Immunisation It's not just for kids

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In an ageing population with a high burden of vaccine-preventable diseases, vaccines are equally as important in adults as they are in children. Although there are many potential barriers to adult vaccination, these can be addressed, and every healthcare provider should routinely review the immunisation status of their adult patients as part of health promotion.



KEY POINTS

- Adults may require vaccines for multiple reasons, including incomplete childhood schedules, waning immunity, medical and lifestyle risk factors, occupation-related risks, travel and migration.
- The majority of undervaccinated people in Australia (those who are eligible for vaccines under the National Immunisation Program but do not receive them) are adults.
- Vaccines are one of the key components to healthy ageing, given the high burden of vaccine-preventable diseases in the older population.
- More vaccines are becoming available and are recommended for the adult population, including zoster vaccine for adults aged 70 to 79 years.
- Barriers to the delivery of adult vaccinations include cost, lack of documentation of doses previously received and public misconceptions about the need for vaccination in adulthood.
- The 'HALO' (Health, Age, Lifestyle, Occupation) principle can be applied when assessing vaccine requirements for adults.
- The Australian Immunisation Register, introduced in 2016, aims to capture all immunisations across the lifespan of a person.

mmunisation is equally as important for adults as it is for children, and just as the number of vaccines recommended in early childhood has increased in recent years, so too has the number recommended for adults. Waning immunity following childhood immunisations, the increased risk of infectious diseases with age, medical comorbidities, behavioural and lifestyle factors, occupational exposures, travel and migration are some of the reasons that vaccinations are recommended in adults.

Adults comprise the majority of undervaccinated people in Australia, and in some instances have been responsible for outbreaks of diseases such as measles.¹ As recommendation by a healthcare provider is the most important factor in influencing vaccine uptake in adults, the vaccination needs of adults should

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Figure 1. Number of Australians eligible for vaccination under the National Immunisation Program, by age group and vaccination status.

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be reviewed regularly by healthcare providers to ensure individuals are offered recommended vaccines.^{2,3} This article provides an overview of how to assess vaccination requirements and the current indications for immunisation of adults as recommended in *The Australian Immunisation Handbook* 10th edition, 2017 update (the *Handbook*), with discussions on vaccinations for several specific diseases and for Aboriginal and Torres Strait Islander (Indigenous) Australians.⁴ Helpful resources include the *Handbook*, the National Centre for Immunisation Research and Surveillance (NCIRS) 'Immunisation recommendations for



1. FACTORS AFFECTING ADULT VACCINATION COVERAGE^{14,15}

- Less comprehensive funding of adult vaccinations
- Poor tracking of vaccination history related to multiple healthcare providers and previous lack of a register
- Infrequent contact with healthcare professionals among healthy adults
- Lack of provider confidence in adult vaccination effectiveness
- Value judgements related to disease prevention in older people
- Scarcity of data and clinical trials in older people
- Competing priorities during a consultation, and complacency
- Logistical challenge of an annual influenza vaccination within a limited time frame

adults in Australia' and the National Immunisation Program (NIP) Schedule.⁴⁻⁶ Discussion of travel vaccinations is outside the scope of this article.

Why does it matter?

Infectious diseases remain one of the leading contributors to poor health in people aged 60 years and over.⁷ Immunosenescence, comorbidities and poorer nutrition in older people all contribute to higher rates of morbidity and mortality from infectious diseases than in younger people.^{8,9} Older adults are also implicated in the transmission of infection to vulnerable groups; for example, of the 50% of cases where the source of pertussis is known in young infants, grandparents account for 5% of the cases.¹⁰

Vaccination rates for adult vaccines included in the NIP are less well documented and generally considered to be much lower than they are for childhood vaccines. Of the estimated 4.1 million undervaccinated people in Australia each year (those who are eligible for vaccines under the NIP but do not receive them), approximately 3.8 million (92%) are adults (Figure 1).¹ The most recent Adult Vaccination Survey, conducted more than eight years ago in 2009, reported that 74.6% of Australians aged 65 years or older had received the seasonal influenza vaccine and 54.4% had been vaccinated against pneumococcal disease. In comparison, over 92% of children in Australia are fully immunised.^{11,12} More recently, a Newspoll Omnibus Flu Vaccination Survey in 2014 reported that only 39% of all adults and 63% of at-risk adults received the influenza vaccine.¹³ Factors affecting poor vaccination coverage in adults are listed in Box 1.^{14,15}

Opportunities to discuss vaccines

Immunisation status should be considered part of routine consultation with adults in general practice, just as it is for children. Every visit to general practice should be viewed as an opportunity to discuss immunisation status (Figure 2).

The immunisation 'HALO'

Vaccine recommendations for individuals differ depending on their risk factors. A useful guide when assessing adult vaccination needs is the 'HALO' principle, which considers the risk factors of Health, Age, Lifestyle and Occupation.⁴ Examples of how this can be applied are given in Box 2.^{4,16-18} A pre-vaccination health screen is recommended for all persons to be vaccinated. An example of a pre-vaccination screening checklist is available in the *Handbook*, along with the recommended responses to conditions or circumstances identified using this checklist (see the Resources box, Box 3).⁴

Recommendations for adult immunisation

Vaccinations recommended for adults are discussed in detail in the *Handbook*, and summarised in the National Centre for Immunisation Research and Surveillance (NCIRS) 'Immunisation recommendations for adults in Australia' and more briefly in the Table.⁴⁻⁶ Helpful resources are outlined in Box 3.

The Australian Government funds

2. APPLICATION OF THE HALO PRINCIPLE TO ADULT IMMUNISATION^{4,16-18}*

H – Health

- A person's medical condition(s) may place them at increased risk of acquiring specific vaccine-preventable diseases (VPDs) or place them at higher risk of complications from the VPD.
- Immunosuppression secondary to disease or treatment is a contraindication to certain live attenuated vaccines, including the zoster vaccine.
- Aboriginal and Torres Strait Islander (Indigenous) Australians experience higher rates of VPDs compared with their non-Indigenous peers, and are recommended to receive additional vaccines.
- Pregnant women are recommended to have a pertussis vaccine during their early third trimester and the seasonal influenza vaccination at any stage during their pregnancy, to protect both themselves and their newborn infants.

A – Age

- Older people are at higher risk of morbidity and mortality from influenza, pneumococcal disease and herpes zoster.^{7,16}
- Some adolescents and young adults may have missed receiving the human papillomavirus vaccine because of absence from school, lack of awareness or hesitancy. Some may also have missed vaccines, such as their second dose of the measles– mumps–rubella vaccine, due to schedule changes and poor uptake in past years.
- Women who are planning a family should have their immunisation history reviewed, particularly for hepatitis B, rubella and varicella.

L – Lifestyle

- Migrants may have had limited or poorly documented immunisation prior to arrival to Australia and may require catch-up vaccination. In particular, women of childbearing age who may be rubella nonimmune need vaccination. Reviewing the need for vaccines also facilitates screening for VPDs, such as hepatitis B in persons from endemic countries.
- Migrants are also at risk of travel-related VPDs when returning home to visit friends and relatives as they are less likely to have a specific pretravel healthcare encounter compared with other travellers.^{17,18}
- Mobile families are more likely to have missed vaccines due to having multiple healthcare providers. Other lifestyle risk factors, including sexual practices, drug use and smoking, are also indications for specific vaccines.*

O – Occupation

 People in certain occupations have higher risks of acquiring certain VPDs and therefore may have specific vaccine needs.* Examples are healthcare workers, laboratory personnel and those working with children or who are in close contact with animals.

* Vaccine recommendations for specific at-risk groups are outlined in The Australian Immunisation Handbook.⁴

vaccines listed on the NIP.⁶ This schedule, implemented by the Government's Immunise Australia Program, currently includes vaccines to prevent 16 infectious diseases for people in specified age or risk groups, of which there are four vaccine-preventable diseases targeted for prevention in adults (influenza, pneumococcal disease, pertussis and herpes zoster). Other vaccines recommended by the *Handbook* are funded by some state or territory health departments and some workplaces or are available for purchase privately.

Zoster

A single dose of live attenuated herpes zoster vaccine is recommended for all adults 60 years and older to prevent shingles and postherpetic neuralgia. Since November 2016, the vaccine has been included in the NIP for all adults at 70 years of age, with a catch-up program for those aged 71 to 79 years until October 2021. People aged 70 years and older have a higher risk of disease than younger people and on balance vaccination in the age group 70 to 79 years is the most cost-effective in terms of population-level use of the vaccine.¹⁹ The zoster vaccine is, however, contraindicated in people who are immunosuppressed due to either a medical condition (including leukaemia, lymphoma and untreated HIV infection) or medical treatment (including but not limited to most biological immuno-suppressives and immunomodulators, with the exception of certain short-term or low-dose corticosteroids and other drugs, as listed in the *Handbook*).⁴

The zoster vaccine is formulated from the same varicella–zoster virus strain as the childhood varicella (chickenpox)

3. ADULT IMMUNISATION: RESOURCES FOR GPS

National Immunisation Program Schedule; 2016

Immunise Australia Program, Australian Government Department of Health. Information about the recommended and fully funded vaccine plan by age group under the National Immunisation Program, 2016

 www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/ national-immunisation-program-schedule

The Australian Immunisation Handbook 10th ed; 2017 update

Australian Technical Advisory Group on Immunisation, Australian Government Department of Health, Canberra (online printable pdfs)

 www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/ Handbook10-home

The last print (hardcopy) version of the *Handbook* (10th edition, 2013) is no longer the most up to date version. It is very important for immunisation providers to check this online version for regular updates.

Pre-vaccination screening

- Table 2.1.1 Pre-vaccination-screening-checklist
- www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/ Handbook10-home~handbook10part2~handbook10-2-1#table-2-1-1
- Table 2.1.2 Responses to relevant conditions or circumstances identified through the pre-vaccination screening checklist
 - www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/ Handbook10-home~handbook10part2~handbook10-2-1#table-2-1-2

National Centre for Immunisation Research and Surveillance (NCIRS)

Immunisation recommendations for adults in Australia; 2016

Summary of vaccine recommendations for adults from the 2015 update of *The Australian Immunisation Handbook* 10th ed

 www.ncirs.edu.au/assets/provider_resources/schedules/adult-immunisationschedule-table-September-2016.pdf

Online fact sheets

Online fact sheets on vaccine preventable diseases and vaccine safety for immunisation providers:

- www.ncirs.edu.au/provider-resources/ncirs-fact-sheets

Specifically:

- Vaccines for Australian adults (April 2017)
- Influenza vaccines for Australians (May 2017)
- Meningococcal vaccines for Australians (March 2017)
- Pertussis vaccines for Australians (March 2016)
- Zoster vaccine for Australian adults (October 2016)

vaccine but is of higher potency, containing approximately 14 times the concentration of live attenuated virus. Guidance for its use is available both in the *Handbook* and the NCIRS online fact sheet 'Zoster vaccine for Australian adults' (Box 3).⁴

Pertussis and tetanus

Pertussis vaccination using the low-dose (reduced diphtheria toxoid and pertussis antigen content) diphtheria-tetanusacellular pertussis vaccine (dTpa) is recommended and funded by states and territories for women in their third trimester of every pregnancy (ideally between 28 and 32 weeks gestation) to provide optimal protection to the newborn via the transfer of antibodies in utero. Vaccination at least seven days before delivery has been shown to prevent pertussis in 91% of infants under 3 months of age.²⁰ Women who do not receive pertussis vaccine while pregnant should be given it as soon as possible after giving birth. Any adult household contacts and carers of infants aged less than 6 months are recommended to have a dTpa vaccine at least two weeks before having close contact with the infant, or a booster dose if 10 years have elapsed since their previous dose.

A single dTpa booster dose is recommended for adults aged over 65 years if they have not received one in the previous 10 years. Healthcare workers are also required to receive a booster dose of dTpa vaccine every 10 years. Although there have been cases of 'breakthrough pertussis' in persons within 10 years after vaccination, this is still considered the most practicable interval for a routine recommendation. Further details on pertussis vaccines are available in the NCIRS online fact sheet 'Pertussis vaccines for Australians' (Box 3).

Adults over 50 years of age should receive a tetanus booster, provided they have had three prior doses and have not received a tetanus-containing vaccine in the previous 10 years. This can be given as dTpa to also provide protection against pertussis. Adults of any age who have a

TABLE. SUMMARY OF VACCINE RECOMMENDATIONS FOR ADULTS FROM THE 10TH EDITION OF *THE AUSTRALIAN IMMUNISATION* HANDBOOK (2017 UPDATE)⁴⁻⁶⁺

Vaccine- preventable disease	Vaccine abbreviation	Adult population group				
		All adults	Older people	Indigenous persons	Pregnant women [†]	Having at-risk medical conditions*
Influenza	QIV ⁺	✓ annually	65 years and over, annually	15 years and over, annually	1	✓ annually
Pneumococcal disease	23vPPV		65 years and over	50 years and over [†]		√ ŝ
	13vPCV					1
Measles, mumps, rubella	MMR	✓ born during or after 1966, if not immune				
Varicella	VV	✓ if not immune				
Herpes zoster	HZ	60 years and over	70 to 79 years			
Diphtheria, tetanus	dT*	50 years and over				1
Diphtheria, tetanus, pertussis	dTpa†	65 years and over			1	
Hepatitis A	НерА					1
Hepatitis B	НерВ			1		✓
Human papillomavirus	HPV	1				1
Meningococcal disease	MenBV	15 to 19 years				✓
	4vMenCV	15 to 19 years"				1
Haemophilus influenzae type b	Hib					1

= Included in the National Immunisation Program (NIP).⁶

Recommended by The Australian Immunisation Handbook (the Handbook) but not included in the NIP (note: some vaccines are funded for specified age groups in some states and territories).⁴⁵

Abbreviations: MenBV = meningococcal B vaccine; 4vMenCV = quadrivalent (A, C, W-135, Y) meningococcal conjugate vaccine; 13vPCV = 13-valent pneumococcal conjugate vaccine; 23vPPV = 23-valent pneumococcal polysaccharide vaccine.

* This table does not include vaccinations recommended for occupational/lifestyle at-risk groups or specific to travel. Refer to Chapters 3.2 (international travel) and 3.3 (groups with special vaccination requirements) in the Handbook. Refer also to disease-specific chapters in the Handbook for at-risk medical conditions recommendations and the National Centre for Immunisation Research and Surveillance (NCIRS) table 'Immunisation recommendations for adults in Australia'.^{4,5}

[†] Refer to Chapter 3.3.2 in the Handbook for recommendations for women planning pregnancy or after pregnancy.⁴

[†] Repeat/booster doses may be required. Refer to the NCIRS table 'Immunisation recommendations for adults in Australia'.⁵

[§] Included in the NIP for Indigenous Australians aged 15 to 49 years with at-risk medical conditions.

" To address the emergence of meningococcal W disease, some states have funded 4vMenCV immunisation programs for adolescents and young adults in 2017.

tetanus-prone wound, potentially including injuries sustained around the house or garden, should receive a booster dose of either dTpa or diphtheria–tetanus vaccine (dT) if more than five years have elapsed since their previous dose of a tetanuscontaining vaccine.

Influenza

Annual influenza vaccination is recommended for any person aged 6 months and over who would like to reduce their risk of influenza infection. It is included in the NIP for all people aged 65 years and over, and for Indigenous Australians, pregnant women (for both maternal and early infant protection) and people with at-risk medical conditions as listed in the *Handbook*.²¹ Workplace-based programs, particularly for healthcare workers, may also provide influenza vaccination for employees. The current quadrivalent influenza vaccines have now replaced the trivalent vaccines used for decades previously. Quadrivalent vaccines are inactivated vaccines that contain two influenza A virus and two influenza B virus strains, with the strains used determined annually based on global influenza epidemiology.

Although the estimated efficacy of influenza vaccine is only around 50%, its cost-effectiveness in offsetting annual influenza disease and in reducing health-care-associated costs is well established in the older population.²²⁻²⁵ Accumulating evidence suggests that immunity begins to wane three to four months following vaccination and vaccine effectiveness depends on vaccine similarity to the circulating viral strains; yearly revaccination is the best way to achieve optimal protection.²⁶

Further details on seasonal influenza vaccines available in Australia and their use can be found in the NCIRS online fact sheet 'Influenza vaccines for Australians' (Box 3).

Pneumococcal disease

The 23-valent pneumococcal polysaccharide vaccine (23vPPV) is included in the NIP for all non-Indigenous adults aged 65 years and over, Indigenous adults aged 15 to 49 years with medical risk factors and all Indigenous adults aged 50 years and over, with a booster dose for Indigenous adults five years following the first vaccination.

The 13-valent pneumococcal conjugated vaccine (13vPCV) has been registered for use in children since 2010 (included in the NIP since July 2011), and registered for use in adults aged 50 years and over since October 2011. This conjugated vaccine has the polysaccharide of each respective pneumococcal serotype linked to a carrier protein; this generates a more durable immune response, immunological memory and reduction in nasal carriage of the pneumococcus bacterium (*Streptococcus pneumoniae*), although covering fewer pneumococcal strains compared with the polysaccharide vaccine.

13vPCV is currently recommended for adults with medical condition(s) associated with increased risk of invasive pneumococcal disease, in addition to extra doses of 23vPPV.4 A large randomised doubleblind placebo-controlled trial of 13vPCV in adults in the Netherlands showed significant vaccine efficacies for the prevention of vaccine-type community-acquired pneumococcal pneumonia and of invasive pneumococcal disease (46% and 75%, respectively).27 However, the number of cases of invasive pneumococcal disease has been declining in Australia since 2011, probably as a result of herd immunity following the introduction of 13vPCV for infants.28 Publication of updated recommendations from the analysis of the efficacy of 13vPCV compared with 23vPPV in adults is expected soon.

Measles, mumps, rubella (MMR)

Adults who were born during or after 1966 should have received two doses of measlesmumps-rubella (MMR) vaccine (a live attenuated vaccine) as they are likely to lack natural immunity. Some adults in this age group are not immune to these diseases because vaccine coverage was low when they were children and they may have missed being vaccinated in the Measles Control Campaign in the 1990s for primary school-aged children or the subsequent Young Adult Measles Control Campaign, in 2001 for those aged 18 to 30 years.²⁹ Over 60% of all measles notifications between 2008 and 2011 were in people aged 15 to 49 years.³⁰ Outbreaks have also been linked to virus imported from nonimmune young-adult travellers to endemic regions.31

Although overall rubella notifications have remained low, the highest average annual rates of rubella notifications from 2008 to 2012 were in men aged 30 to 39 years and women aged 20 to 29 years.³² Vaccination against rubella is particularly important in women of child-bearing age before pregnancy, to prevent fetal infection and congenital rubella syndrome.

Mumps cases have been on the rise

nationwide in recent years. In particular, there has been a large outbreak in Western Australia, primarily affecting Aboriginal adolescents in regional and remote areas.³³ This further underpins the importance of ensuring high levels of two-dose MMR vaccination. All young adults should have their medical records checked for receipt of two doses of MMR vaccine, and be vaccinated (or have serological testing) if there is any doubt that past vaccination occurred. MMR vaccination for adults is not included in the NIP but is funded by some states and territories.

Meningococcal disease

There are three types of meningococcal vaccines available in Australia, covering the five most common (A, B, C, W-135, Y) of the 13 known serogroups of the meningococcus bacterium, Neisseria meningitidis. The two conjugate vaccines - meningococcal C conjugate vaccine (MenCCV) and quadrivalent (ACWY) meningococcal conjugate vaccines (4vMenCV) - contain meningococcal serogroup antigens conjugated to a carrier protein. The recombinant multicomponent meningococcal B vaccine (MenBV) contains four major protein antigens common to multiple meningococcal serogroup B strains. MenCCV is currently the only meningococcal vaccine included in the NIP, given to children at 12 months. The previously widely used quadrivalent polysaccharide vaccines have now been withdrawn from the market in Australia as they are less immunogenic than the quadrivalent conjugate vaccines, despite being less costly and still available in other countries.

From 2003 to 2015, following the commencement of the MenCCV vaccination program, meningococcal serogroup B was the main cause of invasive meningococcal disease in children and young adults. MenBV is recommended in a two-dose schedule for all adolescents aged 15 to 19 years due to their higher risk of meningococcal disease, particularly for those living in close quarters, and is available through private prescription. In South Australia, MenBV is funded from April 2017 for students in Years 10 to 12 as part of a two-year study (see the 'B Part of It' website, www.bpartofit.com.au).

Serogroup W has been an increasing cause of meningococcal disease since 2013, and in 2016 became the main serogroup causing invasive meningococcal disease, accounting for almost half of all serotyped cases. To address this, 4vMenCV has been funded by the states in 2017 for adolescents and young adults in New South Wales, Victoria, Queensland and Western Australia (age coverage varies between states). It is otherwise available through private prescription for anyone older than 2 months.

People with medical conditions or treatments that increase their risk of meningococcal disease should also receive MenBV and 4vMenCV; extra doses are indicated. 4vMenCV is also recommended for travellers to areas with an increased risk of exposure to meningococcal serogroups A, C, W-135 and Y, particularly the 'meningitis belt' of sub-Saharan Africa, and those travelling to mass gatherings, including the annual Hajj pilgrimage.

For further details on meningococcal vaccines, including who should be vaccinated, see the NCIRS online fact sheet 'Meningococcal vaccines for Australians' (Box 3).

Aboriginal and Torres Strait Islander (Indigenous) Australians

Indigenous Australians are eligible for additional vaccines under the NIP as they are at higher risk of acquiring and developing complications from vaccinepreventable diseases. Every effort should be made to identify Indigenous people in primary care to ensure their immunisation needs are met.

All Indigenous adults should have the annual influenza vaccine, and those aged 15 to 49 years with conditions increasing their risk of invasive pneumococcal disease and all those aged 50 years and over should receive the pneumococcal polysaccharide vaccine (23vPPV). Both of these vaccines are included in the NIP for these uses.

Given the increased risk of acquiring hepatitis B in this population, vaccination status should be reviewed in Indigenous persons and testing offered (for evidence of immunity from vaccination or past or chronic infection); vaccination can be provided if nonimmune.³⁴

Indigenous women of child-bearing age living in rural and remote Australia are more likely to be nonimmune to rubella than their non-Indigenous peers.³⁵ Seronegative Indigenous women can be identified before pregnancy and be given MMR vaccine to prevent congenital rubella syndrome and ensure adequate protection against measles.

Japanese encephalitis vaccination is recommended for residents of the outer islands in the Torres Strait.

Hepatitis B, MMR and Japanese encephalitis vaccinations for Indigenous adults are not included in the NIP but are funded by some states and territories.

Australian Immunisation Register

A milestone event occurred in late 2016 when the Australian Childhood Immunisation Register (ACIR) was expanded to become the Australian Immunisation Register (AIR). The change lays the foundation for a more holistic capture of vaccines given to people of all ages, with the long-term objective of providing a whole-of-life immunisation history.

The AIR will make tracking of adult vaccinations across different healthcare

providers easier and will assist with the monitoring of safety, quality, delivery and coverage of vaccinations among the adult population. The AIR uses the same processes of data transfer via general practice software as have been used to populate the ACIR; it will currently only add vaccines given prospectively from the time of commencing use in November 2016. As such, it will be some time before reliable population estimates can be derived.

Safety

Vaccines are subjected to rigorous testing in clinical trials and must pass stringent safety testing before being approved for use by the Therapeutic Goods Administration (TGA). Once in use, ongoing safety monitoring through a national spontaneous reporting surveillance system collates reports of adverse events following immunisations from health authorities, immunisation providers, consumers and vaccine sponsors. These reports are then reviewed by the TGA and are listed on the Database of Adverse Event Notifications, with summary data published annually.^{36,37}

There is now also an active surveillance system, AusVaxSafety, led by NCIRS. This system monitors vaccine safety through automated surveillance tools, including SmartVax and Vaxtracker, which send SMSs or web-based surveys to recently vaccinated people for more immediate real-time feedback. In 2017, AusVaxSafety will specifically track the safety profile of influenza and herpes zoster vaccines given to adults.



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Conclusion

In an ageing population with a high burden of vaccine-preventable diseases, vaccines are equally as important in adults as they are in children. Although there are many potential barriers to adult vaccination, these can be addressed. The use of the HALO principle can assist healthcare providers in starting the discussion on vaccination with adult patients. It should be every healthcare provider's business to make immunisation of adults their issue and an integral part of promoting a healthy lifestyle and healthy ageing. MI

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References

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