Clinical Decision Support (CDS) Content and Health Level 7 (HL7)-Compliant Knowledge Artifacts (KNARTs)

Recommended Immunizations Clinical Content White Paper

Department of Veterans Affairs (VA)

Knowledge Based Systems (KBS)
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Clinical Decision Support (CDS)

Clinical Decision Support (CDS) Content and Health Level 7 (HL7)-Compliant Knowledge Artifacts (KNARTs): Recommended Immunizations Clinical Content White Paper

by Department of Veterans Affairs (VA)

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Table 1: Relevant KNART Information: Recommended Immunizations KNARTs

Recommended Immunizations KNART	Associated CLIN
Recommended Immunizations - Event Condition Action (ECA) Rule	CLIN0007CA
Recommended Immunizations - Order Set	CLIN0008AA

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VA Subject Matter Expert (SME) Panel

Table 2: SME Table

Name	Title	Project Role
Angela Denietolis, MD	Primary Care Physician James A. Haley Veterans Hospital Tampa VA Medical Center (VAMC) Tampa, FL 33612	SME, Primary
Pat Dumas, RN	Clinical Program Director VA Central Office (VACO) 810 Vermont Ave NW Washington, DC 20420	SME, Secondary
Manish Merchant, MD	Health Informatician Albany VAMC 113 Holland Ave. Albany, NY 12208	SME
Timothy Dresselhaus, MD	San Diego VAMC - MEDS 3350 La Jolla Village Drive San Diego, CA 92161	SME
Jane Kim, NCP	Chief Consultant for Preventive Medicine Durham, NC	Immunization Expert

Introduction

The VA is committed to improving the ability of clinicians to provide care for patients while increasing quality, safety, and efficiency. Recognizing the importance of standardizing clinical knowledge in support of this goal, VA is implementing the HL7 Knowledge Artifact Specification for a wide range of VA clinical use cases. Knowledge Artifacts, referred to as *KNARTS*, enable the structuring and encoding of clinical knowledge so the knowledge can be integrated with electronic health records to enable clinical decision support.

The purpose of this Clinical Content White Paper (*CCWP*) is to capture the clinical context and intent of KNART use cases in sufficient detail to provide the KNART authoring team with the clinical source material to construct the corresponding knowledge artifacts using the HL7 Knowledge Artifact Specification. This paper has been developed using material from a variety of sources: VA artifacts, clinical practice guidelines, evidence in the body of medical literature, and clinical expertise. After reviewing these sources, the material has been synthesized and harmonized under the guidance of VA subject matter experts to reflect clinical intent for this use case.

Unless otherwise noted, items within this white paper (e.g., documentation template fields, orderable items, etc.) are chosen to reflect the clinical intent at the time of creation. To provide an exhaustive list of all possible items and their variations is beyond the scope of this work.

Conventions Used

Conventions used within the knowledge artifact descriptions include:

<*obtain*> : Indicates a prompt to obtain the information listed

- If possible, the requested information should be obtained from the underlying system(s). Otherwise, prompting the user for information may be required
- The technical and clinical notes associated with a section should be consulted for specific constraints on the information (e.g., time-frame, patient interview, etc.)
- Default values: unless otherwise noted, <obtain> indicates to obtain the most recent observation. It is recognized that this default time-frame value may be altered by future implementations.

[...] : Square brackets enclose explanatory text that indicates some action on the part of the user, or general guidance to the clinical or technical teams. Examples include, but are not limited to:

[Begin ...] , *[End ...]* : Indicates the start and end of specific areas to clearly delineate them for technical purposes.

[Activate ...] : Initiates another knowledge artifact or knowledge artifact section.

[Section Prompt: ...] : If this section is applicable, then the following prompt should be displayed to the user.

[Section Selection Behavior: ...] : Indicates technical constraints or considerations for the selection of items within the section.

[Attach: ...] : Indicates that the specified item should be attached to the documentation template if available.

[Link: ...] : Indicates that rather than attaching an item, a link should be included in the documentation template.

[Clinical Comment: ...] : Indicates clinical rationale or guidance.

[Technical Note: ...] : Indicates technical considerations or notes.

[If ...] : Indicates the beginning of a conditional section.

[Else, ...] : Indicates the beginning of the alternative branch of a conditional section.

[End if ...] : Indicates the end of a conditional section.

[☐] *[Check boxes]* : Indicates items that should be selected based upon the section selection behavior.

Chapter 1. Recommended Immunizations

1. Clinical Context

[Begin Clinical Context.]

Population-level immunizations have resulted in a vast decrease in and in some cases elimination of, infectious diseases that had been scourges of public health for generations (Greenwood, 2014). Despite this, many patients fail to receive recommended immunizations. Patient concerns and preferences (e.g., fears regarding adverse effects of vaccines) as well as the complexity of adult immunization recommendations contribute to patient failure to receive recommended immunizations. Closing the gap between current immunization recommendations (Advisory Committee on Immunization Practices, 2017) and patient receipt of immunizations is important to the delivery of appropriate preventive healthcare for Veterans.

Table 3: Clinical Context Domains

Target User	All clinical providers
Patient	Adult patients in any clinical setting (ambulatory, inpatient, etc.), including employees of the VA who are treated as patients of the VA.
Priority	Routine
Specialty	All
Location	Any clinical setting

[End Clinical Context.]

2. Knowledge Artifacts

[Begin Knowledge Artifacts.]

This section describes the CDS knowledge artifacts intended for clinical providers caring for patients who present to the outpatient or inpatient setting for exam or other clinical care.

Two knowledge artifacts define this clinical use case and are described in detail in the following sections. They are:

- ECA Rule Recommended Immunizations KNART
  - Rule logic for activation of the immunization order set and provision of immunization guidelines
  - Actions that may include activation of the immunization order set and provision of immunization guidelines
- Order Set Recommended Immunizations KNART
  - Orderable items associated with immunizations
  - Logic for appropriate display of the order set

[End Knowledge Artifacts.]

Chapter 2. Recommended Immunizations: Event-Condition-Action (ECA) Rule

[Begin Recommended Immunizations: Event-Condition-Action (ECA) Rule.]

2.1. Knowledge Narrative

[Begin Knowledge Narrative.]

[See Clinical Context in Chapter 1.]

[End Knowledge Narrative.]

2.2. Immunization General Event-Condition-Action (ECA) Rule

[Begin Immunization General Event-Condition-Action (ECA) Rule.]

Events

Any of the following events will trigger the rule to be processed:

1. Access of the patient record; or

2. 150-day time-based rule processing.

[Clinical Comment: “150-day -time-based rule processing” refers to a whole system run looking every 150 days for any patient meeting the conditions defined below whose record may not have been accessed and who satisfies initial ECA criteria, to determine which patients are due for immunizations.]

[Technical Note: A rule branch will return “true” if the specific conditions of the branch are satisfied.]

Conditions

The general population for this ECA rule will include adult patients (age >= 18 years old) in any clinical setting (ambulatory, inpatient, etc.), including employees of the VA who are treated as patients of the VA.

[Technical Note: Additional conditions related to specific immunizations are described in the branches below. Every system run will test for matching of any and all conditions in the branches below. Action(s) will execute as specified for each branch until all branch conditions have been tested.]

[End Immunization General Event-Condition-Action (ECA) Rule.]

2.2.1. Hepatitis A Immunization

[Begin Hepatitis A Immunization.]

Conditions

The subpopulation for this branch will include those adults with any of the following:

1. Chronic liver disease; or

2. Receipt of clotting factors; or

3. Men who have sex with men; or

4. Illicit drug use (both injection and non-injection drugs); or

5. Potential occupational exposure (working with hepatitis A-exposed primates or in a hepatitis research lab); or

6. Anticipated travel to an area of intermediate or high endemic hepatitis A; or

7. Anticipated close personal contact to an international adoptee from an area of intermediate or high endemic hepatitis A within the first 60 days of the adoptee's residence; or

8. Patient request for hepatitis A immunization; or

9. Unimmunized patients with history of hepatitis A infection.

Adults with any of the following should not be included in the subpopulation:

- History of a severe allergic reaction to the hepatitis A vaccine or to any of its components; or
- Active pregnancy; or

  [Clinical Comment: VA guidance states that "...because hepatitis A vaccine is produced from inactivated HAV, the theoretic risk to the developing fetus is expected to be low. The risk associated with vaccination should be weighed against the risk for hepatitis A in pregnant women who might be at high-risk for exposure to HAV."]
- Receipt of the first dose of the hepatitis A vaccine within the past 6 months; or
- Incompletely immunized (1 or fewer vaccine doses) patients with history of hepatitis A infection and positive hepatitis A antibodies by laboratory testing; or
- History of completed hepatitis A immunization (2-dose series for hepatitis A vaccine, or 3-dose series combined hepatitis A and B vaccine); or
- Received one or more doses of the combined hepatitis A and B vaccine; or
- Severe allergy to neomycin.

Actions

1. Identify the patient as a hepatitis A vaccine candidate; and

2. Open the Immunizations Order Set and display the subsection for hepatitis A vaccine; and

3. Display link to guideline recommendations in Immunization Order Set

[End Hepatitis A Immunization.]

2.2.2. Hepatitis B Immunization

[Begin Hepatitis B Immunization.]

Conditions

The subpopulation for this branch will include those adults with any of the following:

1. Patient request for hepatitis B immunization; or

2. Illicit drug use to include current or recent injection-drug use; or

3. Household contact with hepatitis B surface antigen (HBsAg)-positive person; or

4. Institutionalized developmentally disabled patients; or

5. Incarceration; or

6. Occupational risk; or

   [Clinical Comment: Per recommendations of the CDC ACIP (Center for Disease Control Advisory Committee on Immunization Practices), "**Adults in the following settings are assumed to be at risk for hepatitis B virus infection and should receive a HepB series**: sexually transmitted disease treatment facilities, HIV testing and treatment facilities, facilities providing drug-abuse treatment and prevention services, healthcare settings targeting services to persons who inject drugs, correctional facilities, healthcare settings targeting services to men who have sex with men, hemodialysis facilities and end-stage renal disease programs, and institutions and nonresidential day care facilities for developmentally disabled persons."]

7. Age 19 years or older with diabetes mellitus; or

   [Clinical Comment: Per recommendations of the CDC ACIP (Center for Disease Control Advisory Committee on Immunization Practices), unimmunized adults age 19 to 59 years with diabetes should receive the hepatitis B vaccine. Adults age 60 years or older with diabetes mellitus may receive the hepatitis B vaccine at the discretion of the treating clinician.]

8. Sexual partners of HBsAg-positive persons; or

9. Sexually non-monogamous or in a sexual partnership with someone who is non-monogamous; or

10. Current evaluation for sexually transmitted infections; or

11. Men who have sex with men; or

12. Chronic liver disease; or

13. Hepatitis C infection; or

14. Alanine aminotransferase (ALT) level greater than twice the upper limit of normal (ULN); or

15. Aspartate aminotransferase (AST) level greater than twice the ULN; or

16. End-stage kidney disease; or

17. Dialysis; or

18. HIV infection; or

19. Anticipated travel to areas with intermediate to high endemic hepatitis B infection; or

20. Age less than 19 years old.

Adults with any of the following should excluded from the subpopulation:

1. History of a severe allergic reaction to the hepatitis B vaccine or to any of its components; or

2. History of a severe allergic reaction to yeast; or

3. Receipt of any hepatitis B vaccine within the past 1 month; or

4. Not on dialysis and receipt of the second dose of any hepatitis B vaccine within the past 5 months; or

5. On dialysis and receipt of the second dose of the 20 microgram/mL hepatitis B vaccine within the past 1 month; or

6. On dialysis and receipt of the second dose of the 40 microgram/mL hepatitis B vaccine within the past 5 months; or

7. On dialysis and receipt of the third dose of the 20 microgram/mL hepatitis B vaccine within the past 4 months; or

8. With a history of completed immunization series for hepatitis B (3 doses for patients not on dialysis or on dialysis and receiving the 40 microgram/mL vaccine or 4 doses for patients on dialysis receiving the 20 microgram/mL vaccine) or combined hepatitis A and B (3 doses); or

9. Receipt of at least one dose of the combined hepatitis A and B vaccine; or

10. Most recent hepatitis B surface antibody (anti-HBs) titer >=10 mIU/mL.

Actions

1. Identify the patient as a hepatitis B vaccine candidate; and

1. Open the Immunizations Order Set and display the appropriate subsection for hepatitis B vaccine; and

2. Make sure guideline recommendations are available to care team.

[End Hepatitis B Immunizations.]

2.2.3. Combined Hepatitis A and B Immunizations

[Begin Combined Hepatitis A and B Immunizations.]

Conditions

The subpopulation for this branch will include those adults who meet a minimum of one criterion from the Combined Hepatitis A and Hepatitis B Criteria Set or meet a minimum of one criterion from the Hepatitis A Criteria Set and a minimum of one criterion from the Hepatitis B Criteria Set described below.

Combined Hepatitis A and Hepatitis B Criteria Set:

1. Chronic liver disease; or

2. Male who has sex with men; or

3. Use of illicit injection drugs.

Hepatitis A Criteria Set:

1. Receipt of clotting factors; or

2. Illicit drug use (non-injection drugs); or

3. Potential occupational exposure to hepatitis A (working with hepatitis A–exposed primates or in a hepatitis research lab); or

4. Anticipated travel to an area of intermediate or high endemic hepatitis A; or

5. Anticipated close personal contact to an international adoptee from an area of intermediate or high endemic hepatitis A within the first 60 days of the adoptee's residence; or

6. Patient request for hepatitis A immunization; or

7. Unimmunized with a history of hepatitis A infection.

Hepatitis B Criteria Set:

1. Patient request for hepatitis B immunization; or
2. With a hepatitis B surface antigen (HBsAg)-positive household contact; or
3. Institutionalized developmentally disabled patient; or
4. Incarceration; or
5. Hepatitis B occupational risk (patients working in sexually transmitted disease treatment facilities, HIV testing and treatment facilities, facilities providing drug abuse treatment and prevention services, health care settings targeting services to persons who inject drugs, correctional facilities, health care settings targeting services to men who have sex with men, hemodialysis facilities and end-stage renal disease programs, and institutions and nonresidential day care facilities for developmentally disabled persons); or
6. Age 19 years or older with diabetes mellitus; or
7. With an HBsAg-positive sexual partner; or
8. Sexually non-monogamous or in a sexual partnership with someone who is non-monogamous; or
9. Current evaluation for sexually transmitted infections; or
10. Hepatitis C infection; or
11. Alanine aminotransferase (ALT) level greater than twice the upper limit of normal (ULN); or
12. Aspartate aminotransferase (AST) level greater than twice the ULN; or
13. End-stage kidney disease; or
14. Dialysis; or
15. HIV infection; or
16. Anticipated travel to areas with intermediate to high endemic hepatitis B infection; or
17. Age less than 19 years old.

Patients meeting any of the following should be excluded:

1. History of a severe allergic reaction to the hepatitis A vaccine or to any of its components; or
2. History of a severe allergic reaction to the hepatitis B vaccine or to any of its components; or
3. History of a severe allergic reaction to yeast; or
4. Severe allergy to neomycin; or
5. Active pregnancy; or

[Clinical Comment: VA guidance states that "... because hepatitis A vaccine is produced from inactivated HAV, the theoretic risk to the developing fetus is expected to be low. The risk associated with vaccination should be weighed against the risk for hepatitis A in pregnant women who might be at high-risk for exposure to HAV."]

6. Receipt of the first dose of the combined hepatitis A and B immunization within the past month; or
7. Receipt of the second dose of the combined hepatitis A and B immunization within the past 5 months; or
8. Receipt of one or more doses of either the hepatitis A-only or hepatitis B-only vaccine.
9. Most recent hepatitis B surface antibody (anti-HBs) titer ≥10 mIU/mL

Actions

1. Identify the patient as a combined hepatitis A and B vaccine candidate; and

2. Open the Immunizations Order Set and display the orders in the "Combined Hepatitis A and B Vaccine Series" subsection; and

3. Make sure guideline recommendations are available to care team.

[End Combined Hepatitis A and B Immunizations.]

2.2.4. Herpes Zoster (Shingles) Immunization

[Clinical Comment: This section is correct as December 2017 with the understanding that a new version of the vaccine would be available in 2018. The new version was released January 2018 by the CDC https://www.cdc.gov/mmwr/volumes/67/wr/mm6703a5.htm.]

[Begin Herpes Zoster (Shingles) Immunization.]

Conditions

The subpopulation for this branch includes adults age 60 years or older, with the exception that individuals are not candidates for Herpes Zoster vaccination if they meet any of the following criteria:

1. Active pregnancy; or

2. Leukemia, lymphomas or other malignant neoplasms affecting the bone marrow or lymphatic system but excluding leukemia in remission providing at least 3 months have passed since last chemotherapy or radiation therapy.

3. Present receipt of chemotherapy; or

4. Clinical or laboratory evidence of other unspecified cellular immunodeficiency; or

5. Active use of immunosuppressive medications with an anticipated duration of at least two weeks; or

[Technical Note: High-dose steroids (>= 20 mg/day of prednisone or equivalent) should be considered immunosuppressive medications.]

6. Completion of a 2-week or longer course of immunosuppressive medications within the past 1 month; or

7. HIV infection with the most recent CD4+ T-lymphocyte count of less than 200 cells/microliter or less than 15% of total lymphocytes; or

8. History of a severe allergic reaction to the shingles vaccine or to any of its components; or

9. History of a severe allergic reaction to neomycin or gelatin; or

10. Prior receipt of the shingles vaccine; or

11. Use of acyclovir, famciclovir, or valacyclovir in the 24 hours prior to vaccination; or

12. Persons receiving the recombinant human immune mediators and immune modulators (such as antitumor necrosis factor ("anti-TNF") agents, such as adalimumab, infliximab, etanercept and certolizumab pegol); or

13. Persons undergoing hematopoietic stem cell transplantation.

Actions

1. Identify the patient as a shingles vaccine candidate; and
2. Open the Immunizations Order Set KNART and display the subsection for the shingles vaccine; and
3. Ensure the guideline recommendations are available to the care team.

[End Herpes Zoster (Shingles) Immunization.]

2.2.5. Human Papillomavirus (HPV) Immunization

[Begin Human Papillomavirus (HPV) Immunization.]

Conditions

The subpopulation for this branch includes any of the following:

1. Adult women aged =< 26 years; or
2. Adult men aged =< 21 years; or
3. Adult men aged =< 26 years who have had any of the following:
   - HIV infection; or
   - Sex with other men; or
   - B-lymphocyte antibody deficiency; or
   - Complete or partial T-lymphocyte defect; or
   - Active malignancy; or
   - Prior transplantation; or
   - Active autoimmune disease; or
   - Current immunosuppressive therapy.

Patients should be excluded for any of the following:

1. Active pregnancy; or
2. Prior receipt of two doses of the HPV vaccine at least 5 months apart where the first dose was administered before the 15th birthday; or
3. Prior receipt of three doses of the HPV vaccine where the first dose was administered before the 15th birthday, the second dose was administered less than 5 months after the first dose, and the third dose was administered at least 12 weeks after the second dose; or
4. Receipt of the first dose of the HPV vaccine within the past 1 month; or
5. Receipt of two doses of the HPV vaccine where the first dose was administered less 5 months ago or the second dose was administered less than 4 months ago; or
6. Receipt of the complete 3-dose series of the HPV vaccine where the first dose was administered after the 15th birthday; or
7. Severe allergic reaction to the HPV vaccine or any of its components; or

8. History of immediate hypersensitivity to yeast.

Actions

Actions include the following:

1. Identify the patient as a human papillomavirus vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsection for the HPV vaccines; and

3. Ensure the guideline recommendations are available to the care team.

[End Human Papillomavirus (HPV) Immunization.]

2.2.6. Influenza Immunization: General

[Clinical Comment: Currently there is no preferential recommendation for a particular age-appropriate influenza vaccine. In VA, the clinical leadership in a facility makes the decisions about which vaccines are available based on supply and purchasing.]

[Begin Influenza Immunization: General.]

Conditions

This branch should be processed only between August 1 and April 1 and should include all patients except those who have:

1. Had a severe allergic reaction to an influenza vaccine or any of its components; or

   [Technical Note: Do not exclude for allergy to egg protein.]

2. Received any influenza immunization on or after August 1 of last year if today's date is prior to April 1; or

3. Received any influenza immunization on or after August 1 of the current year if today's date is August 1 or later.

[Technical Note: Flu season is defined as October through April. The flu shot can be received as early as August.]

Actions

Actions include the following:

1. Identify the patient as an influenza vaccine candidate; and

2. Ensure that the Immunization guidelines for Influenza Vaccination are available to the clinical care team.

[End Influenza Immunizations: General.]

2.2.6.1. Influenza Immunization: Standard-Dose Inactivated Influenza Vaccine (IIV)

[Begin Influenza Immunization: Standard-Dose Inactivated Influenza Vaccine (IIV).]

Conditions

The subpopulation for this branch will include those individuals who meet the eligibility criteria for Influenza Vaccination per the logic of the "Influenza Immunizations: General" branch.

Actions

Open the Immunizations Order Set KNART and display the subsection for standard-dose inactivated influenza vaccine.

[End Influenza Immunization: Standard-Dose Inactivated Influenza Vaccine (IIV).]

2.2.6.2. Influenza Immunizations: Recombinant Influenza Vaccine (RIV)

[Begin Influenza Immunizations: Recombinant Influenza Vaccine (RIV).]

Conditions

The subpopulation for this branch will include those individuals who meet the eligibility criteria for Influenza Vaccination per the logic of the "Influenza Immunizations: General" branch.

Actions

Open the Immunizations Order Set KNART and display the subsection for the recombinant influenza virus vaccine.

[End Influenza Immunizations: Recombinant Influenza Vaccine (RIV).]

2.2.6.3. Influenza Immunizations: Intradermal IIV

[Begin Influenza Immunizations: Intradermal IIV.]

Conditions

The subpopulation for this branch will include those individuals who meet the eligibility criteria for Influenza Vaccination per the logic of the "Influenza Immunizations: General" branch and who are younger than the age of 65 years.

Actions

- Open the Immunizations Order Set KNART and display the subsection for the intradermal influenza inactivated virus vaccine.

[End Influenza Immunizations: Intradermal IIV.]

2.2.6.4. Influenza Immunizations: High-Dose or Adjuvanted IIV

[Begin Influenza Immunizations: High-Dose or Adjuvanted IIV.]

Conditions

The subpopulation for this branch will include those individuals who meet the eligibility criteria for Influenza Vaccination per the logic of the "Influenza Immunizations: General" branch and who are age 65 years or older.

Actions

- Open the Immunizations Order Set KNART and display the subsection for high-dose and adjuvanted influenza inactivated virus vaccines.

[End Influenza Immunizations: High-Dose or Adjuvanted IIV.]

2.2.7. Meningococcal Immunizations: General

[Begin Meningococcal Immunizations: General.]

Conditions

The subpopulation for this branch includes all adults.

Patients should be excluded for:

- History of severe allergic reaction to meningococcal vaccines or any of their components.

[Clinical Comment: Meningococcal vaccines should be used during pregnancy only if clearly needed. Health care providers are encouraged to register women who receive a meningococcal vaccine during pregnancy. See package inserts at: https://www.fda.gov/BiologicsBloodVaccines/Vaccines/ApprovedProducts/default.htm.]

[End Meningococcal Immunizations: General.]

2.2.7.1. Meningococcal Immunizations: Serogroups A, C, W, and Y Conjugate Vaccine (MenACWY) Series and Boosters

[Begin Meningococcal Immunizations: Serogroups A, C, W, and Y Conjugate Vaccine (MenACWY) Series and Boosters.]

Conditions

The subpopulation for this sub-branch will include those individuals who meet the eligibility criteria for Meningococcal Immunizations per the logic of the "Meningococcal Immunizations: General" branch and who have any of the following indications for serogroup A, C, W, or Y immunizations:

1. Anatomic or functional asplenia; or

2. Persistent complement component deficiencies (for example, C5-9, properdin, factor H, or factor D deficiencies); or

3. Patient is going to start treatment with the drug eculizumab (Soliris) or currently is taking eculizumab; or

   [Clinical Comment: CDC newly published this recommendation regarding eculizumab and meningococcal vaccination in the July 7, 2017 edition of the Morbidity and Mortality Weekly Report (MMWR). The recommendation is explained in detail at https://www.cdc.gov/meningococcal/clinical/eculizumab.html]; or

4. HIV infection.

Exclude patients for any of the following:

1. Completed a primary MenACWY immunization (2-dose) series within the prior 5 years; or

2. Were revaccinated with the MenACWY within 5 years; or

3. Received the first dose of a 2-dose primary series of MenACWY within the prior 2 months; or

4. Severe allergy to vaccines containing CRM197 or diphtheria toxoid.

Actions

Actions include the following:

1. Identify the patient as a serogroups A, C, W, and Y meningococcal conjugate vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsection for serogroups A, C, W, and Y meningococcal conjugate vaccine; and

3. Ensure guideline recommendations are available to the care team.

[End Meningococcal Immunizations: Serogroups A, C, W, and Y Conjugate Vaccine (MenACWY) Series and Boosters.]

2.2.7.2. Meningococcal Immunizations: Serogroups A, C, W, and Y Conjugate Vaccine (MenACWY), and Boosters

[Begin Meningococcal Immunizations: Serogroups A, C, W, and Y Conjugate Vaccine (MenACWY), and Boosters.]

Conditions

This sub-branch of the "Meningococcal Immunizations: General" branch includes adults with any of the following indications for serogroup A, C, W, or Y immunizations:

1. Microbiologist with ongoing exposure to Neisseria meningitidis as an occupation; or

2. Anticipation of international travel to or residence in areas with hyperendemic or epidemic meningococcal disease; or

3. Ongoing international travel to or residence in areas with hyperendemic or epidemic meningococcal disease; or

4. Current active military recruit.

Exclude patients for any of the following:

1. Received a MenACWY immunization vaccination or booster within the past 5 years; or

2. Severe allergy to vaccines containing CRM197 or diphtheria toxoid.

Actions

1. Identify the patient as a serogroups A, C, W, and Y meningococcal conjugate vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsection for serogroups A, C, W, and Y meningococcal conjugate vaccine and boosters; and

3. Make sure guideline recommendations are available to care team.

[End Meningococcal Immunizations: Serogroups A, C, W, and Y Conjugate Vaccine (MenACWY), and Boosters.]

2.2.7.3. Meningococcal Immunizations: Serogroups A, C, W, and Y Conjugate Vaccine (MenACWY)

[Begin Meningococcal Immunizations: Serogroups A, C, W, and Y Conjugate Vaccine (MenACWY).]

Conditions

This sub-branch of the "Meningococcal Immunizations: General" branch includes adults with any of the following indications for serogroup A, C, W, or Y immunizations:

1. Exposure to a serogroup A, C, W, or Y outbreak; or
2. Current first-year college student living in a resident hall.

Exclude patients for any of the following:

1. Already received 1 dose of MenACWY or MSPV4 for a current meningococcal disease outbreak; or
2. Current first-year college student who received a MenACWY at age 16 years or older; or
3. Severe allergy to vaccines containing CRM197 or diphtheria toxoid.

Actions

1. Identify the patient as a serogroups A, C, W, and Y meningococcal conjugate vaccine candidate; and
2. Open the Immunizations Order Set KNART and display the subsection for Serogroups A, C, W, and Y meningococcal conjugate vaccine; and
3. Make sure guideline recommendations are available to care team.

[End Meningococcal Immunizations: Serogroups A, C, W, and Y Conjugate Vaccine (MenACWY).]

2.2.7.4. Meningococcal Immunizations: Serogroup B Meningococcal Vaccine (MenB) Series 1

[[Clinical Comment: Currently there is no preferential recommendation for choosing between these 2 meningococcal immunization types.]

[Begin Meningococcal Immunizations: Serogroup B Meningococcal Vaccine (MenB) Series 1.]

Conditions

This sub-branch of the "Meningococcal Immunizations: General" branch includes adults with any of the following indications for serogroup B immunizations:

1. Microbiologist with ongoing exposure to Neisseria meningitidis; or

2. Functional or anatomic asplenia; or

3. Persistent complement component deficiencies (for example, C5-9, properdin, factor H, or factor D deficiencies; or

4. Current or anticipated use of the drug eculizumab (Soliris).

Exclude patients for any of the following:

1. Completed the 2-dose MenB-4C immunization series or the 3-dose MenB-FHbp immunization series; or

2. Received the first dose of a 2-dose primary series of MenB-4C within the past 1 month; or

3. Received the first dose of a 3-dose primary series of MenB-FHbp within the past 1 month; or

4. Received the second dose of a 3-dose primary series of MenB-FHbp within the past 4 months.

Actions

1. Identify the patient as a Serogroup B Meningococcal vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsections for serogroup B meningococcal vaccines; and

3. Make sure guideline recommendations are available to care team.

[End Meningococcal Immunizations: Serogroup B Meningococcal Vaccine (MenB) Series 1.]

2.2.7.5. Meningococcal Immunizations: Serogroup B Meningococcal Vaccine (MenB) Series 2

[Begin Meningococcal Immunizations: Serogroup B Meningococcal Vaccine (MenB) Series 2.]

Conditions

This sub-branch of the "Meningococcal Immunizations: General" branch includes adults who have been exposed to a serogroup B outbreak.

Exclude patients for any of the following:

1. Completed the 2-dose MenB-4C series or the 3-dose MenB-FHbp series; or

2. Received the first dose of a primary MenB-4C series within the past 1 month; or

3. Received the first dose of a primary MenB-FHbp series within the past 1 month; or

4. Prior receipt of 2 doses of the MenB-FHbp series where the doses were administered at least 6 months apart; or

5. Received the second dose of a 3-dose primary MenB-FHbp series within the past 4 months.

Actions

1. Identify the patient as a serogroup B meningococcal vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsections for serogroup B meningococcal vaccines; and

3. Make sure guideline recommendations are available to care team.

[End Meningococcal Immunizations: Serogroup B Meningococcal Vaccine (MenB) Series 2.]

2.2.7.6. Meningococcal Immunizations: Serogroup B Meningococcal Vaccine (MenB) Series 3

[Begin Meningococcal Immunizations: Serogroup B Meningococcal Vaccine (MenB) Series 3.]

Conditions

This sub-branch of the "Meningococcal Immunizations: General" branch includes adults age <= 23 years of age.

Exclude patients for any of the following:

1. Completed the 2-dose MenB-4C series or the 3-dose MenB-FHbp series; or
2. Received the first dose of a 2-dose primary series of MenB-4C within the past 1 month; or
3. Received the first dose of a 2-dose primary series of MenB-FHbp within the past 6 months; or
4. Received 2 doses of MenB-FHbp at least 6 months apart. Patients who received a second dose of MenB-FHbp within 6 months of the first dose should be included if they have not received a third dose and it has been at least 4 months since the second dose.

Actions

1. Identify the patient as a serogroup B meningococcal vaccine candidate; and
2. Open the Immunizations Order Set KNART and display the subsections for serogroup B meningococcal vaccines; and
3. Make sure guideline recommendations are available to care team.

[End Meningococcal Immunizations: Serogroup B Meningococcal Vaccine (MenB) Series 3.]

2.2.8. Measles, Mumps, and Rubella (MMR) Immunizations: General

[Begin Measles, Mumps, and Rubella (MMR) Immunizations: General.]

Conditions

The subpopulation for this branch includes all adults except those who:

1. Are currently pregnant; or
2. Have an HIV infection and a CD4+ T-lymphocyte count < 200 cells/microliter or a CD4+ T-lymphocyte percentage less than 15% within 6 months; or
3. Have had an anaphylactoid or anaphylactic reaction to neomycin; or
4. Actively taking immunosuppressive medications with an anticipated duration of at least two weeks; or

[Technical Note: High-dose steroids (>= 20 mg/day of prednisone or equivalent) should be considered immunosuppressive medications.]

5. Have completed a 2-week or longer course of immunosuppressive medications within the past 1 month; or
6. Have primary or acquired immunodeficiency; or
7. Have a malignant condition of the bone marrow or lymphatic system; or
8. Are on systemic immunosuppressive therapy; or
9. Have cellular immunodeficiency; or
10. Have received blood products containing antibodies within the past 11 months; or
11. Have a history of a severe allergic reaction to the MMR vaccine or to any of its components; or
12. Have a history of an anaphylactic reaction to gelatin or gelatin-containing products.

[End Measles, Mumps, and Rubella Immunizations: General.]

2.2.8.1. Measles, Mumps, and Rubella (MMR) Immunizations: Adults Requiring Two Doses of MMR

[Begin Measles, Mumps, and Rubella (MMR) Immunizations: Adults Requiring Two Doses of MMR.]

Conditions

The subpopulation for this branch "Measles, Mumps, and Rubella (MMR) Immunizations: General" branch includes adults born in or after 1957 who meet any of the following criteria:

1. Had a prior inactivated or unknown measles vaccine, or had an attenuated measles vaccine accompanied by immunoglobulin; or
2. Work in healthcare; or
3. Are close contacts of immunocompromised persons; or
4. Are students in a post-high school educational institution; or
5. Anticipate international travel; or
6. Adults with HIV and a CD4+ T-lymphocyte count >= 200 cells/microliters or a CD4+ T-lymphocyte percentage >15% for at least 6 months.

Also include adult health care workers, born before 1957, who meet any of the following criteria:

1. Received an inactivated or unknown type of mumps vaccine before 1979; or
2. Received an inactivated or unknown type of measles vaccine during the years 1963 to 1967; or
3. Lack laboratory-proven immunity to measles or mumps or a history of laboratory proven diagnosis of measles or mumps.

Exclude patients for any of the following:

1. Have received the MMR within the past 28 days; or

2. Documentation showing receipt of 2 doses of the live MMR vaccine where the first dose was administered at age >= 12 months and the second dose was administered at least 28 days after the first dose; or

3. Laboratory-proven immunity to measles, mumps, and rubella; or

4. Prior laboratory-proven diagnosis of measles, mumps, and rubella; or

5. A combination of laboratory-proven immunity and diagnoses for measles, mumps, and rubella.

Actions

1. Identify the patient as a measles, mumps, and rubella vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsection for the measles, mumps, and rubella vaccine; and

3. Ensure the guideline recommendations are available to the care team.

[End Measles, Mumps, and Rubella Immunizations: Adults Requiring Two Doses of MMR.]

2.2.8.2. Measles, Mumps, and Rubella (MMR) Immunizations: Adults Requiring One Dose of MMR

[Begin Measles, Mumps, and Rubella (MMR) Immunizations: Adults Requiring One Dose of MMR.]

Conditions

This sub-branch of the "Measles, Mumps, and Rubella (MMR) Immunizations: General" branch includes adults who meet any of the following criteria:

1. Born in or after 1957 who do not fit the criteria for the “Measles, Mumps, and Rubella (MMR) Immunizations: Adults Requiring Two Doses of MMR” sub-branch; or

2. Health care workers born before 1957 without evidence of immunity to rubella.

Exclude patients for any of the following:

1. Documentation showing receipt of at least 1 dose of the live MMR vaccine administered at age >= 12 months; or

2. Laboratory-proven immunity to measles, mumps, and rubella; or

3. Prior laboratory-proven diagnosis of measles, mumps, and rubella; or

4. A combination of laboratory-proven immunity and diagnoses for measles, mumps, and rubella.

Actions

1. Identify the patient as a Measles, Mumps, and Rubella vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsection for the Measles, Mumps, and Rubella vaccine; and

3. Ensure the guideline recommendations are available to the care team.

[End Measles, Mumps, and Rubella Immunizations: Adults Requiring One Dose of MMR.]

2.2.8.3. Measles, Mumps, and Rubella (MMR) Immunizations: Women Who Are Postpartum or Post-termination

[Begin Measles, Mumps, and Rubella (MMR) Immunizations: Women Who Are Postpartum or Post-termination.]

Conditions

This subbranch of the "Measles, Mumps, and Rubella (MMR) Immunizations: General" branch includes women who are about to be discharged following delivery of a baby or termination of a pregnancy who do not have laboratory-proven immunity to rubella or a prior laboratory-proven diagnosis of rubella who have not received the MMR vaccine within the past 28 days

Actions

1. Identify the patient as a measles, mumps, and rubella vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsection for the measles, mumps, and rubella vaccine; and

3. Ensure the guideline recommendations are available to the care team.

[End Measles, Mumps, and Rubella Immunizations: Women Who Are Postpartum or Post-termination.]

2.2.9. Pneumococcal Immunization: General

[Begin Pneumococcal Immunization: General.]

Conditions

The subpopulation for this branch includes all adults.

Patients should be excluded for:

1. History of severe allergic reaction to pneumococcal vaccines or any of their components.

[Clinical Comment: Both Pneumococcal Polysaccharide Vaccine (PPSV23) and Pneumococcal Conjugate Vaccine (PCV13) should be given to a pregnant woman only if clearly needed. Pregnancy is not an absolute contraindication.]

[End Pneumococcal Immunization: General.]

2.2.9.1. Pneumococcal Immunizations: 13-Valent Pneumococcal Conjugate Vaccine (PCV13) for Younger Adults with Asplenia or Immunocompromise

[Begin 13-Valent Pneumococcal Immunizations: Pneumococcal Conjugate Vaccine (PCV13) for Younger Adults with Asplenia or Immunocompromise.]

Conditions

This sub-branch of the "Pneumococcal Immunizations: General" branch includes patients aged < 65 years with any of the following:

1. Congenital or acquired immunodeficiency excluding chronic granulomatous disease:
    - B- or T-lymphocyte deficiency; or
    - Complement deficiencies; or
    - Phagocytic disorders; or
    - HIV infection; or
    - Chronic renal failure; or
    - Nephrotic syndrome; or
    - Leukemia, lymphoma, or Hodgkin's disease; or
    - Generalized malignancy; or
    - Multiple myeloma; or
    - History of solid organ transplant; or
    - Long-term systemic corticosteroid therapy; or
    - Long-term radiation therapy; or
2. Anatomical asplenia; or
3. Functional asplenia:
    - Sickle cell disease; or
    - Other hemoglobinopathies; or
    - Splenic dysfunction; or
    - Congenital or acquired asplenia; or
4. Scheduled for splenectomy.

Exclude patients for any of the following:

1. Anaphylactic reaction to diphtheria toxin or any vaccine containing diphtheria toxin; or
2. Receipt of the PCV13; or
3. Aged >= 19 years and receipt of PPSV23 within 1 year or
4. Aged < 19 years and receipt of PPSV23 within the past 8 weeks.

Actions

1. Identify the patient as a 13-valent pneumococcal conjugate vaccine candidate; and
2. Open the Immunizations Order Set KNART and display the subsection for the 13-valent pneumococcal conjugate vaccine; and

3. Ensure guideline recommendations are available to the care team.

[End 13-Valent Pneumococcal Immunizations: Pneumococcal Conjugate Vaccine (PCV13) for Younger Adults with Asplenia or Immunocompromise.]

2.2.9.2. Pneumococcal Immunizations: Initial 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Younger Adults with Asplenia or Immunocompromise

[Begin 23-Valent Pneumococcal Immunizations: Initial Pneumococcal Polysaccharide Vaccine (PPSV23) for Younger Adults with Asplenia or Immunocompromise.]

Conditions

This sub-branch of the "Pneumococcal Immunizations: General" branch includes patients aged < 65 years who have either received one dose of PCV13 or have an allergy to the PCV13 or its components (including diphtheria toxin) who also meet at least one of the following criteria:]

1. Congenital or acquired immunodeficiency excluding granulomatous disease:
    - B- or T-lymphocyte deficiency; or
    - Complement deficiencies; or
    - Phagocytic disorders; or
    - HIV infection; or
    - Chronic renal failure; or
    - Nephrotic syndrome; or
    - Leukemia, lymphoma, or Hodgkin's disease; or
    - Generalized malignancy; or
    - Multiple myeloma; or
    - History of solid organ transplant; or
    - Long-term systemic corticosteroid therapy; or
    - Long-term radiation therapy; or
2. Anatomical asplenia; or
3. Functional asplenia:
    - Sickle cell disease; or
    - Other hemoglobinopathies; or
    - Splenic dysfunction; or

- Congenital or acquired asplenia; or

4. Scheduled for splenectomy.

Exclude patients for any of the following:

1. Receipt of the PCV13 within the past 8 weeks; and

2. Receipt of one or more dose of the PPSV23.

Actions

1. Identify the patient as a 23-valent pneumococcal polysaccharide vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsection for the 23-valent pneumococcal polysaccharide vaccine; and

3. Ensure the guideline recommendations are available to the care team.

[End 23-Valent Pneumococcal Immunizations: Initial Pneumococcal Polysaccharide Vaccine (PPSV23) for Younger Adults with Asplenia or Immunocompromise.]

2.2.9.3. Pneumococcal Immunizations: Second 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Younger Adults with Asplenia or Immunocompromise

[Begin Pneumococcal Immunizations: Second 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Younger Adults with Asplenia or Immunocompromise.]

Conditions

This sub-branch of the "Pneumococcal Immunizations: General" branch includes patients aged < 65 years with any of the following:

1. Congenital or acquired immunodeficiency excluding chronic granulomatous disease:

   - B- or T-lymphocyte deficiency; or
   - Complement deficiencies; or
   - Phagocytic disorders; or
   - HIV infection; or
   - Chronic renal failure; or
   - Nephrotic syndrome; or
   - Leukemia, lymphoma, or Hodgkin's disease; or
   - Generalized malignancy; or
   - Multiple myeloma; or

- History of solid organ transplant; or
- Long-term systemic corticosteroid therapy; or
- Long-term radiation therapy; or

2. Anatomical asplenia; or
3. Functional asplenia:
   - Sickle cell disease; or
   - Other hemoglobinopathies; or
   - Splenic dysfunction; or
   - Congenital or acquired asplenia; or
4. Scheduled for splenectomy.

Exclude patients for any of the following:

1. Receipt of the PCV13 within the past 8 weeks; or
2. Receipt of two or more doses of the PPSV23; or
3. Receipt of PPSV23 within the past 5 years.

Actions

1. Identify the patient as a 23-valent pneumococcal polysaccharide vaccine candidate; and
2. Open the Immunizations Order Set KNART and display the subsection for the 23-valent pneumococcal polysaccharide vaccine; and
3. Ensure the guideline recommendations are available to the care team.

[End Pneumococcal Immunizations: Second 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Younger Adults with Asplenia or Immunocompromise.]

2.2.9.4. Pneumococcal Immunizations: 13-Valent Pneumococcal Conjugate Vaccine (PCV13) for Younger Adults with a Cerebrospinal Fluid Leak or a Cochlear Implant

[Begin Pneumococcal Immunizations: 13-Valent Pneumococcal Conjugate Vaccine (PCV13) for Younger Adults with a Cerebrospinal Fluid Leak or a Cochlear Implant.]

Conditions

This sub-branch of the "Pneumococcal Immunizations: General" branch includes patients aged < 65 years not included in any of the asplenic or immunocompromised sub-branches with either a cerebrospinal fluid leak or a cochlear implant.

Exclude patients for any of the following:

1. Allergy to diphtheria toxin or any vaccine containing diphtheria toxin; or

2. Receipt of the PCV13; or

3. Receipt of PPSV23 within 1 year.

Actions

1. Identify the patient as a 13-valent pneumococcal conjugate vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsection for the 13-valent pneumococcal conjugate vaccine; and

3. Ensure guideline recommendations are available to the care team.

[End Pneumococcal Immunizations: 13-Valent Pneumococcal Conjugate Vaccine (PCV13) for Younger Adults with a Cerebrospinal Fluid Leak or a Cochlear Implant.]

2.2.9.5. Pneumococcal Immunizations: 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Younger Adults with a Cerebrospinal Fluid Leak or a Cochlear Implant

[Begin Pneumococcal Immunizations: 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Younger Adults with a Cerebrospinal Fluid Leak or a Cochlear Implant.]

Conditions

This sub-branch of the "Pneumococcal Immunizations: General" branch includes patients aged < 65 years not included in any of the asplenic or immunocompromised sub-branches with either a cerebrospinal fluid leak or a cochlear implant.

To be included in this branch, the patient must have received one dose of PCV13 *or* must be allergic to the PCV13 or its components (including diphtheria toxin).Exclude patients for any of the following:

1. Receipt of the PCV13 within the past 8 weeks; or

2. Receipt of one or more dose of the PPSV23.

Actions

1. Identify the patient as a 23-valent pneumococcal polysaccharide vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsection for the 23-valent pneumococcal polysaccharide vaccine; and

3. Ensure the guideline recommendations are available to the care team.

[End Pneumococcal Immunizations: 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Younger Adults with a Cerebrospinal Fluid Leak or a Cochlear Implant.]

2.2.9.6. Pneumococcal Immunizations: 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Younger Adults with Certain Medical Conditions

[Begin Pneumococcal Immunizations: 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Younger Adults with Certain Medical Conditions.]

Conditions

This sub-branch of the "Pneumococcal Immunizations: General" branch includes patients aged < 65 years not included in any of the asplenic or immunocompromised sub-branches or in any of the cochlear implant or cerebrospinal fluid leak sub-branches who have any of the following:

1. Chronic heart disease including heart failure and cardiomyopathy; or
2. Chronic lung disease including emphysema and asthma; or
3. Chronic liver disease; or
4. Cirrhosis; or
5. Chronic alcoholism; or
6. Diabetes mellitus; or
7. Active cigarette smoking; or
8. Residence in a nursing home or long-term facility.

Exclude patients for any of the following:

1. Receipt of the PCV13 within the past 8 weeks; or
2. Receipt of one or more dose of the PPSV23.

Actions

1. Identify the patient as a 23-valent pneumococcal polysaccharide vaccine candidate; and
2. Open the Immunizations Order Set KNART and display the subsection for the 23-valent pneumococcal polysaccharide vaccine; and
3. Ensure the guideline recommendations are available to the care team.

[End Pneumococcal Immunizations: 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Younger Adults with Certain Medical Conditions.]

2.2.9.7. Pneumococcal Immunizations: 13-Valent Pneumococcal Conjugate Vaccine (PCV13) for Older Adults with Asplenia,

Immunocompromise, Cerebrospinal Fluid Leak, or Cochlear Implant

[Begin Pneumococcal Immunizations: 13-Valent Pneumococcal Conjugate Vaccine (PCV13) for Older Adults with Asplenia, Immunocompromise, Cerebrospinal Fluid Leak, or Cochlear Implant.]

Conditions

This sub-branch of the "Pneumococcal Immunizations: General" branch includes patients age >= 65 years old with any of the following:

1. Congenital or acquired immunodeficiency excluding chronic granulomatous disease:
    - B- or T-lymphocyte deficiency; or
    - Complement deficiencies; or
    - Phagocytic disorders; or
    - HIV infection; or
    - Chronic renal failure; or
    - Nephrotic syndrome; or
    - Leukemia, lymphoma, or Hodgkin's disease; or
    - Generalized malignancy; or
    - Multiple myeloma; or
    - History of solid organ transplant; or
    - Long-term systemic corticosteroid therapy; or
    - Long-term radiation therapy; or
2. Anatomical asplenia; or
3. Functional asplenia; or
    - Sickle cell disease; or
    - Other hemoglobinopathies; or
    - Splenic dysfunction; or
    - Congenital or acquired asplenia; or
4. Scheduled for splenectomy; or
5. Cerebrospinal fluid leak; or
6. Cochlear implant.

Exclude patients for any of the following:

1. Allergy to diphtheria toxin or any vaccine containing diphtheria toxin; or
2. Receipt of the PCV13 at age >= 65 years; or

3. Receipt of PPSV23 within the past 1 year.

Actions

1. Identify the patient as a 13-valent pneumococcal conjugate vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsection for the 13-valent pneumococcal conjugate vaccine; and

3. Ensure the guideline recommendations are available to the care team.

[End Pneumococcal Immunizations: 13-Valent Pneumococcal Conjugate Vaccine (PCV13) for Older Adults with Asplenia, Immunocompromise, Cerebrospinal Fluid Leak, or Cochlear Implant.]

2.2.9.8. Pneumococcal Immunizations: 13-Valent Pneumococcal Conjugate Vaccine (PCV13) for Immunocompetent Older Adults

[Begin Pneumococcal Immunizations: 13-Valent Pneumococcal Conjugate Vaccine (PCV13) for Immunocompetent Older Adults.]

Conditions

This sub-branch of the "Pneumococcal Immunizations: General" branch includes patients age >= 65 years not included in the "Pneumococcal Immunizations: PCV13 for Older Adults with Asplenia, Immunocompromised, Cerebrospinal Fluid Leak, or Cochlear Implant" sub-branch.

Exclude patients for any of the following:

1. Allergy to diphtheria toxin or any vaccine containing diphtheria toxin; or

2. Receipt of the PCV13 at age >= 65 years; or

3. Receipt of PPSV23 within the past 1 year.

Actions

1. Identify the patient as a 13-valent pneumococcal conjugate vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsection for the 13-valent pneumococcal conjugate vaccine; and

3. Ensure the guideline recommendations are available to the care team.

[End Pneumococcal Immunizations: 13-Valent Pneumococcal Conjugate Vaccine (PCV13) for Immunocompetent Older Adults.]

2.2.9.9. Pneumococcal Immunizations: 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Older Adults with

Asplenia, Immunocompromise, Cerebrospinal Fluid Leak, or Cochlear Implant

[Begin Pneumococcal Immunizations: 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Older Adults with Asplenia, Immunocompromise, Cerebrospinal Fluid Leak, or Cochlear Implant.]

Conditions

This sub-branch of the "Pneumococcal Immunizations: General" branch includes patient age >= 65 years who have received one dose of PCV13 at age >= 19 years or have a allergy to the PCV13 or its components (including diphtheria toxin) and any of the following:

1. Congenital or acquired immunodeficiency excluding chronic granulomatous disease:
    - B- or T-lymphocyte deficiency; or
    - complement deficiencies; or
    - Phagocytic disorders; or
    - HIV infection; or
    - Chronic renal failure; or
    - Nephrotic syndrome; or
    - Leukemia, lymphoma, or Hodgkin's disease; or
    - Generalized malignancy; or
    - Multiple myeloma; or
    - History of solid organ transplant; or
    - Long-term systemic corticosteroid therapy; or
    - Long-term radiation therapy; or
2. Anatomical asplenia; or
3. Functional asplenia:
    - Sickle cell disease; or
    - Other hemoglobinopathies; or
    - Splenic dysfunction; or
    - Congenital or acquired asplenia; or
4. Scheduled for splenectomy; or
5. Cerebrospinal fluid leak; or
6. Cochlear implant.

Exclude patients for any of the following:

1. Receipt of the PCV13 within the past 8 weeks; or

2. Receipt of one or more dose of the PPSV23 at age >= 65 years; or

3. Receipt of the PPSV23 within the past 5 years.

Actions

1. Identify the patient as a 23-valent pneumococcal polysaccharide vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsection for the 23-valent pneumococcal polysaccharide vaccine; and

3. Ensure the guideline recommendations are available to the care team.

[End Pneumococcal Immunizations: 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Older Adults with Asplenia, Immunocompromise, Cerebrospinal Fluid Leak, or Cochlear Implant.]

2.2.9.10. Pneumococcal Immunizations: 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Immunocompetent Older Adults

[Begin Pneumococcal Immunizations: 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Immunocompetent Older Adults.]

Conditions

This sub-branch of the "Pneumococcal Immunizations: General" branch includes patients age >= 65 years not included in the "Pneumococcal Immunizations: PPSV23 for Older Adults with Asplenia, Immunocompromise, Cerebrospinal Fluid Leak, or Cochlear Implant" sub-branch.

To be included in this branch, the patient must have received one dose of PCV13 at age >= 65 years or must be allergic to the PCV13 or its components (including diphtheria toxin).

Exclude patients for any of the following:

1. Receipt of the PCV13 within the past 1 year; or

2. Receipt of one or more dose of the PPSV23 at age >= 65 years; or

3. Receipt of the PPSV23 within the past 5 years.

Actions

1. Identify the patient as a 23-valent pneumococcal polysaccharide vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsection for the 23-valent pneumococcal polysaccharide vaccine; and

3. Ensure the guideline recommendations are available to the care team.

[End Pneumococcal Immunizations: 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Immunocompetent Older Adults.]

2.2.10. Tetanus, Diphtheria, and Pertussis Immunizations: General

[Begin Tetanus, Diphtheria, and Pertussis Immunizations: General.]

Conditions

Exclude patients for any of the following:

1. Severe allergic reaction to tetanus or diphtheria vaccines or any of their components; or
2. Arthus-type hypersensitivity reaction after a dose of any tetanus or diphtheria toxoid-containing vaccine within the past 10 years.

[End Tetanus, Diphtheria, and Pertussis Immunizations: General.]

2.2.10.1. Tetanus, Diphtheria, and Pertussis Immunizations: Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis (Tdap) Vaccine

[Begin Tetanus, Diphtheria, and Pertussis Immunizations: Diphtheria, Tetanus Toxoids, Reduced Diphtheria Toxoid, and Acellular Pertussis (Tdap)Vaccine.]

Conditions

This sub-branch includes adults meeting any of the following criteria:

1. Incomplete or unknown history of the primary tetanus and diphtheria toxoid-containing vaccine series (at least three doses if the first dose is administered on or after the first birthday or the patient is aged >= 19 years, or at least four doses if the first dose was administered prior to the first birthday and the patient is aged < 19 years); or
2. No record of prior Tdap receipt; or
3. Current pregnancy; or
4. Immediately postpartum if Tdap is not administered during pregnancy.

Exclude patients for any of the following:

1. Development of encephalopathy within 7 days of any acellular pertussis-, tetanus toxoid-, or diphtheria toxoid-containing vaccine without any other attributable cause; or
2. Current progressive encephalopathy or neurologic disorder, uncontrolled seizures, or unstable neurologic disorder; or
3. Prior Tdap immunization during current pregnancy or postpartum period.

Actions

1. Identify the patient as a tetanus, diphtheria, pertussis vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsection for the tetanus, diphtheria, pertussis vaccine; and

3. Ensure guideline recommendations are available to care team.

[End Tetanus, Diphtheria, and Pertussis Immunizations: Diphtheria, Tetanus Toxoids, Reduced Diphtheria Toxoid, and Acellular Pertussis (Tdap) Vaccine.]

2.2.10.2. Tetanus, Diphtheria, and Pertussis Immunizations: Tetanus and Diphtheria Toxoids (Td) Vaccine

[Begin: Tetanus, Diphtheria, and Pertussis Immunizations: Tetanus and Diphtheria Toxoids (Td) Vaccine.]

Conditions

This sub-branch includes adults with an incomplete or unknown history of the primary series with tetanus and diphtheria toxoid-containing vaccines (at least three doses if the first dose is administered on or after the first birthday or the patient is aged >= 19 years, or at least four doses if the first dose was administered prior to the first birthday and the patient is aged < 19 years).

Patients should not be excluded if they have started or continued the primary series as an adult unless they meet any of the following criteria:

1. Receipt of the first dose of the primary tetanus and diphtheria toxoid-containing vaccine series within the past 4 weeks; or

2. Aged >= 19 years and receipt of the second dose of the tetanus and diphtheria toxoid-containing vaccine primary series within the past 6 months; or

3. Aged < 19 years, receipt of the first dose of the tetanus and diphtheria toxoid-containing vaccine primary series on or after the first birthday, and receipt of the second dose within the past 6 months; or

4. Aged < 19 years, receipt of the first dose of the tetanus and diphtheria toxoid-containing vaccine primary series prior to the first birthday, and receipt of the second dose within the past four weeks; or

5. Aged < 19 years, receipt of the first dose of the tetanus and diphtheria toxoid-containing vaccine primary series prior to the first birthday, and receipt of the third dose within the past 6 months; or

6. No record of prior Td vaccines.

Exclude patients who have started or continued the primary series as an adult should be excluded if they have yet to receive a Tdap

Actions

1. Identify the patient as a tetanus and diphtheria toxoids vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsection for tetanus and diphtheria toxoids vaccine; and

3. Make sure guideline recommendations are available to care team.

[End Tetanus, Diphtheria, and Pertussis Immunizations: Tetanus and Diphtheria Toxoids (Td) Vaccine.]

2.2.10.3. Tetanus, Diphtheria, and Pertussis Immunizations: Tetanus and Diphtheria Toxoids (Td) Vaccine Booster

[Begin Tetanus, Diphtheria, and Pertussis Immunizations: Tetanus and Diphtheria Toxoids (Td) Vaccine Booster.]

Conditions

The subpopulation for this branch includes adults whose most recent Tdap or Td vaccine was at least 10 years ago.

Actions

1. Identify the patient as a tetanus and diphtheria toxoids vaccine candidate; and
2. Open the Immunizations Order Set KNART and display the subsection for tetanus and diphtheria toxoids vaccine; and
3. Ensure guideline recommendations are available to care team.

[End Tetanus, Diphtheria, and Pertussis Immunizations: Tetanus and Diphtheria Toxoids (Td) Vaccine Booster.]

2.2.11. Varicella Immunizations

[Begin Varicella Immunizations.]

Conditions

The subpopulation for this branch includes all patients with the exception of those who meet any of the following criteria:

1. History of a severe allergic reaction to the varicella vaccine or to any of its components; or
2. Active pregnancy; or
3. Active malignancy; or
4. Birth in the U.S. before 1980, unless working in health care or female of reproductive age or immunocompromised; or
5. Health care provider-verified varicella or herpes zoster diagnosis; or
6. Laboratory verification of varicella or herpes zoster diagnosis or immunity; or
7. HIV infection with the most recent CD4+ T-lymphocyte count of < 200 cells/microliter; or
8. Use of acyclovir, famciclovir, or valacyclovir within the past 24 hours; or
9. Receipt of blood products containing antibodies within the past 11 months; or
10. Current chemotherapy; or
11. Congenital or hereditary immunodeficiency; or
12. Active use of immunosuppressive medications with an anticipated duration of at least two weeks; or

[Technical Note: High-dose steroids (>= 20 mg/day of prednisone or equivalent) should be considered immunosuppressive medications.; or

13. Completion of a 2-week or longer course of immunosuppressive medications within the past 1 month

14. History of a severe allergic reaction to neomycin or gelatin; or

15. Prior receipt of 2 doses of the varicella vaccine at least 4 weeks apart; or

16. Prior receipt of 1 dose of the varicella vaccine within the past 4 weeks (or within the past 3 months if active HIV infection).

Actions

1. Identify the patient as a varicella vaccine candidate; and

2. Open the Immunizations Order Set KNART and display the subsection for varicella vaccination; and

3. Ensure guideline recommendations are available to care team.

[End Varicella Immunizations.]

[End Recommended Immunizations: Event-Condition-Action (ECA) Rule.]

Chapter 3. Recommended Immunizations: Order Set

[Begin Recommended Immunizations: Order Set.]

3.1. Knowledge Narrative

[Begin Knowledge Narrative.]

[See Clinical Context in Chapter 1.]

[End Knowledge Narrative.]

3.2. Hepatitis Immunizations

[Begin Hepatitis Vaccines.]

[Section Prompt: Per recommendations of the CDC ACIP (Center for Disease Control Advisory Committee on Immunization Practices), "**Adults in the following settings are assumed to be at risk for hepatitis B virus infection and should receive a HepB series**: sexually transmitted disease treatment facilities, HIV testing and treatment facilities, facilities providing drug-abuse treatment and prevention services, healthcare settings targeting services to persons who inject drugs, correctional facilities, healthcare settings targeting services to men who have sex with men, hemodialysis facilities and end-stage renal disease programs, and institutions and nonresidential day care facilities for developmentally disabled persons."]

3.2.1. Hepatitis A Vaccine (0 and 6 to 18 Months)

[Technical Note: This subsection should be made available for patients for whom the Hepatitis A Immunization branch of the Immunizations General ECA rule KNART is true.]

☐ Hepatitis A vaccine 1 mL solution intramuscular 1 time give injection in the deltoid region now

3.2.2. Combined Hepatitis A and B Vaccine Series (0, 1, and 6 Month)

[Technical Note: This subsection should be made available for patients for whom the Combined Hepatitis A and B Immunizations branch of the Immunizations General ECA rule KNART is true.]

☐ Hepatitis A and hepatitis B (recombinant) vaccine 1 mL solution intramuscular 1 time give injection in the deltoid region now

3.2.3. Hepatitis B Vaccine (0, 1, and 6 Months) for Age < 20 Years

[Technical Note: This subsection should be made available for patients < 20 years for whom the Hepatitis B Immunization branch of the Immunizations General ECA rule KNART is true.]

☐ Hepatitis B vaccine (recombinant) 10 micrograms/mL formulation 0.5 mL solution intramuscular 1 time give injection in the deltoid region now

☐ Hepatitis B vaccine (recombinant) 20 micrograms/mL formulation 0.5 mL solution intramuscular 1 time give injection in the deltoid region now

3.2.4. Hepatitis B Vaccine Series (0, 1, and 6 Months) for Age >= 20 Years

[Technical Note: This subsection should be made available for patients >= 20 years for whom the Hepatitis B Immunization branch of the Immunizations General ECA rule KNART is true.]

☐ Hepatitis B vaccine (recombinant) 10 micrograms/mL formulation 1 mL solution intramuscular 1 time give injection in the deltoid region now

☐ Hepatitis B vaccine (recombinant) 20 micrograms/mL formulation 1 mL solution intramuscular 1 time give injection in the deltoid region now

3.2.5. Hepatitis B Vaccine Series (0, 1, and 6 Months or 0, 1, 2, and 6 Months) for Dialysis

[Technical Note: This subsection should be made available for patients on dialysis for whom the Hepatitis B Immunization branch of the Immunizations General ECA rule KNART is true.]

[Technical Note: The order for the hepatitis B vaccine (recombinant) 40 micrograms/mL formulation should not be displayed for patients who have already received at least one dose of the hepatitis B vaccine (recombinant) 20 micrograms/mL formulation.]

☐ Hepatitis B vaccine (recombinant) 40 micrograms/mL formulation 1 mL solution intramuscular 1 time give injection in the deltoid region now

[Technical Note: The order for the hepatitis B vaccine (recombinant) 20 micrograms/mL formulation should not be displayed for patients who have already received at least one dose of the hepatitis B vaccine (recombinant), 40 micrograms/mL formulation.]

☐ Hepatitis B vaccine (recombinant) 20 micrograms/mL formulation 2 mL solution intramuscular 1 time give injection in the deltoid region now

[End Hepatitis Vaccines.]

3.3. Herpes Zoster (Shingles) Immunization

[Begin Herpes Zoster (Shingles) Immunization.]

[Section prompt: The new version released January 2018 by the CDC https://www.cdc.gov/mmwr/volumes/67/wr/mm6703a5.htm.]

[Technical Note: This subsection should be made available for patients for whom the Herpes Zoster (Shingles) Immunization branch of the Immunizations General ECA rule KNART is true.]

☐ Zoster vaccine live injection, powder, lyophilized 0.65 mL solution subcutaneous 1 time give injection in deltoid region now

[End Herpes Zoster (Shingles) Immunization.]

3.4. Human Papillomavirus (HPV) Vaccine Series (0, 2, and 6 Months)

[Begin Human Papillomavirus (HPV) Vaccine Series (0, 2, and 6 Months.]

[Section Prompt: Human Papillomavirus (HPV) Vaccine CDC guidelines https://www.cdc.gov/hpv/index.html.]

[Technical Note: This subsection should be made available for patients for whom the HPV Immunization branch of the Immunizations ECA rule KNART is true.]

☐ HPV 9-valent vaccine, recombinant injection 0.5 mL solution intramuscular 1 time give injection in the deltoid region now

[End Human Papillomavirus (HPV) Vaccine Series (0, 2, and 6 Months.]

3.5. Influenza Immunization

[Begin Influenza Immunization.]

[Section Prompt: Please see ACIP's Recommended Immunization Schedule for Adults Aged 19 Years or Older, United States, 2017 (https://www.cdc.gov/vaccines/schedules/downloads/adult/adult-combined-schedule.pdf).]

3.5.1. Standard-Dose Inactivated Influenza Vaccine (IIV).

[Technical Note: This subsection should be made available for patients for whom the Influenza Immunizations: Standard-Dose Inactivated Influenza Vaccine (IIV) sub-branch of the Influenza Immunization General ECA rule KNART is true.]

☐ Influenza inactivated virus vaccine 0.5 mL solution intramuscular 1 time give injection in the deltoid region now

3.5.2. Recombinant Influenza Vaccine (RIV)

[Technical Note: This subsection should be made available for patients for whom the Influenza Immunizations: Recombinant Influenza Vaccine (RIV) sub-branch of the Influenza Immunization General ECA rule KNART is true.]

☐ Influenza virus vaccine (recombinant) 0.5 mL solution intramuscular 1 time give injection in the deltoid region now

3.5.3. Intradermal IIV

[Technical Note: This subsection should be made available for patients for whom the Influenza Immunizations: Intradermal IIV sub-branch of the Influenza Immunization General ECA rule KNART is true.]

☐ Intradermal influenza inactivated virus vaccine 0.1 mL solution intradermal 1 time give injection in the deltoid region now

3.5.4. High-Dose or Adjuvanted IIV

[Technical Note: This subsection should be made available for patients for whom the Influenza Immunizations: High-Dose or Adjuvanted IIV sub-branch of the Influenza Immunization General ECA rule KNART is true.]

☐ Influenza high-dose inactivated virus vaccine 0.5 mL solution intramuscular 1 time give injection in the deltoid region now

[End Influenza Immunization.]

3.6. Meningococcal Immunization

[Begin Meningococcal Immunizations.]

[Section Prompt: Meningococcal vaccines should be used during pregnancy only if clearly needed. Health care providers are encouraged to register women who receive a meningococcal vaccine during pregnancy. See package inserts at: https://www.fda.gov/BiologicsBloodVaccines/Vaccines/ApprovedProducts/default.htm.]

3.6.1. Serogroups A, C, W, and Y Conjugate Vaccine (MenACWY) Series and Boosters.

[Technical Note: This subsection should be made available for patients for whom the Meningococcal Immunizations: Serogroups A, C, W, and Y Conjugate Vaccine (MenACWY) Series and Boosters sub-branches of the Meningococcal Immunizations General ECA rule KNART is true.]

[Section Prompt: CDC newly published this recommendation regarding eculizumab and meningococcal vaccination in the July 7, 2017 https://www.cdc.gov/meningococcal/clinical/eculizumab.html.]

☐ Meningococcal (groups a, c, y, and w-135) oligosaccharide diphtheria crm197 conjugate vaccine 0.5 mL solution intramuscular 1 time give injection in the deltoid region now

3.6.2. Serogroup B Meningococcal Vaccine: MenB-4C Series (0 and 1 Month)

[Technical Note: This subsection should be made available for patients for whom any of the Meningococcal Immunizations: Serogroup B Meningococcal Vaccine (MenB) Series sub-branches of the Meningococcal Immunizations General ECA rule KNART is, providing the patient has not had a prior MenB-FHbp immunization.]

☐ Neisseria meningitidis serogroup b-4c protein antigen vaccine 0.5 mL solution intramuscular 1 time give injection in the deltoid region now

3.6.3. Serogroup B Meningococcal Vaccine: MenB-Fhbp Series (0, 1 to 2, and 6 Months or 0 and 6 Months, Based on Indications)

[Technical Note: This subsection should be made available for patients for whom any of the Meningococcal Immunizations: Serogroup B Meningococcal Vaccine (MenB) Series sub-branches of the Immunizations ECA rule KNART is true, providing the patient has not had a prior MenB-4C immunization.]

☐ Neisseria meningitidis serogroup b-FHbp protein antigen vaccine 0.5 mL solution intramuscular 1 time give injection in the deltoid region now

[End Meningococcal Immunizations.]

3.7. Measles, Mumps, and Rubella (MMR) Immunization

[Begin Measles, Mumps, and Rubella (MMR) Immunizations.]

[Section Prompt: Please note that ACIP published updated guidance on MMR immunizations https://www.cdc.gov/mmwr/volumes/67/wr/mm6701a7.htm.]

3.7.1. Measles, Mumps, and Rubella Vaccine Series (0 and 28 Days)

[Technical Note: This subsection should be made available for patients for whom the Measles, Mumps, and Rubella Immunizations: Adults Requiring Two Doses of MMR sub-branch of the Measles, Mumps and Rubella Immunizations General ECA rule KNART is true.]

☐ Measles, mumps, and rubella virus vaccine live injection, powder, lyophilized 0.5 mL solution subcutaneous 1 time give injection in the deltoid region now

3.7.2. Measles, Mumps, and Rubella Vaccine

[Technical Note: This subsection should be made available for patients for whom either the Measles, Mumps, and Rubella Immunizations: Adults Requiring One Dose of MMR or the Measles, Mumps, and Rubella Immunizations: Women Who Are Postpartum or Post-termination sub-branch of the Measles, Mumps and Rubella Immunizations General ECA rule KNART is true.]

☐ Measles, mumps, and rubella virus vaccine live injection, powder, lyophilized 0.5 mL solution subcutaneous 1 time give injection in the deltoid region now

[End Measles, Mumps, and Rubella (MMR) Immunizations.]

3.8. Pneumococcal Immunization

[Begin Pneumococcal Immunization.]

[Section Prompt: Pneumococcal Immunization CDC guidelines https://www.cdc.gov/vaccines/vpd/pneumo/hcp/recommendations.html.]

[Section Prompt: Both Pneumococcal Polysaccharide Vaccine (PPSV23) and Pneumococcal Conjugate Vaccine (PCV13) should be given to a pregnant woman only if clearly needed. Pregnancy is not an absolute contraindication.]

3.8.1. 13-Valent Pneumococcal Conjugate Vaccine

[Technical Note: This subsection should be made available for patients for whom the Pneumococcal Immunizations General ECA rule is true for any of the following: 1) the "Pneumococcal Immunizations: **13-**Valent Pneumococcal Conjugate Vaccine (PCV13) for Younger Adults with Asplenia or Immunocompromise" sub-branch; or 2) the "Pneumococcal Immunizations: 13-Valent Pneumococcal Conjugate Vaccine (PCV13) for Younger Adults with a Cerebrospinal Fluid Leak or a Cochlear Implant" sub-branch; or 3) the "Pneumococcal Immunizations: 13-Valent Pneumococcal Conjugate Vaccine (PCV13) for Older Adults with Asplenia, Immunocompromise, Cerebrospinal Fluid Leak, or Cochlear Implant" sub-branch; or 4) the "Pneumococcal Immunizations: 13-Valent Pneumococcal Conjugate Vaccine (PCV13) for Immunocompetent Older Adults" sub-branch.]

☐ Pneumococcal 13-valent conjugate vaccine 0.5 mL solution intramuscular 1 time give injection in the deltoid region now

3.8.2. 23-Valent Pneumococcal Polysaccharide Vaccine

[Technical Note: This subsection should be made available for patients for whom the Pneumococcal Immunizations General ECA rule is true for any of the following:

1. The "Pneumococcal Immunizations: Initial 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Younger Adults with Asplenia or Immunocompromise " sub-branch

2. The "Pneumococcal Immunizations: Second 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Younger Adults with Asplenia or Immunocompromise" sub-branch

3. The "Pneumococcal Immunizations: 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Younger Adults with a Cerebrospinal Fluid Leak or a Cochlear Implant" sub-branch

4. The "Pneumococcal Immunizations: 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Younger Adults with Certain Medical Conditions" sub-branch

5. The "Pneumococcal Immunizations: 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Older Adults with Asplenia, Immunocompromise, Cerebrospinal Fluid Leak, or Cochlear Implant" sub-branch

6. The "Pneumococcal Immunizations: 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) for Immunocompetent Older Adults" sub-branch.]

☐ Pneumococcal polyvalent-23 vaccine 0.5 mL solution intramuscular 1 time give injection in the deltoid region now

[End Pneumococcal Immunization.]

3.9. Tetanus, Diphtheria, and Pertussis Immunization

[Begin Tetanus, Diphtheria, and Pertussis Immunization.]

[Section Prompt: Tetanus, Diphtheria, and Pertussis Immunization CDC Guidelines https://www.cdc.gov/vaccines/vpd/dtap-tdap-td/hcp/recommendations.html.]

3.9.1. Tetanus, Diphtheria, and Pertussis Vaccine

[Technical Note: This subsection should be made available for patients for whom the Tetanus, Diphtheria, Pertussis Immunizations: Tdap sub-branch of the Tetanus, Diphtheria, Pertussis Immunizations General ECA rule KNART is true.]

☐ Tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine 0.5 mL solution intramuscular 1 time give injection in the deltoid region now

3.9.2. Tetanus and Diphtheria Vaccine

[Technical Note: This subsection should be made available for patients for whom either the Tetanus, Diphtheria, Pertussis Immunizations: Td or Tetanus, Diphtheria, Pertussis Immunizations: Td Vaccine Booster sub-branch of the Tetanus, Diphtheria, Pertussis Immunizations General ECA rule KNART is true.]

☐ Tetanus and diphtheria toxoids vaccine 0.5 mL solution intramuscular 1 time give injection in the deltoid region now

[End Tetanus, Diphtheria, and Pertussis Immunization.]

3.10. Varicella Immunization

[Begin Varicella Immunization.]

[Section Prompt: Varicella Immunization CDC Guidelines https://www.cdc.gov/vaccines/vpd/varicella/hcp/index.html

[Technical Note: This section should be made available for patients for whom any branch or sub-branch of the Immunizations General ECA rule KNART is true.]

☐ Varicella live virus vaccine 0.5 mL solution subcutaneous 1 time give injection in the deltoid region now

[End Varicella Immunization.]

3.11. Patient and Caregiver Education

[Begin Patient and Caregiver Education.]

[Technical Note: This section should be made available for patients for whom any branch or sub-branch of the Immunizations General ECA rule KNART is true.]

☐ Vaccine education (patient-appropriate material regarding ordered vaccines) now

[End Patient and Caregiver Education.]

[End Recommended Immunizations: Order Set.]

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Appendix A. Basic Laboratory Panel Definition

- Blood Urea Nitrogen
- Calcium
- Chloride
- CO2 (Carbon Dioxide, Bicarbonate)
- Creatinine
- Glucose
- Potassium
- Sodium

Appendix B. Acronyms

Acronym	Definition
ALT	Alanine Aminotransferase
AST	Aspartate Aminotransferase
CDS	Clinical Decision Support
ECA	Event-Condition-Action
HAV	Hepatitis A Virus
HepA	Hepatitis A Vaccine
HepA-HepB	Combined Hepatitis A and B Vaccine
HepB	Hepatitis B Vaccine
HIV	Human Immunodeficiency Virus
HL7	Health Level 7
HPV	Human Papillomavirus
IIV	Inactivated Influenza Vaccine
KBS	Knowledge Based Systems
KNART	Knowledge Artifact
MenACWY	Serogroups A, C, W, and Y Meningococcal Conjugate Vaccine
MenB	Serogroup B Meningococcal Vaccine
MMR	Measles, Mumps, and Rubella
NCHPDP	National Center for Health Promotion and Disease Prevention
OIIG	Office of Informatics and Information Governance
PCV13	13-Valent Pneumococcal Conjugate Vaccine
PPSV23	23-Valent Pneumococcal Polysaccharide Vaccine
RIV	Recombinant Influenza Vaccine
Td	Tetanus and Diphtheria Toxoids
Tdap	Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis
TO	Task Order
ULN	Upper Limit of Normal
VA	Department of Veterans Affairs
VACO	VA Central Office
VAMC	VA Medical Center