID-19 vaccine may be considered at a minimum interval of 28 days after the dose of mRNA COVID-19 vaccine. (See Dosage under Dosage and Administration.)

History of immediate allergic reaction of any severity to a previous dose of an mRNA COVID-19 vaccine or known (diagnosed) allergy to a component of the vaccine (e.g., PEG): ACIP considers this a **contraindication** to vaccination with both the Moderna COVID-19 vaccine and the Pfizer-BioNTech COVID-19 vaccine. ACIP states that consideration can 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), consultation with an allergist-immunologist should be considered to help determine if the individual can safely receive the Janssen COVID-19 vaccine. 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>) when making such decisions. Although safety and efficacy of administering the Janssen COVID-19 vaccine after an mRNA COVID-19 vaccine have not been established, ACIP states that, in those *exceptional* situations when an individual received the first dose of an mRNA COVID-19 vaccine but is unable to complete the series with either the same or different mRNA COVID-19 vaccine (e.g., due to a contraindication), a single dose of the Janssen COVID-19 vaccine may be considered at a minimum interval of 28 days after the dose of mRNA COVID-19 vaccine. (See Dosage under Dosage and Administration.)

History of polysorbate allergy: ACIP considers this a **precaution** to vaccination with both the Moderna COVID-19 vaccine and the Pfizer-BioNTech COVID-19 vaccine. ACIP states that polysorbate allergy is a contraindication to vaccination with the Janssen COVID-19 vaccine and that use of an mRNA COVID-19 vaccine (Moderna COVID-19 vaccine or Pfizer-BioNTech COVID-19 vaccine) can be considered in such individuals. However, polysorbates are structurally related to PEG and there is potential for cross-reactive hypersensitivity. Consultation with an allergist-immunologist should be considered to help determine if the individual with polysorbate allergy can safely receive an mRNA COVID-19 vaccine. 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>) when making such decisions. If a decision is made to administer an mRNA COVID-19 vaccine to an individual with a contraindication to the Janssen COVID-19 vaccine (e.g., polysorbate allergy), the vaccine should be administered *only* in an appropriate setting under the supervision of a healthcare provider experienced in the management of severe allergic reactions.

History of any immediate allergic reaction to any other vaccine or injectable therapy (i.e., IM, IV, or subcutaneous vaccines or therapies): ACIP considers this a **precaution**, but not a contraindication, to COVID-19 vaccination. ACIP states that a history of allergic reaction to subcutaneous 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 allergic reactions related to food, pets, insects, 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 the first dose of an mRNA COVID-19 vaccine: ACIP states that these local reactions are **not** a contraindication or precaution for administration of the second dose of the mRNA COVID-19 vaccine. Such individuals should receive the second dose using the same mRNA COVID-19 vaccine used for the first dose at the recommended interval, preferably in the opposite arm.

If a **precaution** for COVID-19 vaccination is identified, ACIP recommends that a risk assessment be performed to help decide whether the individual should be vaccinated. The risk assessment should consider the risk of exposure to SARS-CoV-2 (e.g., because of residence in a congregate setting such as a long-term care facility, occupation), risk of severe disease or death due to COVID-19 (e.g., because of age or underlying medical conditions), the unknown risk of anaphylaxis (including fatal anaphylaxis) following COVID-19 vaccination in individuals with a history of immediate allergic reactions to other vaccines or injectable therapies, and ability to be vaccinated in a setting where appropriate medical care is immediately available to treat anaphylaxis if it occurs.

When a COVID-19 vaccine, including the Moderna COVID-19 vaccine, is administered to individuals without a contraindication to such vaccines, ACIP states that those with a history of an immediate allergic reaction of any severity to any other vaccine or injectable therapy and those with a history of anaphylaxis due to any cause not considered a contraindication should be observed for 30 minutes after the vaccine dose, and that all other individuals should be observed for 15 minutes. In addition, vaccine recipients should be instructed 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 assess and manage immediate allergic reactions (e.g., sufficient quantities of epinephrine in prefilled syringes or autoinjectors) *must* be immediately available in the event that an acute anaphylactic reaction occurs following administration of a COVID-19 vaccine. Early recognition of the clinical signs and symptoms of anaphylaxis is important since such reactions

require immediate treatment. Individuals with suspected anaphylaxis should be immediately treated with IM epinephrine.

ACIP interim guidance regarding early recognition of clinical signs and symptoms of anaphylaxis and guidance regarding preparation for and management of anaphylaxis at COVID-19 vaccination sites, including recommendations for medications and supplies to have immediately available and specific recommendations regarding therapeutic 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 concerning an individual patient that is not readily addressed by ACIP guidance, US healthcare personnel 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>).

Lymphadenopathy

Lymphadenopathy, lymphadenitis, lymph node pain, injection-site lymphadenopathy, axillary swelling/tenderness, and axillary mass have been reported in clinical trials evaluating COVID-19 vaccine (Moderna). At the time that FDA's safety and efficacy analysis of data from the ongoing randomized, double-blind, placebo-controlled, phase 3 trial evaluating the vaccine was performed for the EUA, lymphadenopathy (axillary swelling and tenderness on the vaccination arm) was reported in 21.4% of vaccine recipients younger than 65 years of age and 12.4% of vaccine recipients 65 years of age or older compared with 7.5 and 5.8% of placebo recipients in those age groups, respectively, and was reported more frequently after the second dose than the first dose.

Cases of unilateral axillary adenopathy, including palpable axillary mass, have been identified through self-detection or incidentally on breast imaging in individuals who received an mRNA COVID-19 vaccine outside of clinical trials. In some reported cases, axillary adenopathy on the same side as the vaccination site was seen on breast ultrasound performed 5–13 days after receipt of an mRNA COVID-19 vaccine. Vaccine-induced hyperplastic axillary adenopathy should be considered in the differential diagnosis if unilateral axillary adenopathy is identified on breast imaging in individuals who recently received an mRNA COVID-19 vaccine. Some experts suggest that consideration should be given to scheduling routine screening mammography or ultrasound prior to the first dose of an mRNA COVID-19 vaccine or 4–6 weeks following the second dose of the vaccine, if possible, and if this would not unduly delay appropriate care.

Clinicians also should 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 COVID-19 vaccine, and detailed history regarding COVID-19 vaccination (date of vaccination, arm used for vaccine injection) should be obtained to guide optimal follow-up and avoid unnecessary biopsies in patients undergoing such imaging.

Myocarditis and Pericarditis

There have been rare reports of acute myocarditis or pericarditis in recipients of mRNA COVID-19 vaccines (Moderna COVID-19 vaccine or Pfizer-BioNTech COVID-19 vaccine) during post-authorization and post-marketing surveillance, and these reports suggest an increased risk of myocarditis and pericarditis following vaccination, particularly within 7 days following the second dose. Symptom onset has typically been within 2–7 days (range: 0–40 day) after receipt of a dose of an mRNA COVID-19 vaccine, and such cases have been reported more frequently after the second vaccine dose than the first dose.

Data to date indicate that myocarditis and pericarditis following vaccination with an mRNA COVID-19 vaccine have predominantly occurred in male adolescents and young adults (range: 12–29 years of age). Although most patients were hospitalized for short periods and some required intensive care support, available data from short-term follow-up suggest that the majority of these individuals responded to conservative treatment involving medications and rest with rapid improvement or resolution of symptoms. Additional data are needed regarding the potential for long-term sequelae.

The possibility of myocarditis and pericarditis should be considered in the differential diagnosis for adolescents or young adults with acute chest pain, shortness of breath, or palpitations. During initial evaluation of suspected cases, the patient should be queried about prior COVID-19 vaccination and pertinent medical, travel, and social history; in addition, assessment of ECG, troponin levels, and inflammatory markers such as C-reactive protein and erythrocyte sedimentation rate should be considered. Expert consultation should be considered regarding diagnosis, management, and follow-up.

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 that subsequent vaccine doses should be deferred until additional safety data are available. ACIP states that there may be certain circumstances when administration of a subsequent dose can be considered, taking into account the individual's personal risk of severe COVID-19 (e.g., age, underlying conditions), level of COVID-19 in the community and personal risk of infection,

availability of additional data on the risk of myocarditis or pericarditis in such situations, and availability of additional data on the long-term outcomes of myocarditis and pericarditis in individuals who have received an mRNA COVID-19 vaccine. Individuals with a history of myocarditis or pericarditis after a dose of an mRNA COVID-19 vaccine 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. ACIP states that such individuals may receive any FDA-approved or FDA-authorized COVID-19 vaccine 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.

Individuals receiving an mRNA COVID-19 vaccine, especially males 12–29 years of age, should be informed 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 advised to seek medical care if symptoms of myocarditis or pericarditis occur after vaccination.

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

Thrombocytopenia

During post-authorization surveillance, there have been 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). As of February 4, 2021, more than 18 million doses of the Pfizer-BioNTech COVID-19 vaccine and more than 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 a total of 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

A decision to administer or delay vaccination in an individual with a current or recent febrile illness depends 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 states that a risk assessment should 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 that COVID-19 vaccination be deferred 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. This recommendation applies to individuals who experience SARS-CoV-2 infection before receiving any doses of COVID-19 vaccine and those who experience SARS-CoV-2 infection after receiving the first dose of an mRNA COVID-19 vaccine but before receiving the second dose of the vaccine. While there is no recommended minimum interval between SARS-CoV-2 infection and COVID-19 vaccination, evidence to date suggests that the risk of reinfection is low in the period after initial infection, but may increase with time due to waning immunity.

ACIP states that viral testing to assess for acute SARS-CoV-2 infection or serologic testing to assess for prior infection solely for the purpose of COVID-19 vaccination decision-making is *not* recommended. (See Interpretation of SARS-CoV-2 Testing in Vaccinated Individuals under Cautions.)

Individuals with Recent Exposure to SARS-CoV-2 Infection.

ACIP states COVID-19 vaccines are not currently recommended for outbreak management or for postexposure prophylaxis in individuals with a specific known

exposure to SARS-CoV-2; postexposure vaccination is unlikely to be effective in preventing disease following such exposures. (See Limitations of Vaccine Effectiveness under Cautions.)

Individuals in the community or outpatient setting with a known COVID-19 exposure: ACIP states that such individuals should not seek COVID-19 vaccination until their quarantine period has ended since this avoids potentially exposing healthcare personnel and other individuals to SARS-CoV-2 during the vaccination visit and avoids diagnostic confusion between possible adverse effects of the vaccine and symptoms of COVID-19. This recommendation includes individuals with a known COVID-19 exposure after receiving the first dose of an mRNA COVID-19 vaccine but before receiving the second dose of the vaccine.

Individuals residing in congregate healthcare settings (e.g., long-term care facilities) or congregate non-healthcare settings (e.g., correctional and detention facilities, homeless shelters) who have had a known COVID-19 exposure or are undergoing screening: ACIP states that such individuals may receive COVID-19 vaccination since exposure and transmission of SARS-CoV-2 can occur repeatedly for long periods of time in these settings and healthcare personnel and other staff are already in close contact with residents in these settings. Those waiting for results of SARS-CoV-2 testing may receive COVID-19 vaccination if they do not have symptoms consistent with COVID-19. Individuals providing vaccination services should employ appropriate infection prevention and control procedures. Viral testing to assess for acute SARS-CoV-2 infection solely for the purpose of COVID-19 vaccination decision-making is *not* recommended.

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. ACIP states that COVID-19 vaccination should be offered to individuals regardless of history of prior symptomatic or asymptomatic SARS-CoV-2 infection, including those with prolonged post-COVID-19 symptoms. Completion of a COVID-19 primary vaccination series in previously infected individuals decreases the risk of future SARS-CoV-2 infection.

Data are not available to date regarding the 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 SARS-CoV-2 Antibody Therapies under Drug Interactions.)

Individuals with a History of Multisystem Inflammatory Syndrome.

Data are not available to date regarding the safety and efficacy of COVID-19 vaccines in adults or children with a history of multisystem inflammatory syndrome (MIS-A or MIS-C, respectively). The mechanisms of MIS-A and MIS-C are not well understood, but include a dysregulated immune response to SARS-CoV-2 infection. It is unclear whether those with a history of MIS-A or MIS-C are at risk for recurrence of the same dysregulated immune response following reinfection with SARS-CoV-2 or in response to COVID-19 vaccination. ACIP recommends weighing these theoretical concerns against the known risks of COVID-19 following reinfection and the benefits of protection following COVID-19 vaccination. Although children with MIS-C have high antibody titers to SARS-CoV-2, it is unclear whether this correlates with protection against reinfection and the duration of protective antibody levels in such children is not known.

ACIP states that individuals with a history of MIS-A or MIS-C may choose to be vaccinated. Although a conversation between the patient, their guardian(s), and their clinical team or a specialist may assist with decisions regarding COVID-19 vaccination in such individuals, a conversation with a healthcare provider is not required before vaccination. When making decisions regarding COVID-19 vaccination in those with a history of MIS-A or MIS-C, considerations include clinical recovery from MIS-A or MIS-C (including return to normal cardiac function), personal risk of severe acute COVID-19 (e.g., age, underlying conditions), level of COVID-19 transmission in the community and personal risk of reinfection, lack of safety data regarding administration of COVID-19 vaccines following MIS-A or MIS-C, and timing of any immunomodulatory therapies.

Current evidence suggests that the risk of reinfection with SARS-CoV-2 is low in the months after initial infection, but may increase with time due to waning immunity. 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, referral to a specialist in infectious diseases, rheumatology, or cardiology should be considered. 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, the case should be reported 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. Clinical trials of COVID-19 vaccines have demonstrated that safety and efficacy profiles in individuals with some underlying medical conditions, including those that place them at increased risk for severe COVID-19, are similar to safety and efficacy profiles in those without comorbidities.

US healthcare personnel 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.

FDA-approved or FDA-authorized mRNA COVID-19 vaccines (Moderna COVID-19 vaccine and Pfizer-BioNTech COVID-19 vaccine) are not live virus vaccines and, therefore, can be safely administered to immunocompromised individuals.

Individuals with altered immunocompetence, including those receiving immunosuppressive therapy (see Immunosuppressive Agents under Drug Interactions), may have diminished immune responses to vaccines, including the Moderna COVID-19 vaccine.

Clinical trial data indicate that immunocompromised individuals (e.g., solid organ transplant recipients, those with lymphoid malignancies) may have reduced immune responses following a 2-dose vaccination series of an mRNA COVID-19 vaccine compared with those who are not immunocompromised. There also is evidence that immunocompromised individuals who have been vaccinated against COVID-19 may have a higher rate of breakthrough SARS-CoV-2 infections than the general population.

Data from small studies have demonstrated that 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. Results of a study evaluating the safety and effectiveness of a third dose of an mRNA COVID-19 vaccine in solid organ transplant recipients indicate that the third dose is only moderately effective in increasing potentially protective antibody titers in such patients.

The FDA EUA for the Moderna COVID-19 vaccine permits administration of a third dose of the vaccine administered at least 28 days after completion of the initial 2-dose vaccination series in individuals 18 years of age or older who are solid organ transplant recipients or diagnosed with conditions considered to have an equivalent level of immunocompromise.

ACIP states that, although the clinical benefit of a third (additional) dose of an mRNA COVID-19 vaccine after an initial 2-dose vaccination series in immunocompromised individuals is still under investigation, the potential for an increased immune response and the acceptable safety profile of mRNA COVID-19 vaccines support the recommendation for a third dose in individuals with *moderate to severe* immunocompromise resulting from a medical condition or receipt of immunosuppressive medications or treatments. For public health purposes, ACIP states that immunocompromised individuals are considered fully vaccinated at least 2 weeks after the second dose of the 2-dose primary vaccination series of an mRNA COVID-19 vaccine.

ACIP recommends that a third dose of the Moderna COVID-19 vaccine be considered after the initial 2-dose primary vaccination series for individuals with *moderate to severe* immunocompromise including, but not limited to, the following:

- Active treatment for solid tumor and hematologic malignancies
- Receipt of solid organ transplant and taking immunosuppressive therapy
- Receipt of chimeric antigen receptor (CAR) T-cell therapy or hematopoietic stem cell transplant (within 2 years of transplantation or taking immunosuppression therapy)
- Moderate or severe primary immunodeficiency (e.g., DiGeorge syndrome, Wiskott-Aldrich syndrome)
- Advanced or untreated HIV infection (CD4⁺ T-cell counts less than 200 cells/mm³, history of an AIDS-defining illness without immune reconstitution, or clinical manifestations of symptomatic HIV)
- Active treatment with high-dose corticosteroids (i.e., prednisone dosage at least 20 mg daily or equivalent given for 2 weeks or longer), alkylating agents, antimetabolites, transplant-related immunosuppressive drugs, cancer chemotherapeutic agents classified as severely immunosuppressive, tumor necrosis factor (TNF) blocking agents, and other biologic agents that are immunosuppressive or immunomodulatory

ACIP states that factors to consider when assessing the general level of immune competence include disease severity, duration, clinical stability, complications, comorbidities, and any potentially immunosuppressive treatment. Age or place of residence alone (e.g., residence in a long-term care facility), independent of a patient's medical condition, should not be used to determine the level of immune competence because the balance of benefits and risks of a third primary dose for individuals who are not moderately to severely immunocompromised is currently unknown.

Individuals with altered immunocompetence, including those who receive a third dose of the Moderna COVID-19 vaccine, should be counseled about the unknown safety profile and effectiveness of COVID-19 vaccines in immunocompromised

populations and the potential for reduced immune responses and the need to continue following all current CDC guidelines for fully vaccinated individuals (e.g., wearing a mask in certain settings with substantial or high levels of viral transmission) to protect themselves from COVID-19. In addition, close contacts of immunocompromised individuals should be encouraged to be vaccinated against COVID-19.

Antibody testing to assess for immunity to COVID-19 following COVID-19 vaccination in individuals with altered immunocompetence is *not* recommended. (See Interpretation of SARS-CoV-2 Testing in Vaccinated Individuals under Cautions.)

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 to the vaccine. Individuals with autoimmune conditions were included in clinical trials evaluating mRNA COVID-19 vaccines and safety and efficacy of the vaccines in this population were similar to that in the general population.

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.

The American Association for the Study of Liver Diseases (AASLD) has released a consensus statement regarding use of COVID-19 vaccines in individuals who have chronic liver disease or are liver transplant recipients. These experts state that vaccination against COVID-19 is strongly recommended because of the 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 at least 28 days after the 2-dose primary series.

AASLD states that individuals with chronic liver disease who are receiving antiviral treatment for hepatitis B virus (HBV) or hepatitis C virus (HCV) infection and those receiving medical therapy for primary biliary cholangitis or autoimmune hepatitis should not discontinue such therapy when receiving COVID-19 vaccination. In addition, patients with hepatocellular carcinoma undergoing locoregional or systemic therapy should be considered for COVID-19 vaccination without interruption of treatment; however, those with recent infections or fever should not receive the vaccine until they are medically stable.

AASLD states that liver transplant candidates should receive COVID-19 vaccination prior to transplantation, whenever possible, to help ensure an adequate immune response. The optimal time for COVID-19 vaccination in previously unvaccinated liver transplant recipients is likely to be at least 3 months after transplant; however, vaccination may be given as early as 4 weeks after transplant if indicated based on ongoing community spread of SARS-CoV-2, especially in those at highest risk with other comorbid factors associated with severe COVID-19.

Reducing immunosuppressive therapy in liver transplant recipients solely as an effort to elicit an immune response to COVID-19 vaccination is not recommended because there is a risk of acute cellular rejection (ACR) with lower immunosuppression. AASLD recommends that COVID-19 vaccination be avoided in liver transplant recipients with active ACR, those being treated for ACR, and those receiving high daily doses of corticosteroids until the episode has resolved and the patient's baseline immunosuppression is reestablished.

The AASLD consensus statement should be consulted 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 has not been 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 to the vaccine. A history of GBS is not usually considered a contraindication or precaution to vaccination with most vaccines.

If GBS occurs following COVID-19 vaccination, the case should be reported 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 has not been established, several cases of Bell's palsy have been reported in clinical trials in individuals who received the Moderna COVID-19 vaccine or the Pfizer-BioNTech COVID-19 vaccine.

Data from the ongoing randomized, double-blind, placebo-controlled, phase 3 trial evaluating the Moderna COVID-19 vaccine identified 3 cases Bell's palsy (facial paralysis) in the vaccine group (one was a serious adverse event) and one case of Bell's palsy in the placebo group. Onset of Bell's palsy was 22, 28, or 32 days after the vaccine dose and 17 days after the placebo dose. FDA stated that available data are insufficient to determine a causal relationship with the vaccine.

ACIP states that, in the absence of a causal relationship between COVID-19 vaccines and Bell's palsy, individuals with a history of Bell's palsy may receive COVID-19 vaccination, unless they have a contraindication to the vaccine.

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

Individuals with Increased Bleeding Risk.

Individuals who have bleeding disorders or are receiving anticoagulant therapy and/or their caregiver should be advised 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, a fine needle (23 gauge or smaller) should be used to administer the vaccine and firm pressure applied to the injection site (without rubbing) for at least 2 minutes. In individuals receiving therapy for hemophilia, IM vaccines can be scheduled for administration shortly after a dose of such therapy.

Individuals receiving anticoagulation therapy presumably have the same bleeding risk as patients with clotting factor disorders and should follow the same guidelines for IM administration. If possible, IM vaccines could be scheduled 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 within 1–2 days after vaccination. This effect has been reported when the vaccine was administered 2 weeks to 6 months or longer after the last dermal filler injection, and appears to be temporary and resolves with medical treatment, including corticosteroid therapy. A similar inflammatory reaction at the site of dermal filler injections (lips, cheeks, tear troughs) was reported in at least one unvaccinated individual who was diagnosed with COVID-19 approximately 2 weeks after their last dermal filler injection and has been reported after natural influenza-like illness. Although the mechanism of these reactions is not known, it has been suggested that localized swelling at the site of dermal filler injection may be due to an inflammatory reaction resulting from an interaction between the immune response after vaccination and the dermal filler.

ACIP states that individuals who have received injectable dermal fillers may receive COVID-19 vaccination, unless they have a contraindication to the vaccine. However, such individuals should be advised to contact their healthcare provider for evaluation if they develop swelling at or near the 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 that is not approved or authorized by FDA and/or is not listed for emergency use by the World Health Organization (WHO). For the purposes of public health guidance, ACIP states that only individuals who have completed a primary series of a COVID-19 vaccine approved or authorized by FDA or listed by WHO for emergency use are considered fully vaccinated.

Limited data are available regarding the safety and efficacy of administering an FDA-approved or FDA-authorized COVID-19 vaccine to individuals who previously received a COVID-19 vaccine that is not approved or authorized in the US. However, ACIP states that such individuals may be offered a complete primary vaccination series using an FDA-approved or FDA-authorized COVID-19 vaccine. In such circumstances, the minimum interval between the last dose of the other COVID-19 vaccine and an FDA-approved or FDA-authorized COVID-19 vaccine is 28 days.

Fully or Partially Vaccinated with a COVID-19 Vaccine Approved or Authorized by FDA.

Individuals who were vaccinated outside the US with a COVID-19 vaccine approved or authorized by FDA do *not* need to receive any additional doses in the US if they previously received all the recommended doses of the vaccine.

If an individual in the US received the first dose of an FDA-approved or FDA-authorized COVID-19 vaccine outside the US and a 2-dose regimen is required, ACIP states that the vaccination series does not need to be restarted, but the second dose of the vaccine should be administered as close to the recommended interval as possible.

Previously Received a COVID-19 Vaccine not Approved or Authorized by FDA but Listed for Emergency Use by WHO.

Individuals who completed a COVID-19 vaccination series outside the US with a vaccine listed for emergency use by WHO do *not* need any additional doses using an FDA-approved or FDA-authorized COVID-19 vaccine.

ACIP states that a complete vaccination series using an FDA-approved or FDA-authorized COVID-19 vaccine may be offered to individuals who partially completed a COVID-19 vaccination series outside the US with a vaccine listed for emergency use by WHO.

Previously Received a COVID-19 Vaccine not Approved or Authorized by FDA or Listed for Emergency Use by WHO.

ACIP states that a complete vaccination series using an FDA-approved or FDA-authorized COVID-19 vaccine may be offered to individuals who completed or partially completed a COVID-19 vaccination series outside the US with a vaccine that is not approved or authorized by FDA or listed for emergency use by WHO.

Limitations of Vaccine Effectiveness

COVID-19 vaccine (Moderna) may not protect all vaccine recipients against COVID-19.

The Moderna COVID-19 vaccine is administered in a primary vaccination series of 2 doses given 1 month (28 days) apart (see Dosage under Dosage and Administration). Limited data from the ongoing randomized, double-blind, placebo-controlled, phase 3 trial evaluating the Moderna COVID-19 vaccine indicate that estimated vaccine efficacy is 80.2% following the first dose compared with 94.1% following the second dose. Vaccine recipients should be counseled on the importance of completing the 2-dose primary vaccination series to optimize protection against 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. ACIP states that, because the median incubation period of SARS-CoV-2 infection is 4–5 days, it is unlikely that a dose of COVID-19 vaccine would provide an adequate immune response within the incubation period for effective postexposure prophylaxis.

FDA states that data are too limited to date to assess the effect of the Moderna COVID-19 vaccine for prevention of asymptomatic SARS-CoV-2 infection, as measured by detection of the virus and/or detection of antibodies against non-vaccine antigens that would indicate infection rather than an immune response induced by the vaccine; additional evaluations are needed, including data from clinical trials and from use of the vaccine after issuance of the EUA.

FDA states that data are too limited to date to assess the effect of the Moderna COVID-19 vaccine against transmission of SARS-CoV-2 from individuals who become infected despite vaccination. Demonstrated high efficacy against symptomatic COVID-19 may translate to overall prevention of transmission in populations with high enough vaccine uptake; however, it is possible that if efficacy against asymptomatic infection were lower than efficacy against symptomatic infection, asymptomatic cases in combination with reduced mask-wearing and social distancing could result in significant continued transmission of the virus. Additional evaluations are needed, including data from clinical trials and from use of the vaccine after issuance of the EUA, to assess the effect of the vaccine in preventing virus shedding and transmission, particularly in individuals with asymptomatic infection.

Based on the unknown duration of vaccine-induced protection and the unknown extent of protection against emerging SARS-CoV-2 variants, individuals who receive COVID-19 vaccination and are considered fully vaccinated (see Dosage under Dosage and Administration) and those who have received a third primary dose or a booster dose of the vaccine should be counseled to continue to follow current CDC interim guidance for fully vaccinated individuals to protect themselves and others. This may include wearing a mask in certain settings with substantial or high levels of viral transmission; following federal, state, local, tribal, or territorial laws, rules, and regulations; and following CDC travel guidance and any applicable local business or workplace guidance. These recommendations (available at the CDC website at <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/fully-vaccinated-guidance.html>) should be consulted for information on precautionary measures that fully vaccinated individuals should take in various social situations and/or following exposure to someone with suspected or confirmed COVID-19.

Withholding COVID-19 vaccination due to concerns about efficacy against current or future SARS-CoV-2 viral variants is not recommended.

Data are limited to date regarding vaccine protection in some immunocompromised individuals, including those receiving immunosuppressive drugs (e.g., drugs such as mycophenolate and rituximab used to suppress rejection of transplanted organs or to treat rheumatologic conditions), and such individuals should discuss the need for personal protective measures after COVID-19 vaccination with their healthcare provider.

If COVID-19 breakthrough infection occurs in an individual who has received one or more doses of a COVID-19 vaccine, prior receipt of the vaccine should not affect treatment decisions, including use of SARS-CoV-2-specific monoclonal antibodies, convalescent plasma, antivirals, or corticosteroids. For purposes of surveillance, breakthrough infections in fully vaccinated individuals are defined as detection of SARS-CoV-2 RNA or antigen in a respiratory specimen collected at least 14 days after completion of a primary vaccination series. Breakthrough infections in fully vaccinated individuals that result in hospitalization or death should be reported to VAERS. (See EUA Requirements for Postvaccination Monitoring and Mandatory Vaccine Adverse Event Reporting under Cautions.)

Duration of Immunity

The duration of protection against SARS-CoV-2 infection following completion of the 2-dose vaccination series of COVID-19 vaccine (Moderna) has not been fully evaluated.

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. All vaccines should be inspected on delivery and monitored during storage to ensure that the recommended storage temperatures are maintained.

COVID-19 vaccine (Moderna) 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. Vaccine that has been mishandled or has not been stored at the recommended temperatures should not be administered. (See Stability.)

If there are concerns about mishandling or defective or damaged vaccine, the manufacturer should be contacted at 866-663-3762 for guidance.

EUA Requirements for Postvaccination Monitoring and Mandatory Vaccine Adverse Event Reporting

Safety and efficacy of COVID-19 vaccine (Moderna) have not been established. The FDA issued an EUA that permits use of the vaccine for the prevention of COVID-19 in individuals 18 year of age or older† when used in a 2-dose primary vaccination series and as a third dose‡ in the primary vaccination series in certain immunocompromised adults as specified in the EUA. (See Emergency Use Authorization under Uses.)

Some data are available regarding adverse effects associated with use of the Moderna COVID-19 vaccine. (See Common Adverse Effects under Cautions.) Additional adverse effects, some of which may be serious, may become apparent with more widespread use of the vaccine.

All vaccine recipients should be monitored for immediate adverse reactions according to CDC (ACIP) guidelines. (See General under Dosage and Administration.)

Vaccine recipients or their caregivers should be provided with information on, and encouraged to participate 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. Reports to v-safe that indicate a medically important health impact are followed up by the CDC v-safe call center to collect additional information to complete a VAERS report. Information on v-safe is available at <https://www.cdc.gov/vsafe>.

It is mandatory that vaccination providers administering COVID-19 vaccine (Moderna) 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. VAERS reports can be completed and submitted online at <https://vaers.hhs.gov/reportevent.html> or faxed to 877-721-0366; the words “Moderna COVID-19 Vaccine EUA” should be included in the description section of the report. Information on submitting a VAERS report can be obtained by calling 800-822-7967 or emailing info@vaers.org. To the extent feasible, a copy of the VAERS form should also be provided to the manufacturer (Moderna) at ModernaPV@modernatx.com (email), 866-599-1342 (fax), or 866-663-3762 (phone).

The FDA fact sheet for healthcare providers for the Moderna COVID-19 vaccine available at the FDA website and at <http://www.modernatx.com/covid19vaccine-eua> should be consulted for requirements and instructions regarding reporting of adverse reactions and vaccination errors.

Interpretation of SARS-CoV-2 Testing in Vaccinated Individuals

ACIP states that results of SARS-CoV-2 viral tests (nucleic acid amplification or antigen tests) are not affected by prior COVID-19 vaccination.

To evaluate 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), a test that specifically evaluates IgM/IgG to the nucleocapsid protein should be used.

Antibody testing is *not* currently recommended to assess the need for COVID-19 vaccination in unvaccinated individuals or to assess for immunity to COVID-19 following COVID-19 vaccination. Antibody tests currently authorized for use under EUAs have variable sensitivity and specificity, as well as positive and negative predictive values, and are not authorized for assessment of immune response in individuals who have received COVID-19 vaccination. In addition, the serologic correlates of protection against SARS-CoV-2 have not been established, and antibody testing does not evaluate the cellular immune response, which may also play a role in vaccine-mediated protection. If antibody testing is performed following COVID-19 vaccination, additional doses of the same or different COVID-19 vaccine beyond the recommended vaccination series should *not* be administered based on results of antibody testing. If antibody testing was done after the first dose of an mRNA COVID-19 vaccine, the vaccination series should be completed regardless of antibody test results.

Interpretation of Tuberculosis Tests in Vaccinated Individuals

ACIP states that COVID-19 vaccination should *not* be delayed 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.

If TST or IGRA is required, such testing can be performed before, after, or during the same visit when a COVID-19 vaccine is administered. Although ACIP previously recommended that TST or IGRA testing be delayed until at least 4 weeks after completion of COVID-19 vaccination out of an abundance of caution to minimize potential theoretical interference between vaccination and TB testing, ACIP now

states that such testing can be administered without regard to timing of COVID-19 vaccination.

Specific Populations

Pregnancy.

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

In a developmental toxicity study in female rats, there was no evidence of vaccine-related adverse effects on female fertility, fetal development, or postnatal development when a vaccine formulation (same quantity of mRNA and other ingredients as that in a single human dose of the Moderna COVID-19 vaccine) was given IM on days 28 and 14 prior to mating and on gestation days 1 and 13.

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, 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 increased risk of adverse pregnancy complications and outcomes, such as preeclampsia, coagulopathy, and stillbirth.

Post-authorization surveillance safety data are accumulating regarding COVID-19 vaccination during pregnancy and clinical trials evaluating the safety and efficacy of COVID-19 vaccines in pregnant women are underway or planned. 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 individuals who are not pregnant 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.

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

ACIP states that vaccination against COVID-19 is recommended for pregnant women. These experts state that evidence regarding the safety and efficacy of COVID-19 vaccines available from both animal and human studies indicates that the benefits of vaccination against COVID-19 during pregnancy outweigh any known or potential risks. ACIP does not state a preference for any specific FDA-approved or FDA-authorized COVID-19 vaccine in pregnant women. For purposes of decisions regarding administration of both the primary vaccination series and a booster dose, ACIP recommends that pregnant and recently pregnant women (up until at least 42 days following the end of pregnancy) should be considered in the same group as individuals with underlying medical conditions.

The American College of Obstetricians and Gynecologists (ACOG) recommends that pregnant women be vaccinated against COVID-19. When recommending COVID-19 vaccination to pregnant women, ACOG suggests that clinicians review the available data on risks and benefits of vaccination, including the risks of not getting vaccinated, in the context of the individual patient's current health status and risk of exposure (e.g., possibility for exposure at work or home) and the possibility for exposing high-risk household members. In addition, the individual patient's values and perceived risk of various outcomes should be taken into account and 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 that Rh₀(D) immune globulin should not be withheld when indicated in an individual who is planning to receive or recently received a COVID-19 vaccine. (See Immune Globulins and Antibody Therapies under Drug Interactions.)

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

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

Individuals who receive a COVID-19 vaccine during pregnancy and those who become pregnant within 30 days after receiving a COVID-19 vaccine should be encouraged 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 is not recommended before receiving a COVID-19 vaccine.

ACIP states that vaccination against COVID-19 is recommended for women currently trying to get 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 COVID-19 vaccines approved or authorized by FDA affect current or future fertility. FDA states that there is no scientific evidence to suggest that the Moderna COVID-19 vaccine could cause infertility in women. In addition, infertility is 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.

Data are not available to assess whether COVID-19 vaccine (Moderna) administered to a woman who is breast-feeding has any effects on the breast-fed infant or milk production.

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

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

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

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

Pediatric Use.

Safety and efficacy of COVID-19 vaccine (Moderna) have not been assessed in individuals younger than 18 years of age.

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

Geriatric Use.

Individuals 65 years of age or older have been included in clinical trials evaluating COVID-19 vaccine (Moderna), and data from such individuals contribute to the overall assessment of safety and efficacy of the vaccine.

At the time that FDA's safety and efficacy analysis of data from the ongoing randomized, double-blind, placebo-controlled, phase 3 trial was performed for the EUA, 24.8% of participants were 65 years of age and older and 4.6% were 75 years of age and older. Subgroup efficacy analysis based on age indicated that vaccine efficacy in participants 65 years of age and older was 86.4% compared with 95.6% in those 18 to less than 65 years of age. Overall, there were no notable differences in safety profiles between participants 65 years of age and older and younger adults.

■ Common Adverse Effects

Data regarding the safety of COVID-19 vaccine (Moderna) are available from several clinical trials, including the ongoing randomized, double-blind, placebo-controlled, phase 3 trial (NCT04470427; mRNA-1273-P301; COVE study). At the time that FDA's safety analysis of the phase 3 trial was performed for the EUA, a total of 30,351 study participants 18 years of age or older (15,185 in the vaccine group and 15,166 in the placebo group) had received at least one dose.

Local adverse effects following administration of the Moderna COVID-19 vaccine in clinical trials: Injection site pain (92%), swelling (14.7%), and erythema (10%).

Systemic adverse effects following administration of the Moderna COVID-19 vaccine in clinical trials: Fatigue (70%), headache (64.7%), myalgia (61.5%), arthralgia (46.4%), chills (45.4%), nausea/vomiting (23%), axillary swelling/tenderness (19.8%), and fever (15.5%).

Data indicate that solicited local and systemic adverse effects usually occurred within the first 1–2 days after a dose of the Moderna COVID-19 vaccine, 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 was 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 or older.

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

At the time that FDA's safety analysis of the phase 3 trial evaluating a 2-dose regimen of the Moderna COVID-19 vaccine was performed for the EUA, serious

adverse events had been reported in 1% of vaccine recipients and 1% of placebo recipients. FDA considered 3 of the serious adverse events reported in the vaccine group to be possibly related to the vaccine (i.e., intractable nausea and vomiting in an individual 1 day after vaccination; facial swelling with onset 1–2 days after vaccination in 2 individuals with a history of injection of facial cosmetic dermal fillers).

Although immediate allergic reactions have not been reported to date in clinical trials evaluating the Moderna COVID-19 vaccine, severe allergic reactions (including anaphylaxis) and other hypersensitivity reactions (e.g., rash, pruritus, urticaria) have been reported rarely when the vaccine was administered outside of clinical trials. (See Hypersensitivity Reactions under Cautions.)

Drug Interactions

■ Antiviral Agents

Use of antiviral agents at any interval before or after COVID-19 vaccination is unlikely to impair development of vaccine-induced protective antibody responses.

■ Immune Globulins and Antibody Therapies

Individuals receiving immune globulin (e.g., immune globulin IV [IGIV], Rh₀(D) immune globulin) and antibody therapies *not* specific for SARS-CoV-2 may receive COVID-19 vaccination, either concurrently with or at any interval before or after the immune globulin or antibody therapy since such products are unlikely to substantially impair immune responses to the COVID-19 vaccine. ACIP states that there is no recommended minimum interval between receipt of antibody therapies not specific for SARS-CoV-2 and COVID-19 vaccination.

SARS-CoV-2 Antibody Therapies

Data are not available regarding the safety and efficacy of administering COVID-19 vaccines to individuals who have received passive antibody therapy with investigational SARS-CoV-2-specific monoclonal antibodies (e.g., bamlanivimab and etesevimab, casirivimab and imdevimab, sotrovimab) or investigational COVID-19 convalescent plasma as part of COVID-19 treatment. Based on the estimated half-life of SARS-CoV-2 antibody therapies as well as evidence suggesting that reinfection is uncommon in the 90 days after initial infection, ACIP recommends that COVID-19 vaccination should be deferred for at least 90 days after such therapies as a precautionary measure until additional information becomes available since this avoids potential interference of the antibody therapy with immune responses to the COVID-19 vaccine. This recommendation applies to individuals who received such antibody therapy before receiving any vaccine doses and those who received such antibody therapy after the first dose of an mRNA COVID-19 vaccine but before the second dose of the vaccine, in which case the second vaccine dose should be deferred for at least 90 days following receipt of the antibody therapy. However, COVID-19 vaccination is not contraindicated in individuals who have received passive antibody therapy within the past 90 days, and COVID-19 vaccine doses received within 90 days after receipt of passive antibody therapy do not need to be repeated.

If an individual who received COVID-19 vaccination subsequently develops COVID-19, ACIP states that prior receipt of COVID-19 vaccine should not affect treatment decisions, including the use of SARS-CoV-2-specific monoclonal antibodies or COVID-19 convalescent plasma, or the timing of such treatment.

■ Immunosuppressive Agents

Individuals receiving immunosuppressive therapy (e.g., cancer chemotherapy, corticosteroids, radiation) may have diminished or suboptimal antibody responses to vaccines, including the Moderna COVID-19 vaccine.

Although data are not currently available to establish safety and efficacy in individuals receiving immunosuppressive therapy, ACIP states that such individuals may receive COVID-19 vaccination if they have no contraindications to the vaccine. (See Individuals with Altered Immunocompetence under Cautions.)

Data are insufficient to date to inform optimal timing of COVID-19 vaccination for individuals planning to receive immunosuppressive therapies. However, based on general best practices for vaccination of immunocompromised individuals, ACIP states that COVID-19 vaccination should ideally be completed at least 2 weeks before initiation or resumption of immunosuppressive therapies whenever possible. When it is not possible to administer a complete COVID-19 vaccination series (i.e., a 2-dose regimen of the Moderna COVID-19 vaccine or Pfizer-BioNTech COVID-19 vaccine or a single dose of the Janssen COVID-19 vaccine) in advance, individuals receiving immunosuppressive therapy can still receive COVID-19 vaccination. Decisions to delay immunosuppressive therapy to complete COVID-19 vaccination should consider the individual's risks related to their underlying condition and response to the vaccine.

Based on general best practices for vaccination, ACIP states that COVID-19 vaccines may be administered to individuals receiving corticosteroids given topically or by local injection (e.g., intra-articular, intrabursal, or tendon injections) without regard to the timing of corticosteroid administration.

Based on currently available information, ACIP states that revaccination after immune competence is regained is not recommended in individuals who received COVID-19 vaccination during chemotherapy or treatment with other immunosuppressive drugs. If an individual who received COVID-19 vaccination subsequently develops COVID-19, ACIP states that prior receipt of COVID-19

vaccine should not affect treatment decisions, including the use of corticosteroids, or the timing of such treatment.

■ Vaccines

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

Extensive experience with non-COVID-19 vaccines has demonstrated that immunogenicity and adverse event profiles are generally similar whether vaccines are administered concomitantly or alone. However, it is not known whether reactivity of COVID-19 vaccines is increased when administered concomitantly with other vaccines, including those known to be more reactogenic (e.g., adjuvanted vaccines). Decisions to administer a COVID-19 vaccine concomitantly with other vaccine(s) should be based 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 the reactivity 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, each parenteral vaccine should be given at a different injection site and, if possible, the injection sites should be separated by at least 1 inch. ACIP states that, although the deltoid muscle can be used for more than one IM injection in adolescents and adults, COVID-19 vaccines and vaccines that are likely to cause a local reaction should be administered in different limbs, if possible.

Description

COVID-19 vaccine (Moderna) is a 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 a phase 1 clinical trial in healthy adults 18 years of age or older 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 Moderna COVID-19 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 or older 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).

In a SARS-CoV-2 rhesus challenge model, 2 IM doses of the Moderna COVID-19 vaccine or saline control were given 4 weeks apart followed by a combined intratracheal and intranasal SARS-CoV-2 challenge given 4 weeks after the second dose. In the vaccinated animals, neutralizing and binding antibodies were detected after the first vaccine dose and increased further after the second dose; Th1 CD4 T-cell responses were reported with low or undetectable Th2 or CD8 T-cell responses. Following the SARS-CoV-2 challenge, viral RNA was detected in bronchoalveolar lavage samples from all 8 control animals but was not detected in animals that had received 100-mcg doses of the vaccine.

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 COVID-19 vaccine (Moderna) contains 100 mcg of mRNA encoding the S glycoprotein of SARS-CoV-2. Each dose of the vaccine also contains 4 different lipids (SM-102, polyethylene glycol [PEG] 2000 dimyristoyl glycerol [DMG], cholesterol, and 1,2-distearoyl-sn-glycero-3-phosphocholine [DSPC]), tromethamine, tromethamine hydrochloride, acetic acid, sodium acetate, and sucrose.

The Moderna COVID-19 vaccine does not contain preservatives; vial stoppers are not made with natural rubber latex.

Advice to Patients

Prior to administration of COVID-19 vaccine (Moderna), the vaccine recipient or their caregiver must be provided 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 additional vaccine dose(s) and inform them of the importance of bringing the card when they return for the next dose.

Inform immunocompromised individuals that they may 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) to help prevent COVID-19. In addition, inform immunocompromised individuals that their close contacts should be vaccinated against COVID-19 as appropriate.

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 or older. 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.

Inform vaccine recipients or their caregivers that the vaccination provider cannot charge them for the vaccine dose, any out-of-pocket vaccine administration fees, or any other fees for COVID-19 vaccination. However, vaccination providers may seek appropriate reimbursement from a program or plan that covers COVID-19 vaccine administration fees for the vaccine recipient (e.g., private insurance, Medicare, Medicaid, US Health Resources & Services Administration [HRSA] COVID-19 assistance program for non-insured recipients). Individuals who become aware of any potential violations of these requirements are encouraged to report them to the Office of the Inspector General, US Department of Health and Human Services by phone (800-HHS-TIPS) or online (<https://tips.oig.hhs.gov>).

Inform vaccine recipients or their caregivers that they have the option to accept or refuse the vaccine.

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.

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., polyethylene glycol) 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.)

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 if they have 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.

Overview[®] (see Users Guide). It is essential that the Emergency Use Authorization (EUA) prescribing information contained in the Fact Sheet for Healthcare Providers that is available at the FDA website and at <http://www.modernatx.com/covid19vaccine-eua> be consulted for more detailed information on dosage and administration, cautions, precautions, and contraindications, and for complete information on the conditions for use of the vaccine for the prevention of coronavirus disease 2019 (COVID-19) under the EUA, including mandated record keeping and reporting requirements.

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 or older† and as a third dose† in the primary series in certain immunocompromised adults ≥18 years of age. 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.

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