Clinical recommendations for COVID-19 vaccines

The Australian Technical Advisory Group on Immunisation (ATAGI) has made recommendations on the use of COVID-19 vaccines in Australia.

On this page

COVID-19 vaccination is recommended for all people aged 5 years or older to protect against COVID-19. For most people, a primary vaccination course consists of 2 doses.

A third primary dose is recommended for people aged 5 years or older with severe immunocompromise. See considerations for special populations: people who are immunocompromised.

A single booster dose is recommended for people aged 16 years or older, 3 months after the primary course. An additional booster dose is recommended for people at risk of severe COVID-19, 4 months after the first booster. See booster dose recommendations.

In Australia, vaccination is strongly recommended for the following groups:

- people with occupational risk of exposure to SARS-CoV-2, such as frontline healthcare workers, quarantine and border workers, aged care and disability care staff, and critical and high-risk workers
- residents of aged care and disability care facilities
- older adults
- Aboriginal and Torres Strait Islander people
- people with underlying medical conditions that increase their risk of severe COVID-19
- pregnant women

Primary course: vaccine preference recommendations

Adults aged under 60 years

Pfizer, Moderna, or Novavax COVID-19 vaccines are preferred over AstraZeneca for people aged under 60 years. This is based on the higher risk and observed severity of thrombosis with thrombocytopenia syndrome (TTS) after receiving AstraZeneca vaccine in people aged under 60 years compared with people aged 60 years or older. People aged 60 years or older are also at higher risk of severe illness from COVID-19, meaning the benefits of vaccination outweigh the very small risk of TTS.

AstraZeneca COVID-19 vaccine can be used in adults aged under 60 years if the person has made an informed decision based on an understanding of the risks and benefits.[1]

For more information on third primary doses for severely immunocompromised individuals see: Considerations for special populations – people who are immunocompromised.

Adults aged 60 years or older

There is no brand preference for people aged 60 years and older.

People aged 60 years and older receive greater benefit from vaccination than young people. This is because the risk of severe disease from COVID-19 increases with age. The benefit of vaccination with AstraZeneca in preventing COVID-19 outweighs the risk of TTS in people aged 60 years and older.

For information on third primary doses for severely immunocompromised individuals see: Considerations for special populations – people who are immunocompromised.

Pregnant women

mRNA COVID-19 vaccines (Pfizer or Moderna) are the recommended vaccines in pregnancy. There are substantial data on their safe use in pregnancy.

Novavax COVID-19 vaccine can also be used in pregnancy. There is no immunogenicity or safety data but there are no theoretical safety concerns.

AstraZeneca is not preferred in pregnancy. Pregnant women who have already received a first dose of AstraZeneca can receive either an mRNA COVID-19 vaccine, AstraZeneca, or Novavax for their second dose.

Booster dose recommendations

A single COVID-19 vaccine booster dose is recommended for people aged 16 years and older who completed their primary course 3 or more months ago.

An additional booster dose (also known as a winter dose) is recommended for people in the following groups, from 4 months after the first booster dose:

- people 65 years or older
- residents of an aged care or disability care facility
- people who are severely immunocompromised
- Aboriginal and Torres Strait Islander peoples aged 50 years and older.

For people aged 16 to 17 years, Pfizer COVID-19 vaccine is the only vaccine registered for use as a booster.

For people aged 18 years and older, Pfizer or Moderna COVID-19 vaccines are the preferred vaccines for a booster dose, regardless of which vaccine was used for the primary course.

Although not preferred, AstraZeneca can be used as a booster dose if there are no alternative, for example:

- people who are contraindicated to or had a serious adverse event from mRNA vaccines, e.g. a history of anaphylaxis or myocarditis attributed to an mRNA vaccine
- people who refuse to have a preferred vaccine.

Novavax COVID-19 vaccine is not registered for use as a booster dose, however it can be used as a booster dose in an individual aged 18 or older if no other COVID-19 vaccine brand is suitable for that individual.

There is a growing body of evidence supporting the safety and effectiveness of Pfizer and Moderna as booster vaccines. Data on the use of AstraZeneca as a booster dose are more limited (see Vaccine information – clinical guidance). There is very limited data on the use of Novavax as a booster dose.

The recommended interval between completing the primary COVID-19 vaccine course (the second dose for most vaccine brands) and the first booster dose is 3 months.

The recommended interval between the first booster dose and a second booster dose (for those who are recommended to receive a second booster dose) is 4 months.

There is no upper time limit for the administration of a booster dose. However, vaccine effectiveness wanes over time, and timely receipt of boosters is encouraged for people who will particularly benefit, including:

- people at greater risk of severe COVID-19 – people aged 50 years and older, people with underlying medical conditions, residents of aged care and disability facilities, and Aboriginal and Torres Strait Islander adults.
- people at increased occupational risk of COVID-19
- people living in jurisdictions with active community transmission.

The evidence underpinning booster dose recommendations will continue to be reviewed and this clinical guidance may be refined.

The effectiveness of currently available COVID-19 vaccines against the Omicron variant is not yet known. Laboratory studies suggest that a booster dose of an mRNA COVID-19 may be required to induce adequate neutralising antibody titres against this variant. For more information see: ATAGI Statement on the Omicron variant and the timing of COVID-19 booster vaccination.

In severely immunocompromised people aged 16 years or older who have been recommended to receive a third dose as part of their primary COVID-19 vaccine course, booster doses (that is, a fourth dose) are recommended 3 months after the most recent dose in the primary course. People in this group are also recommended to have an additional booster (winter dose) from 4 months after the first booster dose.

Booster doses are not yet recommended for people under 16 years of age. This advice will be updated as more information is available.

For more information on booster doses, see:

- ATAGI recommendations on the use of a booster dose of COVID-19 vaccine
- ATAGI recommendations on the use of Moderna as a booster dose
- ATAGI recommendations for use of Pfizer COVID-19 vaccine as a booster dose in adolescents aged 16-17 years
- ATAGI statement on the Omicron variant and the timing of COVID-19 booster vaccination.
- ATAGI recommendations on a winter booster dose of COVID-19 vaccine

Considerations for special populations

People who are immunocompromised

COVID-19 vaccine is recommended for people who are immunocompromised because of their increased risk of severe illness with COVID-19.[2]

A third primary dose of COVID-19 vaccine is recommended for people aged 5 years or older with severe immunocompromise from 2 months after the second vaccine dose.

This dose is intended to address the risk of lowered or non-response to the standard 2 dose schedule.

An mRNA COVID-19 vaccine (Pfizer or Moderna) is recommended for the third dose. This is because most studies of third doses of COVID-19 vaccine in immunocompromised people have used mRNA vaccines.

The Novavax COVID-19 vaccine can be used for the third dose for people who have received Novavax for their first 2 doses, or if there are contraindications to mRNA COVID-19 vaccines. There is very limited evidence of the efficacy of Novavax in immunocompromised people.

The AstraZeneca COVID-19 vaccine is not preferred but can be used for the third dose if there are contraindications to mRNA COVID-19 vaccines.

Severely immunocompromised people aged 16 years or older who have received a third primary dose are recommended to receive:

- a booster dose (a fourth dose), 3 months after the primary course, in line with the general population
- an additional booster dose (a fifth dose), 4 months after the first booster.

More information, including definitions of severe immunocompromise, is available in ATAGI recommendations for the use of a 3rd primary dose of COVID-19 vaccine in individuals who are severely immunocompromised.

There are many causes and varying degrees of immunocompromise. The risk of COVID-19 will vary according to:

- the number and type of underlying conditions
- medical management
- other factors.

Immunogenicity studies in immunocompromised populations are limited and immunocompromised populations are clinically diverse. It is difficult to predict anticipated protection against asymptomatic infection, symptomatic infection, hospitalisation and severe disease.

This is because there is no clear correlate of protection from immunogenicity data.

Vaccinated immunocompromised people should be advised to continue taking other protective measures against SARS-CoV-2.

For more details, see the COVID-19 vaccination decision guide for people with immunocompromise and Provider guide to COVID-19 vaccination in people with immunocompromise.

Effectiveness studies[3,4] in immunocompromised people confirm that it is essential to receive 2 doses of a COVID-19 vaccine, as protection may be suboptimal after a single dose. Estimates of vaccine effectiveness range from 4% to 43%[3-5] in partially vaccinated immunocompromised people. These studies were conducted before the widespread dominance of the Delta variant and may reflect effectiveness against older strains.

For more details on vaccine effectiveness in people who are immunocompromised, see COVID-19 vaccine information.

Children and adolescents

COVID-19 vaccination is recommended for all children and adolescents aged 5 years or older.

Children aged 5 to 11 years

Two vaccines are available for young children.

- The paediatric formulation of Pfizer COVID-19 vaccine is registered for use in children aged **5 to 11 years**. The paediatric formulation differs from the adolescent/adult formulation in its concentration and recommended dosing (see Vaccines, dosage and administration – clinical guidance). Children aged 5 to 11 years should not receive the adolescent/adult formulation of the Pfizer vaccine. The Pfizer vaccine is the only COVID-19 vaccine registered for children who are 5 years old.
- The Moderna COVID-19 vaccine is registered for use in children aged **6 to 11 years.** There is no separate paediatric formulation of the Moderna vaccine – children aged 6 to 11 years receive half the adult dose (50µg in 0.25 mL). ATAGI recommends that providers are vigilant about the potential for dosing errors, including overdosing, with the Moderna vaccine in children.

If the Moderna vaccine is inadvertently given to a child who is 5 years of age, the paediatric formulation of the Pfizer vaccine should be given as the second dose.

Adverse events after the Moderna vaccine in young children are reported to be usually mild to moderate and transient, but may be more common than adverse events after the paediatric Pfizer vaccine. For more information see Adverse events – clinical guidance.

AstraZeneca and Novavax vaccines are not registered for use in children aged 5 to 11 years.

Adolescents aged 12 to 17 years

Pfizer and Moderna COVID-19 vaccines are registered for use in people aged 12 years or older.

The AstraZeneca and Novavax COVID-19 vaccines are only registered in people aged 18 years and older. If AstraZeneca or Novavax are inadvertently given as a first dose to a person aged under 18 years, Pfizer of Moderna should be used for the second dose.

Booster doses are not recommended in children aged 5 to 15 years

Booster doses are not recommended for people aged under 16 years.

Severe COVID-19 in children is uncommon and the primary course of COVID-19 vaccines generates a strong immune response. The benefit from additional doses of vaccine is likely to be small and current evidence does not suggest that booster doses are needed at this time.

Benefits of vaccination for children and adolescents

Children aged 5 to 11 years in the following groups are most likely to benefit from COVID-19 vaccination because of their increased risk of severe outcomes and/or exposure:

- children with medical risk factors for severe illness
- Aboriginal and Torres Strait Islander children
- children living in crowded conditions or outbreak areas.

Most children with SARS-CoV-2 infection are asymptomatic or have a mild illness. Adolescents appear to have similar infection rates to adults. But the frequency of severe illness from COVID-19 is lower in adolescents than in adults, with approximately 4% to 7% of adolescents experiencing severe outcomes.[6,7]

Adolescents and children are accounting for increasing proportions of COVID-19 cases, in the context of vaccinated older age groups. Overall hospitalisation rates for COVID-19 in the adolescent age group are higher than for other viral respiratory diseases such as influenza.[8]

Vaccinating children and adolescents is anticipated to prevent:

- SARS-CoV-2 infections, hospitalisations and deaths due to COVID-19
- paediatric inflammatory multisystem syndrome temporally associated with SARS-CoV-2 (PIMS-TS). PIMS-TS is a rare but serious condition associated with COVID-19 in children, which can present with features similar to those of Kawasaki disease or toxic shock syndrome[9]
- post-COVID-19 condition ('long COVID').

For more information see ATAGI recommendations on the use of the paediatric Pfizer COVID-19 vaccine in children aged 5 to 11 years in Australia, ATAGI recommendations on the use of Spikevax (Moderna) COVID-19 vaccine in children aged 6 to 11 years and ATAGI statement regarding vaccination of adolescents aged 12-15 years.

Pregnancy, breastfeeding or planning pregnancy

mRNA vaccines (Pfizer or Moderna) are the recommended COVID-19 vaccines for pregnant women. This is based on the growing body of evidence supporting the safety of mRNA vaccines in pregnancy, whereas there are still very limited data on the safety of the other COVID-19 vaccines (AstraZeneca and Novavax) in pregnancy. However, people who cannot access an mRNA vaccine can consider vaccination with AstraZeneca or Novavax if the benefits to the individual outweigh the potential risks.

Women aged 16 years or older who are pregnant and had their primary course at least 3 months ago are recommended to receive a booster dose. Pfizer or Moderna are the preferred brands for the booster dose, regardless of the brand that was given for the primary course.

For more details, see Shared decision making guide for women who are pregnant, breastfeeding or planning pregnancy.

For details on:

- vaccine effectiveness in pregnancy, see COVID-19 vaccine product information
- risk of COVID-19 in pregnancy, see Clinical features of COVID-19 disease
- adverse events and safety in pregnancy, see COVID-19 vaccine adverse events.

People with a past SARS-CoV-2 infection

All people are recommended to defer COVID-19 vaccination for 3 months after a confirmed SARS-CoV-2 infection, to optimise protection for that person. The next scheduled dose should then be given as soon as possible. All recommended doses should still be received, and no doses should be omitted from the schedule.

The risk of reinfection with the Omicron variant is very low within the first 3 months following a confirmed infection[10]. The Delta variant is no longer circulating in Australia. This advice may change if future variants of SARS-CoV-2 emerge.

Vaccination is likely to enhance the protection induced by infection. The interval between infection and vaccination enhances the protection from vaccination by further boosting the immune response, including immune memory response, generated following infection[11].

An individual may be vaccinated earlier than the recommended 3-month interval in exceptional circumstances, such as prior to starting an immunosuppressant, prior to overseas travel or if someone cannot reschedule vaccination easily (e.g. outreach vaccination program).

Infection can be confirmed by either PCR or rapid antigen test. Results of rapid antigen tests should be reported to jurisdiction reporting systems (where applicable).

For people who have been infected and are required to receive COVID-19 vaccination, a temporary medical exemption may be applicable. People should speak with their healthcare provider about what is best for them. Providers are advised to only provide temporary exemptions for a period of up to 4 months post-infection. This is due to the increased risk of reinfection after this time.

People who were previously vaccinated within 3 months of a confirmed SARS-CoV-2 infection do not need to repeat any doses.

People who have been infected with SARS-CoV-2 can receive other (non-COVID) vaccines without any minimum interval. As with any vaccine, vaccination should be deferred in people who are acutely unwell (e.g., acute febrile or systemic illness).

People treated with an anti-SARS-CoV-2 monoclonal antibody

Anti-SARS-CoV-2 monoclonal antibodies can be used for treatment in the setting of SARS-CoV-2 infection, or as pre or post -exposure prophylaxis. When given following infection, ATAGI does not recommend a specific minimum time to defer vaccination due to monoclonal antibody therapy. However, people are still recommended to follow guidance to defer vaccination for 3 months following infection (see People with a past SARS-CoV-2 infection).

As with all vaccines, COVID-19 vaccination should be deferred in people who are acutely unwell.

Timing of administration of other vaccines

COVID-19 vaccines can be co-administered (that is, given on the same day) with an influenza vaccine. Studies demonstrate the safety and immunoge.nicity of co-administration of COVID-19 and influenza vaccines.

COVID-19 vaccines can also be co-administered with other vaccines if required.

This includes routine childhood and adolescent vaccines. The benefits of ensuring timely vaccination and maintaining high vaccine uptake outweigh any potential risks associated with immunogenicity, local adverse reactions or fever.

There is limited evidence on the safety and effectiveness of co-administering COVID-19 vaccines at the same time as other vaccines. Providers need to balance the opportunistic need for co-administration with the benefits of giving the vaccines on separate visits. There is the potential for an increase in mild to moderate adverse events when more than one vaccine is given at the same time. Co-administration or near administration (e.g. within days) with another vaccine may also make it challenging to attribute potential adverse events.[12,13] Providers should ensure that parents/guardians of young children receiving COVID-19 vaccines are aware of the increased potential for local reactions.

Co-administration of antipyretics or analgesics

Using paracetamol or ibuprofen before receiving a COVID-19 vaccine is not recommended.

Pain relievers such as antipyretics and analgesics can be taken after vaccination if needed to manage vaccine-related side effects such as fever and myalgia.

Recommended and variations on vaccination schedule

COVID-19 vaccine dosing interval for children aged 5 to 11 years

ATAGI recommends a dosing schedule for paediatric Pfizer vaccine or the paediatric dose of Moderna vaccine of 2 doses, 8 weeks apart. The manufacturer's recommended dosing schedule for paediatric Pfizer vaccine is 2 doses, 3 weeks apart; and for Moderna vaccine, 2 doses, 4 weeks apart.

The recommended longer dosing interval will allow more time to observe international data on potentially rare adverse events in this age group. It may also improve immunogenicity. In adult populations, extending the interval to 8 weeks or longer has resulted in higher antibody levels, improved vaccine effectiveness and potentially longer duration of protection compared with the standard interval.[14-16] Extended dosing intervals have not yet been directly studied in children. This recommendation is consistent with other national immunisation technical advisory groups, such as the National Advisory Committee on Immunization in Canada.[17]

For children who turn 12 between their first and second doses, the recommended dosing interval is 3-8 weeks for Pfizer vaccine and 4-8 weeks for Moderna vaccine. When determining the most appropriate dose interval providers should consider:

- the potential for improved immunogenicity and fewer rare side effects with a longer dose interval
- local epidemiology
- individual circumstances including underlying risk of COVID-19 to the child and parental wishes.

Also see: Mixed (heterologous) schedules.

Shorter dose intervals

The dose interval for paediatric Pfizer vaccine can be shortened to a minimum of 3 weeks. The interval can be shortened in special circumstances to a minimum of 3 weeks, for higher risk groups (such as those with medical risk factors for severe illness), or before international travel.

The dose interval for paediatric doses of Moderna vaccine can be shortened in the same special circumstances to a minimum of 4 weeks.

The benefits of earlier protection should be weighed against the benefits of the longer dose interval, such as a slightly lower risk of adverse events and a longer duration of protection.

Longer dose intervals

If the second dose of paediatric Pfizer vaccine or the second paediatric dose of Moderna vaccine is administered later than the recommended interval, no further doses are recommended.

Pfizer and Moderna COVID-19 vaccine dosing interval for adolescents and adults

ATAGI recommends a primary dosing schedule of the adolescents/adults Pfizer COVID-19 vaccine or Moderna COVID-19 vaccine of 2 doses, 8 weeks apart. The manufacturer's dosing schedule for Pfizer is 2 doses, at least 21 days (3 weeks) apart and for Moderna vaccine, 2 doses, 4 weeks apart.

The extended interval of 8 weeks may improve vaccine effectiveness. The longer interval may also reduce the risk of myocarditis and pericarditis, particularly for those most at risk of these side effects (males, aged 12 to 39 years).

For more information see: ATAGI guidance on myocarditis and pericarditis after mRNA COVID-19 vaccines.

Although Pfizer and Moderna may provide partial protection against COVID-19 as soon as 12 days after the first dose, this protection is likely to be short lived. A 2-dose course is recommended for optimal protection.

Shorter dose intervals

The dosing interval can be shortened to a minimum of 3 weeks for Pfizer or 4 weeks for Moderna. This shorter interval can be used in specific circumstances for higher risk groups (such as older people or those with medical risk factors for severe illness), or before international travel.

Providers should consider the potential risk of myocarditis and pericarditis when selecting a COVID-19 vaccine brand and dose interval, taking into account the person's age, preferences and any precautions to specific vaccine brands.

Shortening of the recommended dose interval below the manufacturer's dosing schedule may result in a suboptimal immune response.

If the dose interval is at least 14 days, then both doses are considered valid and no doses need to be repeated. This is because there are no data on administration of more than 2 vaccine doses given in a short time, and the person is still likely to have good protection.

For more information, see use of an additional COVID-19 vaccine dose as a replacement dose if the second dose was given less than 14 days after the first dose.

Longer dose intervals

If the second dose of Pfizer or Moderna is administered later than the recommended interval, no further doses are recommended.

AstraZeneca COVID-19 vaccine dosing interval

The recommended interval between 2 doses of the AstraZeneca COVID-19 vaccine is 12 weeks.

The minimum interval between doses is 4 weeks.

The duration of protection after a single dose of AstraZeneca has not yet been established. A second dose is recommended for optimal protection.

Shorter dose intervals

Shortening of the recommended dose interval may result in a suboptimal immune response.

It is acceptable to shorten the interval between doses from 12 weeks to no less than 4 weeks. This may be appropriate in certain circumstances – for example, imminent travel or anticipated risk of SARS-CoV-2 exposure.

In an outbreak setting, ATAGI recommends an interval of 4 to 8 weeks between doses.

If the dose interval is at least 14 days, then both doses are considered valid and no doses need to be repeated. This is because there are no data on administration of more than 2 vaccine doses given in a short time, and the person is still likely to have good protection.

In clinical trials, the timing of administration of AstraZeneca ranged from around 4 weeks to up to 26 weeks. In a post-hoc analysis, vaccine efficacy after the second dose of AstraZeneca progressively increased with a longer interval between doses. Efficacy was greatest when the interval was 12 weeks or more. Short-term efficacy was about 73% (95% CI: 48.8–85.8) from 3 weeks after the first dose to 12 weeks after the first dose.[18]

Also see vaccine information – clinical guidance for more details.

For more information, see Use of an additional COVID-19 vaccine dose as a replacement dose if the second dose was given less than 14 days after the first dose.

Longer dose intervals

If the second dose of AstraZeneca COVID-19 vaccine is administered later than the recommended interval, no further doses are required.

Novavax COVID-19 vaccine dosing interval

The recommended interval between 2 doses of the Novavax COVID-19 vaccine is a minimum of 3 weeks.

The interval can be extended to 8 weeks in certain circumstances, including to reduce the potential risk of rare side effects such as myocarditis and pericarditis.

The duration of protection after a single dose of Novavax has not yet been established. A second dose is recommended for optimal protection.

Shorter dose intervals

Shortening of the recommended dose interval may result in a suboptimal immune response.

If the dose interval is at least 14 days, then both doses are considered valid and no doses need to be repeated. This is because there are no data on administration of more than 2 vaccine doses given in a short time, and the person is still likely to have good protection.

For more information, see Use of an additional COVID-19 vaccine dose as a replacement dose if the second dose was given less than 14 days after the first dose.

Longer dose intervals

If the second dose of Novavax is administered later than the recommended interval, no further doses are recommended.

Minimum valid dose schedules

ATAGI advises that the absolute minimum interval between the first and second dose of any COVID-19 vaccine is 14 days. Dose intervals of at least 14 days are considered acceptable and valid, and the person will be considered fully vaccinated in the Australian Immunisation Register (AIR).

Use of an additional COVID-19 vaccine dose as a replacement dose if the second dose was given less than 14 days after the first dose

A second dose of a COVID-19 vaccine administered <14 days after the first dose is considered an invalid dose. An additional COVID-19 vaccine dose should be administered as a replacement dose.

The aim of this replacement dose is to attain a level of immune response that is comparable to that expected after completing a 2-dose primary course of a COVID-19 vaccine according to the recommended dosage and schedule.

The same COVID-19 vaccine brand should be used for the replacement dose to complete the primary vaccination course, unless there are special circumstances indicating the use of an alternative vaccine. Refer to the ATAGI clinical advice on use of a different COVID-19 vaccine as the second dose in special circumstances.

The interval between the invalid second dose and the replacement dose is flexible but is recommended at 4 to 12 weeks after the invalid second dose. Timing of the replacement dose should be informed by an individual risk-benefit assessment that considers:

- risk of exposure to SARS-CoV-2 – for example, workers in health care, aged care, disability care, border and quarantine facilities may warrant vaccination with a replacement dose sooner
- local disease epidemiology
- mandatory vaccination requirements for work (such as aged care or healthcare workers)
- individual medical conditions associated with increased risk of severe COVID-19 (such as immunocompromise).

There are no direct clinical trial data on vaccines used in Australia regarding a second dose being administered at <14 days after the first dose. The recommendation for a replacement dose is based on first principles. It takes into consideration the small amount of preliminary data in trials where participants received a third dose of the vaccine (at various intervals), and the potential incremental benefits outweighing the potential adverse effects.

These recommendations do not apply to booster doses.

Mixed (heterologous) schedules

ATAGI prefers use of the same COVID-19 vaccine for the 2 doses of the primary course.

An alternative vaccine brand for dose 2 should be used if there are specific medical contraindications or precautions, or if the same vaccine brand is not available in Australia.

It is preferable to use the same brand for both doses of the primary course, but an alternative brand can be used for the second dose for other reasons. Examples include if a person is unable to access the same brand or does not accept a second dose of the same brand. Emerging data support the safety and efficacy of mixed schedules.

Mixed schedules of Therapeutic Goods Administration (TGA)-approved or TGA-recognised vaccines are acceptable.

The recommended interval between first and second doses of a mixed schedule is 4 to 12 weeks after the first dose, regardless of first dose brand. An interval longer than 12 weeks is acceptable if the second dose cannot be administered during this time window.

Short-term adverse reactions are slightly more likely to occur in people who have a different vaccine for dose 2 than if they had the same vaccine for both doses, but the nature and severity of the adverse events are similar.[19-25]

Emerging data show that mixed schedules stimulate an adequate or comparable immune response compared with using the same brand for both doses. These trials have mostly been conducted with AstraZeneca COVID-19 vaccine as dose 1 and either Pfizer or Moderna COVID-19 vaccine as dose 2. One randomised controlled trial with 100 participants used Pfizer as the first dose followed by AstraZeneca as the second dose. These studies also showed an acceptable safety profile in the small cohorts vaccinated with mixed schedules.[19-23,25,27]

Results from studies investigating mixed schedules of only mRNA vaccines (Pfizer and Moderna) in a primary course is limited. Preliminary results from a Canadian observational cohort study in people aged 65 years and older found no significant differences in antibody responses, 4 weeks after the second dose of Pfizer following a first dose of Moderna, compared with those who received the same vaccine for both doses. Reactogenicity was not reported in this study.[28]

One study investigated AstraZeneca as the second dose following a first dose of an mRNA vaccine. This study showed that the immune response after a first dose of Pfizer followed by AstraZeneca was lower than two doses of Pfizer.[19]

Currently there are no data showing the efficacy or safety of mixed doses using the Novavax vaccine for one of the doses. However, there are no theoretical concerns of mixed doses with Novavax.

Special circumstances for mixed schedules

In the following special circumstances, an alternative formulation, brand or vaccine platform may be recommended for the second dose (if not contraindicated).

Children who turn 12 after their first dose of paediatric Pfizer or Moderna vaccine

Children who turn 12 after their first dose of paediatric Pfizer or Moderna vaccine should receive the adolescent/adult dose and formulation of the Pfizer or Moderna vaccine to complete their primary vaccine course.

People with serious vaccine-attributable adverse events after dose 1 that warrant the use of an alternative vaccine brand for dose 2

Serious vaccine-attributable adverse events include:

- anaphylaxis to the first dose of a COVID-19 vaccine (note: anaphylaxis to a previous dose of an mRNA COVID-19 vaccine (Pfizer or Moderna) is a contraindication to further doses of either vaccine), OR
- thrombosis with thrombocytopenia following the first dose of AstraZeneca, OR
- any other serious adverse event attributed to a previous dose of a COVID-19 vaccine (and without another cause identified) that:
- has been reported to State or Territory adverse event reporting programs and/or the TGA, AND
- has been determined to be serious following review by, and/or on the opinion of, an experienced immunisation provider/medical specialist taking into account whether repeat vaccine doses would be associated with a risk of recurrence of the serious adverse event.

Assessment of adverse events following immunisation requires detailed information about the event and the severity of the condition, as well as a determination of the likelihood of a causal link with vaccination. Serious adverse events are generally defined as those which:

- require hospitalisation (for example, thrombosis with thrombocytopenia following the first dose of AstraZeneca)
- are medically significant (for example, immune thrombocytopenia purpura, myocarditis)
- are potentially life-threatening (for example, anaphylaxis), and/or
- result in persistent or significant disability (for example, Guillain-Barré syndrome).

These reactions do not typically include expected local or systemic reactions that are known to occur within the first few days after vaccination. Attributing a serious adverse event to a previous dose of a COVID-19 vaccine may require discussion with the person's GP, local immunisation service or relevant medical specialist.

People with a precautionary condition for which the use of an alternative COVID-19 vaccines is recommended instead of AstraZeneca

Precautionary conditions are:

- history of cerebral venous sinus thrombosis (CVST)
- history of heparin-induced thrombocytopenia (HIT)
- history of idiopathic splanchnic (mesenteric, portal, splenic) venous thrombosis
- history of anti-phospholipid syndrome (APLS) with thrombosis.

People given an incomplete course of a COVID-19 vaccine brand that is not available in Australia

People who received a first dose of a COVID-19 vaccine overseas that is not available in Australia can be offered an alternative vaccine brand available in Australia to complete their primary vaccination course.

The TGA has information on vaccines that are recognised for the purposes of travel to Australia. People who have had a first dose of a vaccine that is not recognised by the TGA (or are unable to provide evidence of previous vaccine doses) should restart the primary vaccination course using a TGA approved or recognised vaccine. It is recommended that the new primary vaccination course commences 4 to 12 weeks after the last vaccine dose.

Further reading

1. Australian Technical Advisory Group on Immunisation (ATAGI). ATAGI statement regarding COVID-19 vaccines in the setting of transmission of the Delta variant of concern. Published online on 2 August 2021 (Accessed 9 September 2021). https://www.health.gov.au/news/atagi-statement-regarding-covid-19-vaccines-in-the-setting-of-transmission-of-the-delta-variant-of-concern
2. Gao Y, Chen Y, Liu M, Shi S, Tian J. Impacts of immunosuppression and immunodeficiency on COVID-19: a systematic review and meta-analysis. Journal of Infection 2020;81:e93-e5.
3. Whitaker HJ, Tsang RSM, Byford R, et al. Pfizer-BioNTech and Oxford AstraZeneca COVID-19 vaccine effectiveness and immune response among individuals in clinical risk groups. 2021. (Accessed 12 August 2021). https://khub.net/documents/135939561/430986542/RCGP+VE+riskgroups+paper.pdf/a6b54cd9-419d-9b63-e2bf-5dc796f5a91f
4. Young-Xu Y, Korves C, Roberts J, et al. Coverage and Effectiveness of mRNA COVID-19 Vaccines among Veterans. 2021. (Accessed 12 August 2021). https://doi.org/10.1101/2021.06.14.21258906
5. Khan N, Mahmud N. Effectiveness of SARS-CoV-2 Vaccination in a Veterans Affairs Cohort of Patients With Inflammatory Bowel Disease With Diverse Exposure to Immunosuppressive Medications. Gastroenterology 2021.
6. Götzinger F, Santiago-García B, Noguera-Julián A, et al. COVID-19 in children and adolescents in Europe: a multinational, multicentre cohort study. The Lancet Child & Adolescent Health 2020;4:653-61.
7. Molteni E, Sudre CH, Canas LS, et al. Illness duration and symptom profile in symptomatic UK school-aged children tested for SARS-CoV-2. The Lancet Child & Adolescent Health 2021.
8. Havers FP, Whitaker M, Self JL, et al. Hospitalization of Adolescents Aged 12-17 Years with Laboratory-Confirmed COVID-19 - COVID-NET, 14 States, March 1, 2020-April 24, 2021. MMWR Morbidity and mortality Weekly Report 2021;70:851-7.
9. Jiang L, Tang K, Levin M, et al. COVID-19 and multisystem inflammatory syndrome in children and adolescents. The Lancet Infectious Diseases 2020;20:e276-e88.
10. Chemaitelly H, Ayoub HH, Coyle P, et al. Protection of Omicron sub-lineage infection against reinfection with another Omicron sub-lineage. medRxiv 2022;2022:02.24.22271440.

11. Altarawneh H, Chemaitelly H, Ayoub HH, et al. Effect of prior infection, vaccination, and hybrid immunity against symptomatic BA.1 and BA.2 Omicron infections and severe COVID-19 in Qatar. medRxiv 2022;2022:03.22.22272745.
12. Lazarus R, Baos S, Cappel-Porter H, et al. The safety and immunogenicity of concomitant administration of COVID-19 vaccines (ChAdOx1 or BNT162b2) with seasonal influenza vaccines in adults: a phase IV, multicentre randomised controlled trial with blinding (ComFluCOV). 2021. (Accessed 28 October 2021). https://ssrn.com/abstract=3931758
13. Izikson R. Phase II, open-label study to assess the safety and immunogenicity of Fluzone® high-dose quadrivalent (influenza vaccine), 2021–2022 formulation and a third dose of mRNA-1273 COVID-19 vaccine (Moderna) administered either concomitantly or singly in adults 65 years of age and older previously vaccinated with a 2-dose schedule of mRNA-1273 vaccine. 2021. (Accessed 28 October 2021). https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2021-10-20-21/02-influenza-izikson-508.pdf
14. Tauzin A, Gong S, Beaudoin-Bussières G, et al. Strong Humoral Immune Responses against SARS-CoV-2 Spike after BNT162b2 MRNA Vaccination with a Sixteen-Week Interval between Doses. medRxiv 2021;2021:09.17.21263532.
15. Payne R, Longet S, Austin J, et al. Immunogenicity of standard and extended dosing intervals of BNT162b2 mRNA vaccine. Cell 2021;184:5699-714.e11.
16. BC Centre for Disease Control. Two Doses Prevent about 95 per Cent of COVID-19 Hospitalizations: B.C. COVID-19 Vaccine Effectiveness Results. Vancouver: BC Centre for Disease Control; 2021. (Accessed November 2021). http://www.bccdc.ca/about/News-Stories/Stories/2021/Covid-19-Vaccine-Effectiveness-Results
17. National Advisory Committee on Immunization (NACI), Government of Canada. National Advisory Committee on Immunization (NACI) statement: Recommendation on the use of the Pfizer-BioNTech COVID-19 vaccine (10 mcg) in children 5 to 11 years of age. Ottawa: Government of Canada; 2021. (Accessed 26 November 2021). https://www.canada.ca/en/public-health/services/immunization/national-advisory-committee-on-immunization-naci/recommendations-use-covid-19-vaccines/pfizer-biontech-10-mcg-children-5-11-years-age.html
18. Voysey M, Clemens SAC, Madhi SA, et al. Safety and efficacy of the ChAdOx1 nCoV-19 vaccine (AZD1222) against SARS-CoV-2: an interim analysis of four randomised controlled trials in Brazil, South Africa, and the UK. The Lancet 2021;397:99-111.
19. Liu X, Shaw RH, Stuart ASV, et al. Safety and immunogenicity of heterologous versus homologous prime-boost schedules with an adenoviral vectored and mRNA COVID-19 vaccine (COM-Cov): a single-blind, randomised, non-inferiority trial. Lancet 2021;398:856-69.
20. Chiu N-C, Chi H, Tu Y-K, et al. To mix or not to mix? A rapid systematic review of heterologous prime–boost COVID-19 vaccination. Expert Review of Vaccines 2021;20:1211-20.
21. Hillus D, Schwarz T, Tober-Lau P, et al. Safety, reactogenicity, and immunogenicity of homologous and heterologous prime-boost immunisation with ChAdOx1 nCoV-19 and BNT162b2: a prospective cohort study. Lancet 2021;9:1255-65.
22. Schmidt T, Klemis V, Schub D, et al. Immunogenicity and reactogenicity of heterologous ChAdOx1 nCoV-19/mRNA vaccination. Nat Med 2021;27:1530-5.
23. Normark J, Vikström L, Gwon YD, et al. Heterologous ChAdOx1 nCoV-19 and mRNA-1273 vaccination. New England Journal of Medicine 2021;385:1049-51.
24. Powell A, Power L, Westrop S, et al. Real-world data shows increased reactogenicity in adults after heterologous compared to homologous prime-boost COVID-19 vaccination, March−June 2021, England. Eurosurveillance 2021;26:2100634.
25. Shaw RH, Stuart A, Greenland M, et al. Heterologous prime-boost COVID-19 vaccination: initial reactogenicity data. The Lancet 2021;397:2043-6.
26. Gram MA, Nielsen J, Schelde AB, et al. Vaccine effectiveness when combining the ChAdOx1 vaccine as the first dose with an mRNA COVID-19 vaccine as the second dose. medRxiv 2021:doi.org/10.1101/2021.07.26.21261130.
27. Nordström P, Ballin M, Nordström A. Effectiveness of heterologous ChAdOx1 nCoV-19 and mRNA prime-boost vaccination against symptomatic Covid-19 infection in Sweden: A nationwide cohort study. Lancet Regional Health Europe 2021;11:100249.
28. Vinh D, Gouin J-P, Cruz-Santiago D, et al. Real-world serologic responses to extended-interval and heterologous COVID-19 mRNA vaccination in frail elderly: interim report from a prospective observational cohort study. medRxiv 2021:doi.org/10.1101/2021.09.16.21263704.

Last updated:
29 April 2022