NCIRS National Centre for Immunisation Research and Surveillance

FactSheet

Influenza vaccines for Australians

This fact sheet provides information for immunisation providers on seasonal influenza vaccines that are available in Australia in 2023. It can be used in conjunction with the NCIRS fact sheet Influenza vaccines – frequently asked questions which provides responses to common questions about influenza viruses and seasonal influenza vaccines.

- Influenza is a common cause of hospitalisation and death in Australia.
- Annual influenza vaccination is recommended for all people aged ≥6 months.
- Annual influenza vaccination is funded under the National Immunisation Program (NIP) for people aged ≥6 months who are at increased risk of severe influenza. These include:
  - all Aboriginal and/or Torres Strait Islander people aged ≥6 months
  - all children aged 6 months to <5 years
  - all adults aged ≥65 years
  - people with specified medical conditions (refer to Table 1)
  - pregnant women (during any stage of pregnancy).
- The strains used in seasonal influenza vaccines can change from year to year depending on which viruses are predicted to circulate in each upcoming season.
- Influenza vaccine can be co-administered (given on the same day) with any COVID-19 vaccine.
- For adults aged ≥65 years, adjuvanted influenza vaccine Fluad Quad (NIP-funded) and Fluzone High Dose Quadrivalent are preferentially recommended over standard influenza vaccine. There is no preference between Fluad Quad and Fluzone High-Dose Quadrivalent for use in this age group.
- If a person had a 2022 influenza vaccine in late 2022 or early 2023, they are still recommended to receive a 2023 formulation of influenza vaccine when it becomes available.
- Providers are reminded to vaccinate pregnant women at any time of the year and any stage of pregnancy. Vaccination of pregnant women provides protection to mothers and their newborn infants.
- Providers must record all vaccinations on the Australian Immunisation Register (AIR).

The Australian Technical Advisory Group on Immunisation (ATAGI) publishes annual advice on the use of influenza vaccines in Australia.

The disease

Influenza or ‘the flu’ is an acute viral illness that mainly affects the respiratory system.

Causative agent

Influenza is caused by influenza viruses classified as type A, B or C.[1] Only influenza A and B viruses are included in seasonal influenza vaccines as they cause the majority of disease in humans.

Type A influenza viruses are further categorised into subtypes based on two kinds of proteins on their surface: haemagglutinin (H) and neuraminidase (N).[1] Type B influenza viruses are categorised into two lineages: Yamagata and Victoria.

Both influenza A and B can be further broken down into different strains.

The genes for the H and N proteins on the virus surface mutate frequently. This results in constant change to influenza viruses. These minor changes to the H and N proteins of both influenza A and B are referred to as ‘antigenic drift’ and result in new virus strains. Antibody cross-protection against drifted strains is likely to be reduced. If a major change happens in the H or N protein of influenza A, it is called ‘antigenic shift’. Previous immunity is usually not adequate against disease from a ‘shifted’ strain. This creates the potential for a pandemic.

Transmission

Influenza is spread easily, mainly through large particle droplets produced by sneezing and coughing.[1,2] Droplets containing the influenza virus also settle onto surfaces, and the virus can then pass from hands to the nose, mouth or eyes. People with influenza can be infectious to others from 24 hours before symptoms start until 1 week after the start of symptoms. In previously healthy individuals, symptoms typically subside within 5–8 days.

People of all ages can get influenza. The percentage of people in the general community affected by flu each year is typically 5–10%, but may be up to 20% in some years. This percentage is higher for children, with 10–40% infected each year.[1-3]

Influenza is more easily spread where large numbers of people gather together.[1] As such, infection rates may be 2–3 times higher in closed populations (e.g. childcare centres, aged care facilities, households).[4,5]

Clinical features

Influenza symptoms usually have a sudden onset. The most common symptoms are:

- fever
- dry non-productive cough
- nasal congestion
- headache
- sore throat
- general physical complaints such as myalgia, malaise and fatigue.

The older adults may present with atypical symptoms such as malaise and confusion, and more often develop respiratory complications.

Non-respiratory symptoms such as gastrointestinal complaints and calf muscle pain occur more frequently in children than in adults.[1,3]

Although most influenza infections are symptomatically worse and more severe than other viral upper respiratory tract infections, some may be mild.[1-3] Serious complications from influenza occur in a small proportion of people who are infected.[1-3] Complications include pneumonia, myocarditis and neurological complications, which can lead to hospitalisation and death. People at the highest risk of complications from influenza include those with pre-existing medical conditions. However, previously healthy people can also have severe complications.

Diagnosis

Laboratory tests are required to confirm an influenza infection. The virus can be detected in a nose or throat swab by rapid antigen-based tests, viral culture or more commonly by molecular methods, such as polymerase chain reaction (PCR). Serological diagnosis of influenza infection can be made by measuring antibodies in blood samples.

Treatment

Treatment of influenza, including bed rest, pain relief such as aspirin/paracetamol and fluid intake, generally aims to prevent or minimise symptoms.[1-3] Children and adolescents aged <16 years must not be given aspirin or aspirin-containing medications while sick with influenza because of the increased risk of developing Reye syndrome, a condition that causes swelling in the liver and brain.

Antiviral medications such as oseltamivir or zanamivir, which require a prescription, can help reduce the severity and duration of symptoms of influenza. To be most effective, they need to be given within 48 hours of symptom onset.[1]

Prevention

Vaccination is the only way to specifically prevent influenza infection and its complications (refer to Who should be vaccinated).

Practising cough etiquette (such as covering the nose and mouth with a tissue when coughing or sneezing) and washing hands before eating can help reduce the chances of getting and passing on the influenza virus.

People who are sick with influenza should stay home from work, school and social gatherings to prevent close contact with and transmission to other people.[1-3,6]

Who should be vaccinated

Annual influenza vaccination is recommended for all people aged ≥6 months unless contraindicated (refer to Contraindications).

There are a number of groups that are at increased risk of influenza and its complications. Annual influenza vaccination is strongly recommended for these groups. For some of these groups, seasonal influenza vaccination is funded under the NIP on the basis of demonstrated cost-effectiveness as a public health intervention.[7] However, annual influenza vaccine should be actively promoted for all people, regardless of eligibility for a funded vaccine.

Influenza vaccination is strongly recommended and funded on the NIP for the following groups:

- all Aboriginal and/or Torres Strait Islander people
- all children aged 6 months to <5 years
- all adults aged ≥65 years
- all people aged ≥6 months with medical conditions **listed in Table 1** which increase the risk of influenza complications
- pregnant women (during any stage of pregnancy).

Influenza vaccination is strongly recommended but not funded on the NIP for the following groups:

- people with certain medical conditions (in addition to those funded on the NIP):
  - Down syndrome
  - obesity (body mass index ≥30 kg/m^2)
  - chronic liver disease
- residents and staff (including volunteers) of aged care and long-term residential care facilities
- homeless people
- carers and household contacts of those in high-risk groups

- commercial poultry or pork industry workers
- essential services providers
- travellers.

Detailed information on influenza vaccine recommendations is provided in the *Australian Immunisation Handbook* (refer also to Additional resources for primary medical care/vaccination providers).

Table 1: Medical conditions that are associated with an increased risk of influenza complications and for which individuals are eligible for funded vaccine under the NIP*

Category	Vaccination strongly recommended for (but not limited to) people with the following clinical conditions
Cardiac disease	Cyanotic congenital heart disease Congestive heart failure Coronary artery disease
Chronic respiratory conditions†	Severe asthma (for which frequent medical consultations or the use of multiple medications is required) Cystic fibrosis Bronchiectasis Suppurative lung disease Chronic obstructive pulmonary disease (COPD) Chronic emphysema
Chronic neurological conditions†	Hereditary and degenerative CNS diseases† (including multiple sclerosis) Seizure disorders Spinal cord injuries Neuromuscular disorders
Immunocompromising conditions‡	Immunocompromised due to disease or treatment (e.g. malignancy, transplantation and/or chronic steroid use) Asplenia or splenic dysfunction HIV infection
Diabetes and other metabolic disorders	Type 1 diabetes Type 2 diabetes Chronic metabolic disorders
Renal disease	Chronic renal failure
Haematological disorders	Haemoglobinopathies
Long-term aspirin therapy in children aged 6 months to 10 years	These children are at increased risk of Reye syndrome following influenza infection

* Further details are provided in the Australian Immunisation Handbook (refer to Additional resources for primary medical care/vaccination providers).

† People who have any condition that compromises the management of respiratory secretions or is associated with an increased risk of aspiration should be vaccinated.

‡ People with certain immunocompromising conditions (i.e. haematopoietic stem cell transplant, solid organ transplant) receiving influenza vaccine for the first time post transplant are recommended to receive 2 vaccine doses at least 4 weeks apart (irrespective of age) and 1 dose annually thereafter.

Contraindications

The only absolute contraindications to influenza vaccines are:

- anaphylaxis after a previous dose of any influenza vaccine
- anaphylaxis due to any vaccine component within influenza vaccine.

Note: Egg allergy is not a contraindication to influenza vaccine. People with egg allergy, including anaphylaxis, can be safely vaccinated with a full dose of influenza vaccine.

Vaccines

All influenza vaccines used in Australia are quadrivalent.

The 2023 southern hemisphere egg-based seasonal influenza vaccines contain the following strains:

- A/Sydney/5/2021 (H1N1)pdm09-like virus
- A/Darwin/9/2021 (H3N2)-like virus
- B/Austria/1359417/2021-like (B/Victoria lineage) virus
- B/Phuket/3073/2013-like (B/Yamagata lineage) virus

The 2023 southern hemisphere cell-based seasonal influenza vaccine contains the following strains:

- A/Sydney/5/2021 (H1N1)pdm09-like virus
- A/Darwin/6/2021 (H3N2)-like virus
- B/Austria/1359417/2021-like (B/Victoria lineage) virus
- B/Phuket/3073/2013-like (B/Yamagata lineage) virus

Vaccines are registered based on evidence of their effectiveness and safety (refer to Supplementary information). Multiple registered influenza vaccine products are available each year. The age group(s) in which each vaccine can be used and their NIP availability vary. Refer to Table 2 for the available seasonal influenza vaccines by brand and recommended age.

Table 2: Seasonal influenza vaccines available for use in Australia in the 2023 influenza season, by brand and recommended age

(from ATAGI advice on seasonal influenza vaccines in 2023)

Vaccine / Registered age group	**Vaxigrip Tetra** 0.5 mL (Sanofi)	**Fluarix Tetra** 0.5 mL (GSK)	**Afluria Quad** 0.5 mL (Seqirus)	**FluQuadri** 0.5 mL (Sanofi)	**Influvac Tetra** 0.5 mL (Viatris)	**Flucelvax Quad** 0.5 mL (Seqirus)	**Fluad Quad** 0.5 mL (Seqirus)	**Fluzone High-Dose Quad** 0.7 mL (Sanofi)
6 to 24 months (<2 years)	✓	✓	X	✓	✓	X	X	X
≥2 to <5 years	✓	✓	X	✓	✓	✓	X	X
≥5 to <60 years	✓*	✓*	✓*	✓	✓	✓	X	X
≥60 to <65 years	✓*	✓*	✓*	✓	✓	✓	X	✓
≥65 years	✓	✓	✓	✓	✓	✓	✓	✓

Ticks indicate age for which a vaccine is registered and available. White boxes represent funding under the NIP.

* Funding only for Aboriginal and Torres Strait Islander people, pregnant women and people who have certain medical conditions.

† Adjuvanted influenza vaccine preferred over standard influenza vaccines.

It is important to note that adjuvanted influenza vaccine is not registered for use in people aged 60–64 years, only high-dose influenza vaccines are.

More detailed information is provided in the ATAGI advice on seasonal influenza vaccines in 2023.

Dosage and administration

The preferred route of administration for influenza vaccines is by intramuscular injection; however, these may also be given by the subcutaneous route. The recommended number of vaccine doses varies by age and immune status of the vaccine recipient. Refer to Table 3 for the recommended doses of seasonal influenza vaccine by age.

Although protection provided by influenza vaccine is generally expected to last for the whole season, optimal protection occurs within the first 3 to 4 months after vaccination.[8,9] While influenza continues to circulate, it is never too late to vaccinate.

All influenza vaccines available in Australia may be co-administered with any other vaccine (refer to Supplementary information, Safety in infants and children). Detailed information on the administration of influenza vaccines, including co-administration and vaccine interchangeability, is provided in the *Australian Immunisation Handbook*.

Table 3: Recommended doses of influenza vaccine by age

(from the current Influenza disease chapter of the Australian Immunisation Handbook)

Age	Dose	Number of doses needed in 1st year of influenza vaccination	Number of doses needed if person received 1 or more doses of influenza vaccine in a previous season
≥6 months to <9 years	0.5 mL	2 (given 4 weeks apart)	1
≥9 years	0.5 mL	1	1
People of any age who have recently had a haematopoietic stem cell transplant or solid organ transplant	0.5 mL	2 (given 4 weeks apart) in 1st year vaccinated after transplant	2 (given 4 weeks apart) in 1st year vaccinated after transplant then 1 annually

Co-administration with other vaccines

People can get influenza vaccines at any time before or after, or with, most other vaccines, including COVID-19 vaccines.

For more information refer to the ATAGI clinical guidance for COVID-19 vaccine providers.

For information about co-administration of influenza vaccines and Novavax COVID-19 vaccine (Nuvaxovid), refer to the ATAGI statement on the use of Novavax COVID-19 vaccine (Nuvaxovid).

The safety of concomitant administration of the adjuvanted vaccines Fluad Quad and Shingrix has not been studied. While it is acceptable to co-administer these vaccines, if necessary, given the lack of data on co-administration of these vaccines, it is preferable to separate their administration by a few days.

See also Contraindications and precautions and Pneumococcal disease chapter in the *Australian Immunisation Handbook*.

For more information, refer to the ATAGI clinical guidance for COVID-19 vaccine providers.

Supplementary information

Epidemiology

Influenza is a seasonal disease in temperate regions. Most cases in Australia occur during the winter months of June through September.[10] In the northern hemisphere, influenza usually occurs between December and April, whereas in the tropics, influenza can occur all year round.

Annual influenza epidemics are most often due to a single virus subtype or lineage. However, the circulating subtypes/lineages can vary year to year and different subtypes/lineages may appear sequentially or simultaneously in the same season.[11]

Influenza is an important cause of illness and death. The number of affected people varies considerably from year to year depending on the characteristics of the circulating virus strains and the level of immunity in the population.

It has long been recognised that the impact of influenza is often greatly underestimated.[6,12] Between 2006 and 2013 (excluding the 2009 pandemic year), an average of 100 deaths and around 5,100 hospitalisations due to influenza occurred annually in Australia.[13]

In the 2017 influenza season, the highest level of activity since the 2009 pandemic year was recorded. Around 1,100 deaths were reported nationally among notified cases of laboratory-confirmed influenza.[14]A mathematical modelling study conducted during 2006–2015 in Australia estimated that influenza is likely to be associated with an average of around 500 deaths and up to 9,700 hospitalisations each year in Australia, just in people aged ≥65 years.[15]

There are a number of groups who are at a higher risk of influenza and its complications. These groups experience higher illness and death associated with influenza than the rest of the population:

- Adults aged ≥65 years and children aged <5 years have the highest rates of influenza notifications and hospitalisations.[13]
- Aboriginal and Torres Strait Islander people experience a greater disease burden from influenza than non-Indigenous Australians across all age groups.[13,16]
- People with certain underlying medical conditions such as chronic heart, lung and neuromuscular disease, among others, are also at higher risk of severe influenza complications compared with otherwise healthy individuals.[17]
- Pregnant women are more likely than other women to be hospitalised with influenza.[18] Infants born to mothers who contract influenza during pregnancy are at risk of preterm birth and low birth weight.[19]

During the COVID-19 pandemic in 2020–2021 circulation of influenza virus and coverage of influenza vaccine were lower than in previous years. COVID-19 related public health measures and the community's adherence to public health messages have also likely had an effect on the transmission of acute respiratory infections, including influenza.[20] In 2022, as international travel resumed, there was a resurgence of influenza with the influenza season commencing earlier than in previous years. During 2023, influenza epidemiology may be atypical, particularly in the context of COVID-19. Vaccination is the most important measure to protect against influenza and its complications.

Vaccine effectiveness

The level of protection that influenza vaccine provides against influenza virus varies depending on several factors:

- age of the person
- immunocompetent status of the person
- the level and severity of influenza activity

- how good is the match between the virus strains in the vaccine and those circulating in the community.[6]

A systematic review estimated the efficacy of standard trivalent influenza vaccine to be 59% against laboratory-confirmed influenza in healthy adults aged <65 years; efficacy varied by influenza season.[21] Similar levels of protection have been achieved in young children aged 6 to 59 months, with an estimated vaccine effectiveness of 65% against laboratory-confirmed influenza.[22-24]

Clinical trials of a standard quadrivalent influenza vaccine showed equivalent antibody levels (an accepted surrogate for protection against influenza) to a standard trivalent influenza vaccine for the shared strains in adults and children aged >6 months, and added protection against the additional B strain.[25-28]

The effectiveness of standard influenza vaccines is comparatively lower in older adults, especially in those aged ≥65 years.[29,30] In 2020 an adjuvanted quadrivalent influenza vaccine became available to possibly improve the protection provided through a higher antibody response.[14]

In a large post-licensure study of community-dwelling adults aged ≥65 years, the adjuvanted trivalent influenza vaccine was estimated to be around 25% more effective against hospitalisation for influenza or pneumonia than the standard trivalent influenza vaccine.[31]

In 2022 a high-dose quadrivalent influenza vaccine became available for adults aged ≥60 years for improved protection. Two post-licensure studies in adults aged ≥65 years found that the high-dose quadrivalent influenza vaccine was between 23% and 47% more effective in preventing influenza- or pneumonia-associated mortality than standard influenza vaccines.[32,33] The high-dose quadrivalent influenza vaccine was also found to be between 2% and 27% more effective in preventing hospitalisation from influenza or pneumonia than standard influenza vaccines.[34-36]

There are no studies that directly compare high-dose quadrivalent influenza vaccine and adjuvanted quadrivalent influenza vaccine. Large post-licensure studies comparing high-dose trivalent influenza vaccine and adjuvanted trivalent influenza vaccine in adults aged ≥65 years show little to no difference between these two vaccines in effectiveness against a range of influenza outcomes (relative vaccine effectiveness ranged from -3% to 7.7%).[37,38]

In 2021, Flucelvax Quad, a cell-based influenza vaccine, became available for use in Australia. The effectiveness of Flucelvax Quad against laboratory-confirmed influenza is similar to that of standard influenza vaccine.[39,40]

Vaccine safety

The common symptoms after influenza vaccination can mimic influenza infection, but are due to the vaccine's interaction with the immune system. None of the influenza vaccines available in Australia contain live virus, so they cannot cause influenza.

Less than 15% of people who get influenza vaccine get fever, headache, arthralgia and myalgia. Injection site reactions such as swelling, redness and pain are also common. These side effects may commence within a few hours of vaccination and can last for 1–2 days.[6]

In clinical trials, people who received adjuvanted influenza vaccine had a higher rate of injection site reactions in the week following vaccination than those who received standard influenza vaccine (around 35% versus 18%).[41] Less than 1% of local reactions after both adjuvanted influenza vaccine and standard influenza vaccine were severe.[41]

Clinical trials show a higher rate of mild to moderate injection site reactions in adults aged ≥65 years after receiving high-dose influenza vaccine than standard influenza vaccines. There were no differences in the frequency of severe local adverse events.[42]

Some studies reported a slightly higher frequency of systemic events among high-dose influenza vaccine recipients compared with standard influenza vaccines recipients,[43-47] but events were mostly mild to moderate. In a large active surveillance study, the frequency of any adverse event was 8.9% among high-dose influenza vaccine recipients compared with 6.3% among standard influenza vaccine recipients. However the number who sought medical attention was similar for both groups.[47]

The number of people who experienced injection site and systemic reactions was similar for both cell-based influenza vaccine and standard influenza vaccine.[48,49] Slightly more injection site reactions were reported in adults aged 18–60 years who received standard influenza vaccine than in those who received cell-based influenze vaccine (29% versus 25%).[49] Less than 1% of injection site and systemic reactions following cell-based influenza vaccine were reported as severe.

Surveillance of influenza vaccine safety through active enhanced surveillance systems such as AusVaxSafety showed that in 2018 across all ages low rates of any adverse event (7.5%) and medical attendance (<0.7%) were reported after vaccination.[50] The rate of fever after vaccination in children aged <5 years was less than 1.8%. The latest influenza vaccine safety data can be viewed on the AusVaxSafety website.

More severe immediate adverse effects such as hives, angioedema or anaphylaxis are rare consequences of influenza vaccination.[6,51,52]

A small increased risk of Guillain-Barré syndrome (GBS) was associated historically with one influenza vaccine in the United States in 1976. But since then, close surveillance has shown that GBS has occurred at a very low rate of less than 1 in 1 million doses of influenza vaccine, if at all.[53,54] The risk of GBS following influenza illness is estimated to be much higher, up to about 15 times the risk of GBS following influenza vaccine.[55,56]

Safety in infants and children

Surveillance of influenza vaccine safety in young children through AusVaxSafety has shown that influenza vaccine is safe in children aged 6 months to <5 years.

In young children, febrile seizures can occur in susceptible children because of fever of any cause. They occur most often among children aged 12–23 months.[57] Febrile seizures related to influenza vaccination are uncommon: a large study of 69,391 children in the United States calculated a febrile seizure rate of 1.4 per 100,000 in vaccinated children aged 6–23 months.[58]

A slightly higher risk of fever and febrile seizures in children aged 6 months to <5 years (especially those aged 12–24 months) has been reported following the concurrent administration of the inactivated influenza vaccine and the 13-valent pneumococcal conjugate vaccine.[59] This increased risk is small; furthermore, a second more recent study has not demonstrated the same association with febrile seizures and these two vaccines.[60] It is acceptable to administer these vaccines concurrently when both vaccines are indicated.[61]

Safety in pregnant and lactating women

All influenza vaccines in Australia are inactivated vaccines, which can be safely given to pregnant women at any stage during pregnancy. The rate of adverse events after vaccination in pregnant women is no different from the rate in women who are not pregnant. In addition, studies of mother–baby pairs have shown that receiving the influenza vaccine while pregnant does not increase maternal or fetal complications during pregnancy.[62]

Several high-quality studies[63-67] and an extensive review[68] have shown that influenza vaccination during pregnancy:

- is safe for both the mother and her unborn baby
- protects against preterm birth and low birth weight of the baby
- protects the mother and her newborn in the first few months of life when they are most vulnerable.

Standard influenza vaccines are preferred for use in pregnancy over cell-based influenza vaccines as a larger body of evidence supports the safety of standard influenza vaccines in pregnant women. Although the use of cell-based influenza vaccines in pregnancy has not been assessed, there are no theoretical concerns regarding their safety in pregnant women.

Studies of influenza vaccine given to women who are breastfeeding are limited. However, the available evidence shows that vaccination with influenza vaccine in lactating mothers is safe and can provide protection to the infant.[69]

For further information, refer to the NCIRS fact sheet on Vaccinations during pregnancy.

Additional resources for primary medical care/vaccination providers

- NCIRS Influenza vaccines for Australians: Frequently asked questions
- The Australian Immunisation Handbook
- ATAGI advice on influenza and COVID-19 vaccines
- Australian Government Department of Health and Aged Care immunisation website

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