VACCINATION RECOMMENDATIONS FOR SOUTH AFRICAN ADULTS WITH AUTOIMMUNE RHEUMATIC DISEASES

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VACCINATION CONSIDERATIONS IN AUTOIMMUNE RHEUMATIC DISEASES (AIRDS)

• Epidemiology of vaccine preventable infections
• Does vaccination alter the burden of infectious diseases in AIRDS?
• Efficacy of vaccinations
• Safety of vaccinations
• Do vaccinations cause autoimmune diseases or flares?
• Is vaccination in AIRDS cost effective?
Since their implementation, smallpox has been eradicated, and diseases like polio, measles, mumps, and rubella are on their way out.
MEASLES IS VERY CONTAGIOUS!
For every one person that has it 90% of the people close to that person, who are not immune, will also become infected
POPULATION IMMUNITY
NUMBER OF VACCINATION GUIDELINES AND RECOMMENDATIONS

- Advisory Committee on Immunization Practices (ACIP) Recommended Immunization Schedule for Adults Aged 19 Years or Older, United States, 2019
- 2013 Infectious Diseases Society of America (IDSA) Clinical Practice Guideline for Vaccination of the Immunocompromised Host
- 2015 ACR Guideline for the Treatment of Rheumatoid Arthritis
- EULAR Recommendations for Vaccination in Adult Patients with Autoimmune Inflammatory Rheumatic Diseases, 2011. Recently abstract published in 2018
- A Practical Approach to the Vaccination of patients with AIRDS in Australia, 2017
- A Practical Guide to Adult Vaccination for Patients with Autoimmune Inflammatory Rheumatic Diseases in India, 2017
<table>
<thead>
<tr>
<th>Inactivated vaccines</th>
<th>Live attenuated vaccines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza (injectable)</td>
<td>BCG</td>
</tr>
<tr>
<td>Diphtheria, tetanus, pertussis</td>
<td>Measles, mumps, rubella</td>
</tr>
<tr>
<td>Haemophilus influenza type b</td>
<td>Oral polio</td>
</tr>
<tr>
<td>Hepatitis A/B</td>
<td>Oral typhoid</td>
</tr>
<tr>
<td>Human papillomavirus</td>
<td>Rotavirus</td>
</tr>
<tr>
<td>Meningococcal</td>
<td>Varicella</td>
</tr>
<tr>
<td>Pneumococcal</td>
<td>Yellow fever</td>
</tr>
<tr>
<td>Injectable polio</td>
<td>Zoster</td>
</tr>
<tr>
<td>Typhoid vaccine</td>
<td>Live intranasal influenza</td>
</tr>
<tr>
<td>Others</td>
<td></td>
</tr>
<tr>
<td>Cholera, Japanese encephalitis, tick borne</td>
<td></td>
</tr>
<tr>
<td>encephalitis</td>
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</tbody>
</table>
Streptococcus pneumoniae
PPV23 is more commonly used than the conjugate vaccine, and vaccination should be considered

Haemophilus influenza B
Anatomic and functional hyposplenia/asplenia

Influenza viruses
The vaccine differs each year; therefore, annual influenza vaccination should be considered

Herpes zoster virus
More research is needed, nevertheless, vaccination might be of benefit

Hepatitis viruses
Hepatitis A and hepatitis B vaccination is recommended for patients "at risk"*

Human papillomavirus
Vaccination should be considered for selected patients†
FACTORS TO CONSIDER WHEN VACCINATING PATIENTS

• Type of vaccine
  • Conjugate pneumonia vaccine (T cell dependent),
  • PCV13 or prevnar 13 Polysaccharide pneumonia vaccine (T cell independent), PPSV 23 or pneumovax

• Disease activity
  • High dose drug therapy
    • Prednisone > 2mg/kg or ≥ 20mg/day for ≥ 14 days
    • Prednisone > 10mg/day for 7 days
    • Biologic DMARD
  • Low level immunosuppression maybe recommended
    • Topical, intra-articular steroids
    • Low dose prednisone or ≥ 20mg/day for ≥ 14 days
    • MTX ≤ 0.4mg/kg/week
    • Azathioprine ≤ 3mg/kg/day

• Factors that apply to other healthy individuals including age, comorbidities

Wong. RACP. 2017
Rubin LG.IDSA guidelines. 2013
GENERAL PRINCIPLES

• Balance between availability, resources, cost of vaccines and evidence to support the use of the vaccine
• Each patient visit is an opportunity to review, update and document vaccinations
• Assess risk benefit ratio and individualise management
• Appropriate vaccinations should be administered before initiating drug therapy
• Inactivated vaccines
  • generally safe and can be administered during treatment with cDMARDs or biologics
  • ≥ 2 weeks prior to initiation of therapy
  • If already on treatment vaccines should be administered during the period of lowest disease activity and the lowest dose of immunosuppressive therapy
GENERAL PRINCIPLES
LIVE VACCINES

• Live vaccines generally avoided if possible
  • administer ≥4 weeks prior to initiation of immunosuppression
  • can be administered during treatment with sulfasalazine and hydroxychloroquine (5 European countries and Australia)
  • consider administration to patients on low dose immunosuppression (especially herpes zoster)
  • immunosuppressed patients should avoid contact with household contacts who have received live vaccines

IDA guidelines. 2013
Van Assen. Ann Rheum Dis. 2011
GENERAL PRINCIPLES
LIVE VACCINES

• Safe time intervals before live vaccines
  • 4 weeks after high-dose corticosteroid therapy
  • Wait 5 half-lives after the administration of biological agents or disease-modifying drugs (3–12 months),
  • 6 to 12 months after rituximab
  • 2 years after leflunomide
• Restart biologic 1 month after vaccination
• Emphasis on vaccination of immunocompetent household contacts
• Patients with AIRD who wish to travel should attend a travel medicine consultation at least 6 months in advance

IDSA guidelines 2013
EULAR recommendations. 2018
Welcome to Amayeza Information Centre

The word “Amayeza” means “Medicine” in the Xhosa language.

We are an independent medicine information centre that aims to provide reliable, accurate, objective, and up-to-date information on medicine to pharmacists and other health care professionals across South Africa.

Please note that our services are subscription-based. In order for you to benefit from our up-to-date medicine information, you will need to be a subscriber of Amayeza Information Services. For more information regarding subscriptions, click here.
<table>
<thead>
<tr>
<th>DISEASE</th>
<th>VACCINE</th>
<th>RECOMMENDATION</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFLUENZA</td>
<td>VAXIGRIP® / Infuvac®</td>
<td>1 dose annually</td>
<td>No benefit of 2 doses in 1 season&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Recommended for pregnant women, irrespective of trimester&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>TETANUS, DIPHTHERIA, PERTUSSIS, POLIO</td>
<td>Td and Tdap-IPV</td>
<td>1 Tdap-IPV and then Td every 10 years&lt;sup&gt;c&lt;/sup&gt;</td>
<td>If vaccine status is not known but it has not been given within the last 5 years, then a dose can safely be given. Recommended for pregnant women, ideally between weeks 16 and 32&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>DIFTAVAX® / ADACEL QUADRA® / Boostrix Tetra®</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEASLES, MUMPS, RUBELLA</td>
<td>MMR</td>
<td>1 or 2 doses&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Depends on prior vaccination. If previous vaccination status is unknown, the vaccine should be given, as it is not a problem to give extra doses.&lt;sup&gt;e&lt;/sup&gt; If only measles is required, then Measbio can be given.</td>
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<tr>
<td></td>
<td>Priorix&lt;sup&gt;e&lt;/sup&gt;</td>
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<tr>
<td>CHICKEN POX</td>
<td>Varicella Varilix®, Onvara®</td>
<td>2 doses at least 6 weeks apart&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Depends on prior vaccination. Onvara is currently licenced as a single dose. If previous vaccination status is unknown, the vaccine should be given, as it is not a problem to give extra doses.&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>SHINGLES (Herpes zoster)</td>
<td>ZOSTER</td>
<td>1 dose &gt;50 years</td>
<td>Preferably &gt;60 years. Currently only one dose is recommended. Can be given to someone who has already had an attack of shingles, but cannot be used as treatment.</td>
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<tr>
<td></td>
<td>Zostavax®</td>
<td></td>
<td></td>
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<tr>
<td>HUMAN Papilloma VIRUS</td>
<td>HPV Cervarix®, Gardasil®</td>
<td>3 doses (0, 1-2, 6 months)</td>
<td>See notes&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>PNEUMOCOCCAL</td>
<td>PCV13</td>
<td>1 dose PCV13 &gt; 50 years of age&lt;sup&gt;h&lt;/sup&gt;, If &gt;65 years, 1 dose of PCV13 followed one year later by 1 dose of PPSV23&lt;sup&gt;i&lt;/sup&gt;</td>
<td>Additional information for high risk adults.&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Prevenar®, PPSV23 Pneumovax®</td>
<td></td>
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</tr>
<tr>
<td>HEPATITIS A</td>
<td>AVAXIM®, Havrix®</td>
<td>2 doses at least six months apart&lt;sup&gt;e&lt;/sup&gt;</td>
<td>For those who are not immune. (May be advisable to test antibody levels) Having additional doses is not a problem.&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>HEPATITIS B</td>
<td>HEBERBIO HBV®, Engerix B®, Euvax B®</td>
<td>3 doses, schedule depends on product</td>
<td>For those who are not immune. (May be advisable to test antibody levels) Having additional doses is not a problem.&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>HEPATITIS A and B</td>
<td>Twinrix®</td>
<td>3 doses (0,1 and 6 months)</td>
<td>This vaccine is an option if protection against both hepatitis A and B is required. Each dose has a paediatric dose of hepatitis A. there is an accelerated schedule. (day 0, 7 and 21, with a booster a year later)</td>
</tr>
<tr>
<td>MENINGOCOCCAL</td>
<td>MENACTRA®</td>
<td>1 dose</td>
<td>For high risk patients and see notes for additional recommendations&lt;sup&gt;1c&lt;/sup&gt;</td>
</tr>
<tr>
<td>HAEMOPHILUS INFLUENZAE type B</td>
<td>Hiberix®</td>
<td>1 dose</td>
<td>For high risk patients only&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

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*Recommended for all who meet age requirements and have no contraindications, and are not already immune.*

*Recommended for those with additional medical conditions or other indications.*
<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Influenza</strong></td>
<td>1 dose annually</td>
</tr>
<tr>
<td><strong>Pneumococcal</strong></td>
<td></td>
</tr>
<tr>
<td>- PCV 13</td>
<td>At least one dose in a lifetime</td>
</tr>
<tr>
<td>- PPSV 23</td>
<td>1-3 doses &lt; 65 years and 1 dose after 65 years</td>
</tr>
<tr>
<td><strong>Hepatitis B</strong></td>
<td>3 doses (0, 1, and 6 months)</td>
</tr>
<tr>
<td><strong>Human papilloma virus (HPV)</strong></td>
<td>2-3 doses through to age 26</td>
</tr>
<tr>
<td><strong>Zoster</strong></td>
<td></td>
</tr>
<tr>
<td>- Zoster vaccine live (ZVL)</td>
<td>1 dose ZVL at age ≥ 50 yrs</td>
</tr>
<tr>
<td>- Recombinant zoster virus (RZV)</td>
<td>≥ 50 years 2 doses Immunocompetent patients</td>
</tr>
<tr>
<td><strong>Tdap</strong></td>
<td>16-32 weeks each pregnancy</td>
</tr>
<tr>
<td><strong>Td</strong></td>
<td>Every 10 years</td>
</tr>
</tbody>
</table>
FLU: EVERYONE 6 MONTHS & OLDER NEEDS FLU VACCINE EVERY YEAR

- 8-10% of patients hospitalized for pneumonia and 25% of patients with flu-like illness (fever and cough) will test positive for influenza.
- Mortality in South Africa between 6000 and 11000 deaths a year
- On average flu season starts in June, lasts 12-25 weeks
- Only the trivalent vaccine is currently available in SA

Sources:
Boyles. Jour Thoracic Dis. 2017
NICD website
Cohen C. 2015
Wong PK. 2017
• Influenza vaccine reduces admissions and mortality in elderly pts with pneumonia in rheumatological disease or vasculitis

• Acceptable (but reduced) humoral response on methotrexate or TNF inhibitors in rheumatoid arthritis

• Hampered humoral responses following influenza vaccination after treatment with rituximab and abatacept.

• Of note, azathioprine hampered the response following influenza vaccination in patients with SLE but the majority of patients still develop protective levels of antibodies 

CASE SCENARIO

30 year old female with SLE
Known positive antibodies, arthritis and DLE
Low disease activity at present

Clinician recommends the annual influenza vaccine

Considerations
Does she need the vaccine?
Patient has an egg allergy
Patient wants to know
• will the vaccine cause the flu?
• if the vaccine will cause a disease flare?

Van Assen. Annals Rheum Dis. 2011
PNEUMOCOCCAL VACCINE

- Recommended in patients ≥ 50 years and earlier if comorbidities
- In South Africa PCV 13 has been included in childhood program since 2009
- Registered for adults 2014
- Recommend both
  - PPCV13 (prevnar), conjugated and PSV 23 (pneumovax)
  - Order and timing important - better response if PCV given first
  - Can use combinations of both depending on availability and resources
  - Only a single dose PCV 13 in adult life, more robust response

Boyles. Jour Thoracic Dis. 2017
AICP guideline 2019
PNEUMOCOCCAL VACCINE

- Methotrexate, rituximab, and abatacept were shown to decrease vaccine response.
- The results with TNF inhibitors are contradictory.
- Tocilizumab in rheumatoid arthritis and ustekinumab in psoriatic arthritis patients did not significantly change the vaccine response to PPSV23.

Wong. RACP.2017
65 year old newly diagnosed RA patient
Severe disease activity
Started on prednisone 10 mg daily and methotrexate 15 mg weekly

Which vaccinations would you consider in this patient?
How would you proceed with administering the pneumococcal vaccination?
Indicated to receive 1 dose of PCV13 at ≥ 19 years and 1 or 2 doses of PPSV23 at 19 through 64 years.

- PCV13 (at 19-64 years) → At least 8 weeks apart → PPSV23 (at 19-64 years) → At least 5 years apart → PPSV23 (at 19-64 years) → At least 5 years apart → PPSV23 (at ≥ 65 years)
Indicated to receive 1 dose of PPSV23 at 19 through 64 years

PPSV23 (at 19–64 years) → At least 1 year apart → PCV13 (at ≥ 65 years) → At least 1 year apart → PPSV23 (at ≥ 65 years)

At least 5 years apart
HEPATITIS

• Hepatitis B part of childhood vaccination in SA since 1995
• ACR/EULAR recommends screening and consideration of other risk factors before initiation of DMARDS or biologic therapy
• Coinfection of HIV and hepatitis B endemic in South Africa
• Increased risk of reactivation with immunosuppressive treatment particularly rituximab

ACR 2015
Van Assen. Ann Rheum Dis 2011
HUMAN PAPILLOMA VIRUS VACCINE

- Cervical cancer second most common cancer after breast cancer in SA
- Increased risk of HPV infection and cervical dysplasia in SLE
- Differences in government and private schedule
- Part of EPI, from 9 years of age since 2014
  - Bivalent vaccine (Cervarix) for girls only, cost R140
  - 2 doses six months apart given to grade 4 girls in public schools.
- Private schedule HPV
  - Quadrivalent vaccine (Gardasil) for boys and girls, cost R786
  - Course consists of 2-3 doses, 9-14 years of age

NICD. 2016
IDSA 2013
CDC 2018
VARICELLA ZOSTER VACCINE

- From age 50 risk of zoster and post herpetic neuralgia increases with age
- Lack of prospective studies in AIRDS
- Observational studies show increased risk of HZV
  - AIRDS
  - Cyclophosphamide, leflunamide, azathioprine
  - TNF blocking agents
- Live vaccine - zostavax R1523
- Recombinant vaccine - shingrix not available in SA
ZOSTER VACCINE

- NEJM 2005, Shingles prevention study
  - Live shingles vaccine (Zostavax):
    - Reduced incidence shingles by 51%
    - Reduced incidence of PHN by 66.5%
  - NEJM 2015, ZOE 50 and 70
  - Recombinant zoster vaccine (Shingrix)
    - Reduced incidence shingles by 97%
    - Reduced incidence of PHN by 91%
CASE SCENARIO

33 year old female
Newly diagnosed with SLE in summer
  • Lupus nephritis, arthritis
  • Prednisone 60 mg daily, anti-malarial
Which vaccinations would you administer?

CONCLUSIONS

• Administration of vaccines are a balance between resources, cost and benefit
• Vaccinate during the period of lowest disease activity and the lowest dose of immunosuppressive therapy
• Inactivated vaccines generally safe
• Live vaccines usually contraindicated, except for specific circumstances
• Influenza, pneumococcal disease, herpes zoster and HPV infection are all more common in patients with an AIRD or cause complications more frequently in these patients than in the general population.
• Treatment with rituximab, and probably abatacept, can suppress immune responses after vaccination
• Studies do not seem to indicate that vaccination exacerbates underlying AIRDS
Vaccine Information Statements (VIS)
http://www.cdc.gov/vaccines/pubs/vis/default.htm

Hepatitis B Vaccine

What You Need to Know

1. What is hepatitis B?

Hepatitis B is a serious illness that can harm the liver. It is caused by the hepatitis B virus (HBV).

- In 2009, about 18,000 people became infected with hepatitis B.
- Each year, 2,000 to 4,000 people die in the United States from cirrhosis or liver cancer caused by hepatitis B.

2. Hepatitis B vaccine: Why get vaccinated?

HBV vaccine can prevent hepatitis B and its complications, including liver cancer and death. HBV vaccine must be given by injection in the arm muscles.

- HBV vaccine can prevent hepatitis B.
- Many people with HBV infection do not have symptoms.

3. Who should get hepatitis B vaccine?

Children and Adolescents:
- Babies should get 3 doses of hepatitis B vaccine at 2, 4, and 6 months of age.
- 1 dose is given to children 1 year of age and older.

Adults:
- People who have had close contact with someone who has hepatitis B.
- People who have certain sexually transmitted diseases (STDs).
- People who have used injectable drugs or were exposed to someone else who uses injectable drugs in the past.
- People who have a family history of liver disease.
- People who have a medical condition that makes them more likely to get liver disease.

4. What if there is a moderate or severe reaction?

Any reaction should be reported to the local health department. Hepatitis B vaccine is recommended for all children at the age of 2 months of age and older. Hepatitis B vaccine is also recommended for all adults

5. The National Vaccine Injury Compensation Program

The National Vaccine Injury Compensation Program (VICP) was created in 1986 to provide funds for compensation to those who have suffered injury or death as a result of a vaccine. The program is separate from the federal vaccine safety system, and its funding is provided by the federal government.
GOOD RESOURCES FOR ADULT PATIENTS

• IAC’s handouts related to adult immunization
  www.immunize.org/handouts/adult-vaccination.asp

• IAC’s website for the public www.vaccineinformation.org

• VEC’s handouts on hepatitis A, meningococcal, HPV, influenza, shingles, and Tdap
  www.chop.edu/center-programs/vaccine-education-center/resources/vaccine-and-vaccine-safety-related-qa-sheets

• VEC’s “Vaccines and Adults” booklet

• National Foundation for Infectious Diseases www.adultvaccination.org
REFERENCES


WHY DO WE VACCINATE?

Why?

- The aim is to reduce morbidity and mortality from vaccine preventable conditions
- Concept of immune senescence
- Increased risk of infections and more severe disease with complications in autoimmune rheumatic inflammatory diseases (AIRDS)
MYTHS AND MISCONCEPTIONS

• I got the flu from the flu shot
• I never get the flu
• I do not like shots
• Vaccine does not work
• Natural infection is better
• Only old people die from the flu
• I can take Echinacea, vitamin C, ……
• Flu is not a serious disease
• If I have symptoms, I will stay home and not spread it
• Ingredients in vaccine are unsafe
• I am on _____ medicine and should not get the vaccine
Some Explanations Behind the Excuses

- Perceived Risk
- False Beliefs
- Overwhelmed
- Do not understand
- Unreliable vaccine information and negative media
- Prefer inactivity to negative outcomes
- Herd Immunity
- Alternate medical beliefs
- Previous adverse effects
- Provider attitudes
PATIENT CENTERED CARE

• Understand biomedical, social, and psychological factors relating to illness
• Patient autonomy
• Individualized care
• Involve patients in decision making – shared decision
• Be aware of your own response and unintended behaviors
• “Patients do not care how much you know until they know how much you care”
Recommended Adult Immunization Schedule
for ages 19 years or older

UNITED STATES 2019

How to use the adult immunization schedule

1. Determine recommended vaccinations by age (Table 1)
2. Assess need for additional recommended vaccinations by medical condition and other indications (Table 2)
3. Review vaccine types, frequencies, and intervals, and considerations for special situations (Notes)

Vaccines in the Adult Immunization Schedule*

<table>
<thead>
<tr>
<th>Vaccines</th>
<th>Abbreviations</th>
<th>Trade names</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haemophilus influenzae type b vaccine</td>
<td>Hib</td>
<td>ActHIB</td>
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<tr>
<td></td>
<td></td>
<td>Hiberix</td>
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<tr>
<td>Hepatitis A vaccine</td>
<td>HepA</td>
<td>Havrix</td>
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<tr>
<td></td>
<td></td>
<td>Vaqla</td>
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<td>Hepatitis A and hepatitis B vaccine</td>
<td>HepA-HepB</td>
<td>Twinrix</td>
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<td>Hepatitis B vaccine</td>
<td>HepB</td>
<td>Engerix-B</td>
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<td></td>
<td></td>
<td>Recombivax HB</td>
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<td></td>
<td></td>
<td>Heplira-B</td>
</tr>
<tr>
<td>Human papillomavirus vaccine</td>
<td>HPV vaccine</td>
<td>Gardasil 9</td>
</tr>
<tr>
<td>Influenza vaccine, inactivated</td>
<td>IIV</td>
<td>Many brands</td>
</tr>
<tr>
<td>Influenza vaccine, live attenuated</td>
<td>LAIV</td>
<td>FluMist Quadriivalent</td>
</tr>
<tr>
<td>Influenza vaccine, recombinant</td>
<td>RIV</td>
<td>Flublok Quadriivalent</td>
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<tr>
<td>Measles, mumps, and rubella vaccine</td>
<td>MMR</td>
<td>M-M-R II</td>
</tr>
<tr>
<td>Meningococcal serogroups A, C, W, Y vaccine</td>
<td>MenACWY</td>
<td>Menactra</td>
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<td>Menveo</td>
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<td>Meningococcal serogroup B vaccine</td>
<td>MenB-4C</td>
<td>Bexsero</td>
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<tr>
<td></td>
<td>MenB-FHbp</td>
<td>Trumenda</td>
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<tr>
<td>Pneumococcal 13-valent conjugate vaccine</td>
<td>PCV13</td>
<td>Prevnar 13</td>
</tr>
<tr>
<td>Pneumococcal 23-valent polysaccharide vaccine</td>
<td>PCV23</td>
<td>Pneumovax</td>
</tr>
<tr>
<td>Tetanus and diphtheria toxoids</td>
<td>Td</td>
<td>Tenvac</td>
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<tr>
<td></td>
<td></td>
<td>Td vaccine</td>
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<tr>
<td>Tetanus and diphtheria toxoids and acellular pertussis vaccine</td>
<td>Tdap</td>
<td>Adacel</td>
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<tr>
<td></td>
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<td>Boostrix</td>
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<tr>
<td>Varicella vaccine</td>
<td>VAR</td>
<td>Varivax</td>
</tr>
<tr>
<td>Zoster vaccine, recombinant</td>
<td>RZV</td>
<td>Shingrix</td>
</tr>
<tr>
<td>Zoster vaccine live</td>
<td>ZVL</td>
<td>Zostavax</td>
</tr>
</tbody>
</table>

Recommended by the Advisory Committee on Immunization Practices (www.cdc.gov/vaccines/acip) and approved by the Centers for Disease Control and Prevention (www.cdc.gov), American College of Physicians (www.acponline.org), Academy of Family Physicians (www.aafp.org), American College of Obstetricians and Gynecologists (www.acog.org), and American College of Nurse-Midwives (www.midwife.org).

Report
- Suspected cases of reportable vaccine-preventable diseases or outbreaks to the local or state health department
- Clinically significant postvaccination reactions to the Vaccine Adverse Event Reporting System at www.vaers.hhs.gov or 800-822-7967

Injury claims
All vaccines included in the adult immunization schedule except pneumococcal 23-valent polysaccharide and zoster vaccines are covered by the Vaccine Injury Compensation Program. Information on how to file a vaccine injury claim is available at www.hrsa.gov/vaccinecompensation or 800-338-2382.

Questions or comments
Contact www.cdc.gov/cdc-info or 800-CDC-INFO (800-232-4636), in English or Spanish, 8 A.m.--8 p.m. ET, Monday through Friday, excluding holidays.

Download the CDC Vaccine Schedules App for providers at www.cdc.gov/vaccines/schedules/hcp/schedule-app.html.

Helpful information
- Complete ACIP recommendations: www.cdc.gov/vaccines/hcp/acip-recs/index.html
- General Best Practice Guidelines for Immunization (including contraindications and precautions): www.cdc.gov/vaccines/hcp/acip-recs/general-recs/index.html
- Vaccine Information Statements: www.cdc.gov/vaccines/hcp/vis/index.html
- Travel vaccine recommendations: www.cdc.gov/travel
- Recommended Child and Adolescent Immunization Schedule, United States, 2019: www.cdc.gov/vaccines/schedules/hcp/child-adolescent.html

*Administer recommended vaccines if vaccination history is incomplete or unknown. Do not restart or add doses to vaccine series for extended intervals between doses. The use of trade names is for identification purposes only and does not imply endorsement by the ACIP or CDC.
### Table 1: Recommended Adult Immunization Schedule by Age Group
United States, 2019

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>19–21 years</th>
<th>22–26 years</th>
<th>27–49 years</th>
<th>50–64 years</th>
<th>≥65 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza inactivated (IV) or Influenza recombinant (RIV)</td>
<td></td>
<td></td>
<td>1 dose annually</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Influenza live attenuated (LAIV)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Tdap or Td)</td>
<td></td>
<td></td>
<td>1 dose Tdap, then Td booster every 10 yrs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Varicella (VAR)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Zoster recombinant (HZV) (preferred)</td>
<td></td>
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<td></td>
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<tr>
<td>Zoster live (ZVL)</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Female</td>
<td>2 or 3 doses depending on age at initial vaccination</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Male</td>
<td>2 or 3 doses depending on age at initial vaccination</td>
<td></td>
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<tr>
<td>Pneumococcal conjugate (PCV13)</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal polysaccharide (PPSV23)</td>
<td></td>
<td></td>
<td></td>
<td>1 dose</td>
<td></td>
</tr>
<tr>
<td>Hepatitis A (HepA)</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Hepatitis B (HepB)</td>
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<tr>
<td>Meningococcal A, C, W, Y (MenACWY)</td>
<td></td>
<td></td>
<td>1 or 2 doses depending on indication, then booster every 5 yrs if risk remains</td>
<td></td>
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<tr>
<td>Meningococcal B (MenB)</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Haemophilus influenza type b (Hib)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 or 3 doses depending on indication</td>
</tr>
</tbody>
</table>

- Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of past infection
- Recommended vaccination for adults with an additional risk factor or another indication
- No recommendation
<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Pregnancy</th>
<th>Immunocompromised (excluding HIV infection)</th>
<th>HIV infection CD4 count &lt;200</th>
<th>HIV infection CD4 count ≥200</th>
<th>Asplenia, complement deficiencies</th>
<th>End-stage renal disease, on hemodialysis</th>
<th>Heart or lung disease, alcoholism</th>
<th>Chronic liver disease</th>
<th>Diabetes</th>
<th>Health care personnel</th>
<th>Men who have sex with men</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV or RIV</td>
<td></td>
<td>CONTRAINDICATED</td>
<td></td>
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<td>LAIV</td>
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<tr>
<td>Tdap or Td</td>
<td>1 dose Tdap each pregnancy</td>
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<tr>
<td>MMR</td>
<td>CONTRAINDICATED</td>
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<tr>
<td>VAR</td>
<td>CONTRAINDICATED</td>
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<tr>
<td>RZV (preferred)</td>
<td>DELAY</td>
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<tr>
<td>ZVL</td>
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<tr>
<td>HPV Female</td>
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<tr>
<td>HPV Male</td>
<td>3 doses through age 26 yrs</td>
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<td>HepA</td>
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<tr>
<td>HepB</td>
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<tr>
<td>MenACWY</td>
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<tr>
<td>MenB</td>
<td>PRECAUTION</td>
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<tr>
<td>Hib</td>
<td>3 doses HSCT recipients only</td>
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</tbody>
</table>

1. Precaution for LAIV does not apply to alcoholism. 2. See notes for influenza; hepatitis B; measles, mumps, and rubella; and varicella vaccinations. 3. Hematopoietic stem cell transplant.
**Recommended Adult Immunization Schedule**

**United States, 2019**

### Haemophilus influenzae type b vaccination

**Special situations**
- Anatomical or functional asplenia (including sickle cell disease): 1 dose Hib if previously did not receive Hib; if elective splenectomy, 1 dose Hib, preferably at least 14 days before splenectomy
- Hematopoietic stem cell transplant (HSCT): 3-dose series Hib 4 weeks apart starting 6–12 months after successful transplant, regardless of Hib vaccination history

### Hepatitis A vaccination

**Routine vaccination**
- Not at risk but want protection from hepatitis A (identification of risk factor not required): 2-dose series HepA (Havrix 6–12 months apart or Vaqta 6–18 months apart [minimum interval: 6 months]) or 3-dose series HepA-HepB (Twinrix at 0, 1, 6 months [minimum intervals: 4 weeks between doses 1 and 2, 8 weeks between doses 2 and 3, 16 weeks between doses 1 and 3]) or 3-dose series HepA-HepB (Twinrix at 0, 1, 6 months [minimum intervals: 4 weeks between doses 1 and 2, 5 months between doses 2 and 3])

**Special situations**
- At risk for hepatitis A virus infection: 2-dose series HepA or 3-dose series HepA-HepB as above
- Chronic liver disease
- Clotting factor disorders
- Men who have sex with men
- Injection or non-injection drug use
- Homelessness
- Work with hepatitis A virus in research laboratory or nonhuman primates with hepatitis A virus infection
- Travel in countries with high or intermediate endemic hepatitis A
- Close personal contact with international adoptee (e.g., household contacts of HBsAg-positive persons; residents and staff of facilities for developmentally disabled persons; health care and public safety personnel with reasonably anticipated risk for exposure to blood or blood-contaminated body fluids; hemodialysis, peritoneal dialysis, home dialysis, and predialysis patients; persons with diabetes mellitus age younger than 60 years and, at discretion of treating clinician, those age 60 years or older)
- Incarcerated persons
- Travel in countries with high or intermediate endemic hepatitis B

### Hepatitis B vaccination

**Routine vaccination**
- Not at risk but want protection from hepatitis B (identification of risk factor not required): 2- or 3-dose series HepB (2-dose series HepB at least 4 weeks apart (2-dose series HepB only applies when 2 doses of HepB are used at least 4 weeks apart) or 3-dose series Engerix-B or Recombivax HB at 0, 1, 6 months [minimum intervals: 4 weeks between doses 1 and 2, 8 weeks between doses 2 and 3, 16 weeks between doses 1 and 3]) or special series HepA-HepB (Twinrix at 0, 1, 6 months [minimum intervals: 4 weeks between doses 1 and 2, 5 months between doses 2 and 3])

**Special situations**
- At risk for hepatitis B virus infection: 2-dose (Hepadvac-B) or 3-dose (Engerix-B, Recombivax HB) series HepB, or 3-dose series HepA-HepB as above
  - Hepatitis C virus infection
  - Chronic liver disease (e.g., cirrhosis, fatty liver disease, alcoholic liver disease, autoimmune hepatitis, alanine aminotransferase [ALT] or aspartate aminotransferase [AST] level greater than twice upper limit of normal)
- HIV infection
- Sexual exposure risk (e.g., sex partners of hepatitis B surface antigen (HBsAg)-positive persons; sexually active persons not in mutually monogamous relationships; persons seeking evaluation or treatment for a sexually transmitted infection, men who have sex with men)
- Current or recent injection drug use
- Percutaneous or mucosal risk for exposure to blood (e.g., household contacts of HBsAg-positive persons; residents and staff of facilities for developmentally disabled persons; health care and public safety personnel with reasonably anticipated risk for exposure to blood or blood-contaminated body fluids; hemodialysis, peritoneal dialysis, home dialysis, and predialysis patients; persons with diabetes mellitus age younger than 60 years and, at discretion of treating clinician, those age 60 years or older)
- Incarcerated persons
- Travel in countries with high or intermediate endemic hepatitis B

### Human papillomavirus vaccination

**Routine vaccination**
- Females age 26 years and males through age 21 years: 2- or 3-dose series HPV vaccine depending on age at initial vaccination; males age 22 through 26 years may be vaccinated based on individual clinical decision (HPV vaccination routinely recommended at age 11–12 years)
- Age 15 years or older at initial vaccination: 3-dose series HPV vaccine at 0, 1–2, 6 months [minimum intervals: 4 weeks between doses 1 and 2, 12 weeks between doses 2 and 3, 5 months between doses 1 and 3; repeat dose if administered too soon]
- Age 9 through 14 years at initial vaccination and received 1 dose, or 2 doses less than 5 months apart: 1 dose HPV vaccine
- Age 9 through 14 years at initial vaccination and received 2 doses at least 5 months apart: HPV vaccination complete, no additional dose needed
- If completed valid vaccination series with any HPV vaccine, no additional doses needed

**Special situations**
- Immunocompromising conditions (including HIV infection) through age 26 years: 3-dose series HPV vaccine at 0, 1–2, 6 months as above
- Men who have sex with men and transgender persons through age 26 years: 2- or 3-dose series HPV vaccine depending on age at initial vaccination as above
- Pregnancy through age 26 years: HPV vaccination not recommended until after pregnancy; no intervention needed if vaccinated while pregnant; pregnancy testing not needed before vaccination
PNEUMOCOCCAL VACCINE TIMING FOR ADULTS ≥ 65 YEARS

For those who have not received any pneumococcal vaccines, or those with unknown vaccination history:

- **PCV13** (at ≥ 65 years)
  - At least 1 year apart for most immunocompetent adults
  - At least 8 weeks apart for adults with certain medical conditions
- **PPSV23** (at ≥ 65 years)

For those who have previously received 1 dose of PPSV23 at ≥ 65 years and no doses of PCV13:

- **PPSV23** (at ≥ 65 years)
- At least 1 year apart for all adults
- **PCV13** (at ≥ 65 years)

*Administer 1 dose of PCV13 at least 1 year after the dose of PPSV23 for all adults, regardless of medical conditions.*
DIPTHERIA, TETANUS AND ACELLULAR PERTUSSIS

- dTap booster every 10 years
- Pregnant women third trimester
- ≥ 50 years
LIVE VACCINES

- Live vaccines contraindicated in immunocompromised patients, administer 4 weeks prior to initiation of treatment
- BCG
  - Infancy to prevent disseminated disease
  - Risk of disseminated infection in immunocompromised patients
  - Risk with intravesical BCG
- MMR
  - Not recommended
  - Post exposure prophylaxis with human immunoglobulin within 6 days of exposure
- Yellow fever
  - Contraindicated
  - Avoid travel to endemic areas
LIVE VACCINES AND DMARDS/BIOLOGIC DRUGS

- MMR
  - Not recommended
  - Post exposure prophylaxis with human immunoglobulin within 6 days of exposure
- Yellow fever
  - Contraindicated
  - Avoid travel to endemic areas
- Defer 3-6 months after discontinuation of DMARDS
HOUSEHOLD MEMBERS AND NEWBORNS

- Oral polio vaccine (OPV) should not be administered to individuals who live in a household with immunocompromised patients
  - Last case of polio was seen in 2012 but still occurs in Afghanistan and Pakistan
  - Given at birth and 6 weeks? Can substitute with injectable
- Live attenuated vaccines should be avoided during the first 6 months of life in newborns of mothers treated with biologics during the second half of pregnancy
- Highly immunocompromised patients should avoid handling diapers of infants who have been vaccinated with rotavirus vaccine for 4 weeks after vaccination

IDSA 2013
Update EULAR recommendations 2018