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Adult pneumococcal vaccination – accredited pharmacist's perspective

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Pneumococcal disease, caused by *Streptococcus pneumoniae* bacteria (also known as pneumococcus), is a major cause of morbidity and mortality in older persons. Pneumococcal disease includes pneumonia and invasive pneumococcal disease (IPD). Strategies to reduce pneumococcal disease burden are primarily centred on vaccination.

Rates of pneumococcal disease immunisation in Australians aged 65 years and older are sub-optimal. Data from New South Wales in 2015-2016, shows less than half of persons aged 65 and older were immunised (42.7% males, 50.5% females).[1]

Accredited pharmacists conducting Home Medicine Reviews (HMRs) and residential Medication Management Reviews (RMMRs) have an opportunity to identify patients likely to benefit from pneumococcal vaccination.

Streptococcus pneumoniae

Streptococcus pneumoniae is transmitted from person to person through contact with respiratory droplets of colonised people. In most cases, pneumococci are carried for weeks to months in the nasopharynx before being cleared by the immune system.

More than 90 capsular antigenic types (serotypes) of *S. pneumoniae* have been identified, but only a limited number cause most of the pneumococcal disease. Pneumococcal vaccines are designed to cover the serotypes most frequently associated with severe pneumococcal disease.

Almost all pneumococcal disease begins with nasopharyngeal colonisation. Pneumococci may spread from the nasopharynx into adjacent sites to cause non-invasive disease such as sinusitis, otitis media or pneumonia (without bacteraemia). Pneumococci can also enter the bloodstream to cause severe systemic disease such as bacteraemia, meningitis and, rarely, infection in remote sites such as joints, bones and soft tissues.

Pneumococcal disease

Non-invasive pneumococcal pneumonia occurs far more frequently than invasive pneumococcal disease (IPD), which has a high case fatality rate. Thus the greatest burden of disease rests with pneumococcal pneumonia rather than IPD.[2] Among people aged over 65 years, there is a 5-fold increase in the

incidence of and death due to pneumococcal community-acquired pneumonia (CAP).[3] Pneumococcal pneumonia accounts for 20% of hospitalisations for all CAP in Australia.[2]

Young children, older adults, Aboriginal and Torres Strait Islander Australians, and people with certain underlying conditions are at a higher risk of IPD than others. In older people, IPD occurs at a rate of 20–60 per 100,000 elderly people per annum with a fatality rate of 15–20%.[4]

IPD involves infection of normally sterile sites, such as blood, cerebrospinal fluid, pleural or synovial fluid.

Major categories of invasive pneumococcal disease include:

- meningitis
- pneumonia with bacteraemia
- bacteraemia

Meningitis is associated with the highest case-fatality rate and possible neurological sequelae among survivors. Bacteraemia without focus, including at bones, joints and soft tissues is the commonest clinical category in young children.

Rates of IPD and death rates for children have fallen dramatically in Australia since the introduction of vaccination in 2005.[4] Unfortunately IPD rates remain high among older Australians, with hospitalisations and deaths rising since the introduction of funded vaccines in 2005.[4]

Treatment

Treatment of pneumococcal disease is use of appropriate b-lactam antibiotics, although resistance is developing rapidly. Intravenous benzylpenicillin is the drug of choice for pneumococcal pneumonia, followed oral amoxicillin. For patients hypersensitive to penicillins, ceftriaxone or cefotaxime is recommended. For adults with immediate hypersensitivity to penicillins, oral or IV moxifloxacin or oral doxycycline is recommended in the Therapeutic Guidelines.

To prevent pneumococcal disease, immunisation is recommended for high-risk groups and older people.

Risk factors

Risk factors for CAP include age >65 years, male gender, dysphagia, immunosuppressive conditions, and conditions such as COPD, cardiovascular disease, cerebrovascular disease, HIV infection, chronic liver or renal disease, and diabetes mellitus.[5] Neurological disorders such as dementia, epilepsy, Parkinson's disease and multiple sclerosis have approximately twice the risk of CAP compared to persons without these conditions.[5] Lifestyle factors such as smoking, high alcohol intake, being underweight, living in a large household or having regular contact with children are associated with an increased risk of CAP.[5] Adherence to good dental hygiene is also associated with a reduced risk of CAP.[5]

Conditions associated with the highest increased risk of IPD include:[6]

- Asplenia
- Solid organ transplant
- Myeloma
- Lymphoma

Hodgkin lymphoma
Chronic renal failure
HIV infection

People with conditions associated with an increased risk of IPD, for example:[6]

Diabetes mellitus
Alcohol dependence
Chronic cardiac disease
Chronic lung disease, including severe asthma in adults
Chronic liver disease
Tobacco smoking
Down syndrome
Preterm birth at less than 28 weeks' gestation

Pneumococcal immunisation is recommended for all people with COPD.[7] Vaccination also reduces the likelihood of an exacerbation of COPD, with a number needed to treat (NNT) of 8 to prevent one exacerbation.[7] A significant additive effect of pneumococcal immunisation to annual influenza immunisation has been shown.[7]

Australian diabetes guidelines recommend vaccination with pneumococcal vaccine in people with diabetes aged less than 65 years, and revaccination at 65 years of age or after 10 years, whichever is later.[8] People with type 2 diabetes aged older than 65 years of age require a single dose and revaccinate after five years.

Australian guidelines recommend pneumococcal vaccination in people with end stage kidney disease (ESRD).[9]

Vaccines

Pneumococcal vaccine is preventive against pneumococcal disease caused by *Streptococcus pneumoniae* serotypes. Pneumococcal disease can cause severe invasive disease, including meningitis, pneumonia and bacteraemia, and non-invasive disease, including otitis media and sinusitis.

Pneumococcal vaccine is recommended for all adults aged 65 years and older, Aboriginal and Torres Strait Islander adults aged 50 years and older and those aged 15 to 49 years of age with medical at risk factors. However; rates of immunisation across these groups remains suboptimal, despite the availability of a nationally funded program. NSW Health survey data for 2015-2016 shows less than 50% of all adults aged 65 years and older and 32.9% of Aboriginal peoples aged 65 years and over had received pneumococcal disease immunisation.[1] For Aboriginal and Torres Strait Islander people aged 15 to 49 years with medical risk factors, pneumococcal coverage is estimated at an unacceptable 13%.[10]

There are 2 major types of pneumococcal vaccines – pneumococcal conjugate vaccine (PCV) and pneumococcal polysaccharide vaccine (PPV). Vaccine formulations vary in the number of pneumococcal serotypes included in the vaccine (valency).

Polyvalent pneumococcal vaccines included in the National Immunisation Program (NIP) schedule[11] include:

- 23vPPV (*PNEUMOVAX®23*)
- 13vPCV (*PREVENAR® 13*)

Introduced in 2005, *PNEUMOVAX®23* vaccine is available free on the NIP to groups considered at risk of pneumococcal infection including all:

- Aboriginal or Torres Strait Islander aged 50 years of age and over and those aged 15 to 49 years of age with medical at risk factors
- Children aged four years of age who have a chronic medical condition and considered at high risk of increased complications from a pneumococcal infection
- Persons 65 years of age and over

23vPPV is around 60-80% effective for IPD in immunocompetent adults.[12],[13] UK observational data shows moderate effectiveness (48%) of the 23-valent vaccine against invasive disease within 2 years of vaccination in adults 65 years and over.[14] Immune responses to 23vPPV are similar in older people (aged 70–80 years) and younger people (aged 50–60 years), but poor in people who are immunocompromised.[12] Following the national funding of 23vPPV in 2005, there was a 35% decline in total IPD in people aged 65 years and older.[13]

The protective effect of 23vPPV against pneumococcal CAP is controversial. Some studies show no significant protective efficacy against pneumococcal pneumonia,[15] whilst other studies have shown effectiveness is up to 50%.[16] Higher protection has been shown in people younger than 75 years, women, and persons with lobar pneumonia or healthcare-associated pneumonia.[17] There is no protective effect against non-vaccine serotypes.[17]

The CAPITA study, a large randomised controlled trial in people aged 65 years and over in the Netherlands, found 13vPCV was effective in preventing vaccine-type CAP and IPD. The study found a vaccine effectiveness of 46% against vaccine-type pneumococcal CAP, 22% against all-type pneumococcal CAP and 5% against all-cause CAP.[18] There is only limited safety information on the 13-valent conjugate vaccine in adults and it is not currently funded under the NIP for this group of patients.

13vPCV is recommended under the NIP for healthy infants and young children. It is also recommended, but not funded, for people with chronic conditions with a high risk of pneumococcal infection. 13vPCV is highly effective (over 80-90%) against IPD due to 13vPCV serotypes in children.[19] Childhood vaccination programs generate herd protection by reducing colonisation and thus halting transmission at the population level.

Dose and administration

A single dose of 23vPPV is recommended and NIP funded for all non-Indigenous adults at 65 years of age. As of December 2011, a second or subsequent 23vPPV dose is no longer recommended for non-Indigenous adults other than for those adults who have conditions predisposing them to increased risk. Adults aged more than 65 years who did not receive a dose at 65 years of age are recommended to receive a single catch-up dose of 23vPPV as soon as possible.

For Aboriginal or Torres Strait Islander adults aged 50 years, an initial dose of 23vPPV is recommended, followed by a second dose 5 years after the first dose.

All adults with at-risk conditions are recommended to receive up to 3 lifetime doses of 23vPPV. For ATSI people with medical risk factors, initial vaccination is recommended at age 15 to 49 years. The second 23vPPV dose is recommended approximately 5 to 10 years (minimum 5 years) after the first 23vPPV dose; with a third dose at age 50 years or at least 5 years after the second dose. For non-Indigenous adults, the 3rd dose of 23vPPV is recommended at age 65 years or at least 5 years after the second dose.

The 13vPCV should be considered as an alternative first vaccination in unvaccinated older people, followed 2-6 months later by the polysaccharide vaccine (23vPPV).[20] However, 13cPCV is only funded on the NIP for children up to 5 years of age.

The intramuscular route is preferred. A 3-fold greater rate of injection site reactions is found following administration of 23vPPV by the subcutaneous route.

Pneumococcal vaccine can be administered at the same time as the influenza vaccine. The herpes zoster or shingles vaccine *ZOSTAVAX®* can be given at the same time as 23vPPV, using separate injection sites and syringes.[21] However, product information for *PNEUMOVAX®23* advises against concomitant use with *ZOSTAVAX®* because a clinical trial resulted in reduced immunogenicity of *ZOSTAVAX®*, and recommends separation of administration of the two vaccines by at least 4 weeks.[22]

Age group	Vaccine brand	Dose
15-49 years		
Aboriginal and Torres Strait Island people with medical risk factors	*PNEUMOVAX®23*	Initial dose, followed by second dose 5-10 years later, and third dose at 50 years or at least 5 years after the second dose
50 years and over		
Aboriginal and Torres Strait Island people without medical risk factors	*PNEUMOVAX®23*	Initial dose, followed by second dose 5 years later
65 years and over		
without medical risk factors	*PNEUMOVAX®23*	Single dose at 65 years
Adults		
with newly identified conditions associated with increased risk of IPD	*PNEUMOVAX®23*	Initial dose at diagnosis, 2 further doses at least 5 years apart
Adults		
with newly identified conditions associated with the highest increased risk of IPD	*PREVENAR 13®* *PNEUMOVAX®23*	1 lifetime dose of 13vPCV and 3 doses of 23vPPV

Table 1 – Adult pneumococcal vaccination schedules

A tool to identify the recommended pneumococcal vaccination regimen is available on the PneumoSmart website (**http://www.pneumosmart.org.au/clinicians/vaccination-tool/**).

Adverse effects

Local reactions are common, more so after 13vPCV (71–82% of participants) than after 23vPPV (62–76%). Adverse events are usually mild and self-limiting. Adverse reactions should be reported.

Systemic reactions such as myalgia, fever and chills are common with *PNEUMOVAX®23*. Local and systemic adverse events are more common after a repeat dose of *23vPPV* than after the 1st dose in adults.

In people who receive 23vPPV:

about 50% or more have some soreness after the 1st dose
about 20% have swelling and redness
up to 5% have moderate or severe local adverse events that limit arm movement after the 1st dose
up to 10% have fever ≥37.5°C, but high fever is uncommon

Role of accredited pharmacists

The unacceptably low rates of pneumococcal disease vaccination present an opportunity for accredited pharmacists to make a positive impact. The most important factor influencing vaccination in older persons is a recommendation from a health professional.[4] Accredited pharmacists should actively determine vaccination status during HMRs and RMMRs, either from the referral, case notes and/or My Health Record. Discussion with the patient on the benefits and recommendations to general practitioners (GPs) should be an integral part of medication reviews in older people.

Summary

Pneumococcal disease is an infectious bacterial disease, most frequently occurring in young children and in older persons. Pneumococcus is a major cause of illness among older people and the most important pathogen in deaths due to respiratory infection. The most common form of pneumococcal disease in adults is pneumococcal pneumonia. *Streptococcus pneumoniae* is responsible for a considerable burden of illness and death in adults, usually from pneumonia and less often from invasive pneumococcal disease.

There is consistent strong evidence that vaccination is effective in preventing invasive pneumococcal disease. A dose of *PNEUMOVAX®23* should be given to all adults at 65 years of age. A second dose is no longer recommended for non-Indigenous adults aged 65 years and over without conditions that predispose them to an increased risk of invasive pneumococcal disease.

Accredited pharmacists conducting medication reviews on older people can ensure patients are made aware of their increased risk of IPD and strongly encourage vaccination where appropriate. Accredited pharmacists can play a crucial role in helping to reduce the burden of pneumococcal disease.

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[22] PNEUMOVAX®23 Product Information

Before prescribing, please review the Product Information available at www.seqirus.com.au/PI

PNEUMOVAX®23 MINIMUM PRODUCT INFORMATION.

PNEUMOVAX®23 (Pneumococcal vaccine, polyvalent). Purified capsular polysaccharides from 23 pneumococcal types. INDICATIONS: Immunisation against pneumococcal disease of the specified capsular types in all persons over 65 years; Aboriginal and Torres Strait Islander people over 50 years; individuals over age 2 with asplenia; immunocompromised patients at increased risk of pneumococcal disease; immunocompetent persons at increased risk of complications from pneumococcal disease; patients with cerebrospinal fluid (CSF) leaks; tobacco smokers. CONTRAINDICATIONS: Hypersensitivity to any component of the vaccine. PRECAUTIONS: Immunocompromised Patients: Chemotherapy or immunosuppressive therapy (e.g. in Hodgkin's disease); continue proven antibiotic prophylaxis against pneumococcal infection after vaccination. General: Intradermal administration may cause severe local reactions. May not be effective in preventing meningitis in patients with chronic CSF leakage. Exercise care with individuals with severely compromised cardiac and/or pulmonary function; consider delaying vaccination in febrile respiratory illness or active infection. Paediatric Use: Not recommended in children aged under 2; Pregnancy: Category B2. Lactation: Caution in nursing mothers. ADVERSE EFFECTS: Most commonly, fever and injection site reactions including soreness, erythema, warmth, swelling and local induration. Compared with primary vaccination, an increased rate of local reactions has been observed with revaccination at 3–5 years following primary vaccination. Cellulitis-like reactions have been reported in post-marketing experience. DOSAGE AND ADMINISTRATION: 0.5mL subcutaneously or intramuscularly only. Do not inject intravenously. Intradermal administration should be avoided. Give two weeks before elective splenectomy, commencement of cancer chemotherapy, or immunosuppressive therapy. Avoid vaccination during chemotherapy or radiation therapy. Revaccination is recommended in some at risk individuals; consult the Australian Immunisation Handbook regarding revaccination. Based on approved Product Information: 09 March 2017.

Seqirus (Australia) Pty Ltd. ABN 66 120 398 067, 63 Poplar Road Parkville, Victoria 3052. www.seqirus.com.au. Medical Information: 1800 642 865. ® PNEUMOVAX 23 is a registered trademark of Merck & Co. Inc. Whitehouse Station, NJ, USA. Seqirus™ is a trademark of Seqirus UK Limited or its affiliates. Date of preparation: May 2019. SEQ/PNEU/0519/0132.

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