JULY 2020

IMMUNIZATION RESOURCES FOR UNDERGRADUATE NURSING (IRUN)

Fundamentals of Immunization Case Studies Faculty Guide

A Resource to Enhance the IRUN Curriculum Framework

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

CS309631-C

Contents

Acknowledgements

Thank you to the nursing education experts and the organizations they represent for their review of and feedback on these case studies.

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Disclaimer

This publication was funded by the Centers for Disease Control and Prevention (CDC) through Cooperative Agreement Number 5NU36OE000008-03-00 with the Association for Prevention Teaching and Research (APTR) and Cooperative Agreement Number 6NU36OE000009-02-01 with the American Association of Colleges of Nursing (AACN). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of APTR, AACN, CDC, or the Department of Health and Human Services.

Immunization Resources for Undergraduate Nursing (IRUN) Overview

Advancements in teaching methods for health professions education and nursing practice have resulted in the need to enhance immunization resources for training and education of nurses. With the current trend of vaccine hesitancy, it is important that future nurses are armed with the best evidence to promote immunizations. To improve the integration of immunization in prelicensure nursing education, the Association for Prevention Teaching and Research (APTR) and the National Center for Immunization and Respiratory Diseases (NCIRD) at the Centers for Disease Control and Prevention (CDC) convened the Nursing Education Experts (NEE), a group of experts with diverse nursing perspectives. Its members include prelicensure nursing educators, national nursing practice and education association members, and nursing students.

Now referred to as the Immunization Resources for Undergraduate Nursing (IRUN) project, IRUN seeks to improve the integration of immunization in prelicensure nursing education through the development of a curriculum framework and teaching resources. The following materials are the result of this initiative.

IRUN Framework

The purpose of the IRUN framework is to:

- ✓ Provide guidance for faculty on integrating immunization content into a curriculum, with a focus on entry-level learning for the prelicensure nursing student.
- ✓ Ensure access to and consistency of current information for faculty and students.
- ✓ Prioritize information and content to be included in curricula.

The framework does not provide instructions for teaching immunization in an academic setting. It serves solely as a guide to foundational topics identified by IRUN, CDC, and APTR. Nursing faculty members are encouraged to assess their existing curricula and incorporate appropriate elements of the framework. The framework consists of 12 topic areas with corresponding learning objectives and suggested resources. The framework objectives are meant to be comprehensive. Faculty members can present the subject matter in any manner they find suitable.

User Guide

The IRUN case studies are designed for all prelicensure nursing levels. Based on CDC immunization training materials, each case was reviewed and adapted from recommendations of a group of nursing education experts.

The most current versions of the CDC recommended immunization schedules should be used with each case. The schedules are available at www.cdc.gov/vaccines/schedules/.

The 21 cases are grouped by patient age and topic into four parts. Within each part, the cases are organized by difficulty level from easy to moderate to advanced. The difficulty level for each case is listed in parentheses after the case title.

Organization of Contents

Part	Included Topics	Number of Cases	Levels of Difficulty
Part 1: Birth through 5 Years of Age–Patient Encounters	• Vaccine storage and handling • Pain, communication, and site and needle selection • Simultaneous administration • Educating the parent using VISs • Vaccine contraindications and precautions	7 cases	Easy – Moderate
Part 2: Birth through 12 Years of Age–Vaccination Schedule	• Using the CDC child and adolescent immunization schedule	5 cases	Easy – Moderate
Part 3: Adult Vaccination Schedule	• Using the CDC adult immunization schedule for ages 19 years or older with: • Healthy Older Adults • Health Care Personnel • Healthy Pregnancies	6 cases	Moderate – Advanced
Part 4: Catch-Up Vaccination Schedule	• Appropriate timing and spacing of doses when vaccination schedule is delayed • Using the CDC catch-up vaccination schedule	3 cases	Moderate – Advanced

Each case begins with an **Overview** of the topic and the **Objectives** participants will meet upon completion. A section of **Teaching Tools** follows and contains reference material for both instructors and students. The **Glossary Words** include technical terminology used within the case and corresponding definitions. This content is followed by the **Background,** in which the case is presented along with **Instructions** and **Activities**, which offer questions and exercises to be completed by the students, either individually or in groups.

The cases' flexible design allows instructors to modify the materials to meet the needs of diverse curricula. The content may be inserted into a presentation to emphasize a teaching point, or an entire part may be assigned for completion outside of the class period. An individual case may be used in full or an instructor may assign only one activity from a case. Additionally, depending on the time allotted, instructors can highlight specific vaccines, especially in activities that require an evaluation of vaccines needed for the clinic visit and future visits.

If desired, instructors can remove patient names from each case study and customize the activities to match NCLEX-RN® formatting.

Please submit questions or comments about the case studies on the IRUN web page: https://www.irunursing.org/.

Vaccine Acronyms

The list of vaccine acronyms below is not exhaustive and only includes those used or included in the following case studies..

DTaP – Diphtheria, tetanus, and acellular pertussis vaccine

DTP – Diphtheria, tetanus, and pertussis vaccine

Hib – *Haemophilus influenzae* type b vaccine

HepA – Hepatitis A vaccine

HepB – Hepatitis B vaccine

HPV – Human papillomavirus vaccine

IIV – Influenza vaccine (inactivated)

LAIV – Influenza vaccine (live, attenuated)

MMR – Measles, mumps, and rubella vaccine

MenACWY – Meningococcal serogroups A, C, W, Y vaccine

MenB – Meningococcal serogroup B vaccine

PCV13 – Pneumococcal 13-valent conjugate vaccine

PPSV23 – Pneumococcal 23-valent polysaccharide vaccine

IPV – Poliovirus vaccine (inactivated)

RIV – Influenza vaccine (recombinant)

RV – Rotavirus vaccine

RZV – Zoster vaccine (recombinant)

Tdap – Tetanus, diphtheria, and acellular pertussis vaccine

Td – Tetanus and diphtheria vaccine

VAR – Varicella vaccine

ZVL – Zoster vaccine (live)

A syringe with needle withdrawing vaccine from a vial.

Vaccine Trade Names

The list of vaccine trade names below is not exhaustive and only includes those used or included in the following case studies. Within each case, a vaccine trade name is specified only when the vaccine products are not interchangeable or when the use of a different trade name would require a different schedule or otherwise modify the case as currently written.

ActHIB® – *Haemophilus influenzae* type b vaccine

Bexsero® – Meningococcal serogroup B vaccine

Engerix-B® – Hepatitis B vaccine

Fluzone® High-Dose – Inactivated influenza vaccine

Heplisav-B® – Hepatitis B vaccine

Hiberix® – *Haemophilus influenzae* type b vaccine

Menactra® – Meningococcal serogroups A, C, W, Y vaccine

Menveo® – Meningococcal serogroups A, C, W, Y vaccine

Pediarix® – DTaP, hepatitis B, and inactivated poliovirus vaccine

PedvaxHIB® – *Haemophilus influenzae* type b vaccine

Pentacel® – DTaP, inactivated poliovirus vaccine, and *Haemophilus influenzae* type b vaccine

ProQuad® – Measles, mumps, rubella, and varicella vaccine

Recombivax HB® – Hepatitis B vaccine

Rotarix® – Rotavirus vaccine

RotaTeq® – Rotavirus vaccine

Tenivac® – Tetanus and diphtheria vaccine

Multiple vials of vaccines.

Part 1: Birth through 5 Years of Age–Patient Encounters

A health care provider checking an infant's chest with a stethoscope.

Part 1 Case Studies

Case Study	Topics	Level of Difficulty
1a. We Care Pediatric Facility	Vaccine Storage and Handling	Easy
1b. 5-year-old, Trinity	Pain, Communication, and Site and Needle Selection	Easy
1c. 5-year-old, Trinity	Simultaneous Administration	Easy
1d. 2-year-old, Jackson	Educating the Parent Using VISs	Easy
1e. 2-year-old, Kristoph	Vaccine Contraindications and Precautions	Moderate
1f. 6-month-old, Lilly	Vaccine Contraindications and Precautions	Moderate
1g. 15-month-old, Anna	Vaccine Contraindications and Precautions	Moderate

1a. We Care Pediatric Facility, Vaccine Storage and Handling (Easy)

Overview

To be effective, vaccines must be stored and handled correctly. Storage and handling errors can result in significant costs to replace expensive vaccines and revaccinate patients. Every facility should have detailed, written protocols for routine and emergency vaccine storage and handling, and those protocols should be updated annually.

Objectives

Using this case study, nursing students will:

- Identify requirements and best practices for vaccine storage and handling.
- Identify when a vaccine may have been compromised.

Teaching Tools

Review the following to help complete the case study:

1. *Epidemiology and Prevention of Vaccine-Preventable Diseases* (the Pink Book), Chapter 5– Vaccine Storage and Handling (Vaccine and Diluent Inventory Control)
2. *Epidemiology and Prevention of Vaccine-Preventable Diseases* (the Pink Book), Chapter 5– Vaccine Storage and Handling (Vaccine and Diluent Placement and Labeling)
3. Vaccine Storage and Handling Toolkit (Organizing and Storing Vaccine in Storage Unit)
4. You Call the Shots: Vaccine Storage and Handling module

Glossary Words

Antigen: A foreign substance (e.g., bacterium or virus) in the body that is capable of causing disease. The presence of antigens in the body triggers an immune response, usually the production of antibodies.

Buffered temperature probe: A temperature probe designed to prevent false readings by protecting the thermometer from sudden changes in temperature that can occur when opening a refrigerator door. A probe is "buffered" by immersing it in a vial filled with liquid (e.g., glycol, ethanol, glycerin), loose media (e.g., sand, glass beads), or a solid block of material (e.g., Teflon®, aluminum).

Digital data logger (DDL): An electronic device that records data digitally over time or in relation to location either with a built-in or external instrument or sensor.

Pink Book: An informal name for the textbook *Epidemiology and Prevention of Vaccine-Preventable Diseases*, which provides physicians, nurses, nurse practitioners, physician assistants, pharmacists, and others with the most comprehensive information on routinely used vaccines and the diseases they prevent, based on the recommendations of the Advisory Committee on Immunization Practices (ACIP).

Vaccination: The use of vaccines to produce immunity to a disease. This usually entails administering antigenic material, or vaccine, by injection.

Vaccine: A biological product that is injected, ingested, or inhaled to confer or improve immunity to a particular disease.

Vaccine diluent: A liquid supplied by the vaccine manufacturer that is used to reconstitute lyophilized (freeze-dried) vaccine before administration.

Background

We Care pediatric facility's current vaccine stock includes DTaP, Hib, PCV13, IPV, MMR, VAR, HepA, RV, IIV, and HepB vaccines. The facility has placed an order for Tdap, HPV, MenACWY (Menveo®), and MenB (Bexsero®). The vaccine shipment arrived today, and the vaccine coordinator immediately checked the contents and stored the vaccines properly in the storage unit.

Activities

1. Should the HepA vaccine be stored in the refrigerator? If so, should the vaccine with the latest expiration dates be placed in the front of the unit and used first?

2. Should the diluent for any of these vaccines be stored with the corresponding vaccine? If so, which one(s) and why?

3. Should Tdap vaccine be placed next to existing supplies of DTaP vaccine within the storage unit?

4. The clinic is doing an off-site flu vaccination clinic. How do you ensure the vaccine is not compromised once it has arrived at an off-site facility?

A health care provider applying an adhesive bandage to a young girl's injection site.

1b. 5-year-old, Pain, Communication, and Site and Needle Selection (Easy)

Overview

The pain and anxiety associated with vaccination can increase fear among patients, leading to avoidance of future medical procedures and lack of adherence to immunization schedules. However, there are strategies health care providers can use to reduce procedural pain and fear of injections. In addition, providers should encourage parents and guardians to take an active role before, during, and after the administration of vaccines.

Objectives

Using this case study, nursing students will:

- Identify techniques to reduce procedural pain and fear of injections associated with immunization.
- Practice communication with caregivers during vaccine administration.
- Identify age-appropriate sites for vaccine administration.
- Identify correct needle length and gauge for intramuscular (IM) injections.

Teaching Tools

Review the following to help complete the case study:

1. *Epidemiology and Prevention of Vaccine-Preventable Diseases* (the Pink Book), Chapter 6– Vaccine Administration (Patient Care during Vaccine Administration)
2. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 6–1: Dose and Route of Administration for Selected Vaccines
3. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 6–2: Needle Length and Injection Site of IM Injections for Children Aged ≤18 Years (by Age) and Adults Aged ≥19 Years (by Sex and Weight)
4. Vaccine Administration e-Learn
5. Vaccine Administration Resource Library
6. How to Hold Your Child during Vaccinations
7. Tips for a Less Stressful Shot Visit

Glossary Words

Analgesia: A neurologic or pharmacologic state in which painful stimuli are moderated such that, although still perceived, they are no longer painful.

Anterolateral: Referring to the front and outer side of an area; the anterolateral thigh is the area on the front and outer aspect of the thigh where the vastus lateralis muscle is located.

Aspiration: The process of pulling back on the syringe plunger after needle insertion but before injection. ACIP does not recommend aspiration when injecting vaccines or toxoids because no large vessels are present at the recommended sites, and it might make the injection more painful for infants.

Deltoid muscle: Muscle in the outer portion of the upper arm found two to three fingerbreadths down from the acromion process and above the axillary fold.

Immunization: The process of being made immune or resistant to an infectious disease, typically by the administration of a vaccine. It implies that you've had an immune response.

Immunization schedule (vaccination schedule): A summary of vaccination recommendations by the Advisory Committee on Immunization Practices/CDC that gives health care providers information on recommended timelines, conditions, and other indications for administering vaccines. There are child/adolescent, adult, and catch-up immunization schedules.

Intramuscular: Into the muscle; abbreviated IM.

Subcutaneous: Into the fatty, connective tissue just beneath the skin (dermis); abbreviated Subcut.

Triceps muscle: A three-headed muscle attached to the back up the upper arm bone (humerus) and to the outer edge of the shoulder blade (scapula) and running down the back of the arm.

Vaccination: The use of vaccines to produce immunity to a disease. This usually entails administering antigenic material, or vaccine, by injection.

Background

Trinity is 5 years old and has no known medical conditions. She is in the office in July for a well-child visit. She is on schedule with her vaccinations and is due for her DTaP, MMR, VAR, and IPV doses. Trinity is very upset since she knows she may get several injections today. Her mother is concerned about how to comfort her.

Activities

1. What are some ways you can decrease Trinity's pain and help with her fear?

2. What advice will you give Trinity's mother to help Trinity before, during, and after vaccine administration?

3. What are the age-appropriate sites for administering the vaccines she needs today and what needle size will you select? Complete the information in the table below (see example for DTaP). Refer to the General Guidelines, Table 6–1 and Table 6–2.

Table 1b-3: Vaccine route, site, needle size, and sample vaccination plan

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Route(s)	Age-Appropriate Sites	Needle Size	Sample Plan
Example: DTaP	*IM**	*Deltoid* *Anterolateral thigh muscle*	*5/8"–1"* *1"–1.25"*	*IM in the L deltoid*
IPV				
MMR				
VAR				
MMRV				

*If skin is stretched tightly and Subcutaneous tissues are not bunched.

1c. 5-year-old, Simultaneous Administration (Easy)

Overview

Simultaneous administration of vaccines means administering more than one vaccine on the same day. It is considered a standard practice and available evidence suggests that it is safe and effective. It increases the probability that a child will be fully immunized at the appropriate age. Yet some parents request that health care providers avoid simultaneous administration of vaccines because of concerns about "overloading" the immune system. These concerns are not supported by scientific data. However, they are very real concerns for parents and must be addressed.

Objectives

Using this case study, nursing students will:

- Recognize the advantages of simultaneous administration of vaccines.
- Practice explaining how simultaneous administration of vaccines is safe.

Teaching Tools

Review the following to help complete the case study:

1. *Epidemiology and Prevention of Vaccine-Preventable Diseases* (the Pink Book), Chapter 6–Vaccine Administration
2. If You Choose Not to Vaccinate Your Child, Understand the Risks and Responsibilities
3. Multiple Vaccines and the Immune System
4. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 3–1: Recommended and Minimum Ages and Intervals between Vaccine Doses
5. Addressing Parents' Concerns: Do Multiple Vaccines Overwhelm or Weaken the Infant's Immune System?

Glossary Words

Antigen: A foreign substance (e.g., bacterium or virus) in the body that is capable of causing disease. The presence of antigens in the body triggers an immune response, usually the production of antibodies.

Febrile seizure: Also known as a "fever fit" or "febrile convulsion"; a convulsion associated with a significant rise in body temperature. They most commonly occur in children between the ages of 6 months and 6 years and are twice as common in boys as in girls.

Background

Trinity is 5 years old and has no known medical conditions. She is in the office in July for a well-child visit. She is on schedule with her vaccinations and is due for her DTaP, MMR, VAR, and IPV doses. Before Trinity received her vaccines today, her mother expressed concern that Trinity would be getting so many vaccines during the same visit. Worried about "overwhelming" her daughter's immune system, Trinity's mother felt it was best to space the vaccines out over multiple visits.

Activity

1. How do you respond to this mother's concerns about the number of vaccines Trinity will receive today? Practice saying aloud to another student what you would tell Trinity's mother.

A health care provider speaking with a young child, who is sitting on her mother's lap.

1d. 2-year-old, Educating the Parent Using VISs (Easy)

Overview

Federal law requires that a vaccine information statement (VIS) be provided to either the adult patient or the patient's parent/legal representative before each vaccine dose is administered. A VIS provides information on both the benefits and risks of the vaccine, as well as symptoms of possible adverse reactions and information on when to seek medical care.

Objectives

Using this case study, nursing students will:

- Learn the requirements for using the VIS.
- Use CDC's vaccine information statements (VISs) for teaching and explaining vaccine risks and benefits before the administration of any vaccines.

Teaching Tools

Review the following to help complete the case study:

1. Instructions for Using VISs
2. Vaccine Information Statement–Influenza (Flu) Vaccine (Inactivated or Recombinant)
3. Vaccine Information Statement–Pneumococcal Conjugate (PCV13)
4. *Epidemiology and Prevention of Vaccine-Preventable Diseases* (the Pink Book), Chapter 6– Vaccine Administration (Vaccine Information Statements and Documentation)
5. *Epidemiology and Prevention of Vaccine-Preventable Diseases* (the Pink Book), Chapter 17– Pneumococcal Disease (Adverse Reactions Following Vaccination)

Glossary Words

Immunization information system (IIS): Confidential, population-based, computerized database that records all vaccine doses administered by participating providers to persons residing within a given geopolitical area. Also known as "immunization registry."

Pneumococcal disease: Bacterial diseases caused by *Streptococcus pneumoniae*; pneumococcal diseases include pneumococcal pneumonia, pneumococcal bacteremia, and pneumococcal meningitis, which can all cause significant illness and death. Pneumococcal disease also causes otitis media in children.

Vaccine information statement (VIS): A document produced by CDC that informs vaccine recipients or their parents or legal representatives about the benefits and risks of a vaccine being administered. All public and private vaccine providers are required by the National Childhood Vaccine Injury Act to give the appropriate VIS to the patient (or parent or legal representative) prior to every dose of specific vaccines.

Background

Jackson is 2 years old and is being seen in the outpatient clinic. His mother reports that he was hospitalized with laboratory-confirmed pneumococcal pneumonia and has now recovered. Jackson is due for his PCV13 and IIV vaccinations. He is up to date with all other immunizations.

Activities

1. When should Jackson's parent receive VISs and which VISs will they need?

2. Jackson's mother expresses concern about the information provided in the VIS, which indicates young children who get IIV and PCV13 at the same visit might be more likely to have a seizure caused by fever. In what section of the VIS did she find this information? How should the nurse respond?

3. What is the role of the nurse in regard to the VIS?

4. What would you document about the VIS in the medical record and/or IIS?

1e. 2-year-old, Vaccine Contraindications and Precautions (Moderate)

Overview

Screening for vaccine contraindications and precautions at every clinical encounter is considered a standard practice for nurses. A contraindication is a condition in a recipient that is likely to result in a life-threatening problem if a vaccine were given. A precaution is a condition in a recipient that might increase the risk for a serious adverse reaction, might cause diagnostic confusion, or might compromise the ability of the vaccine to produce immunity. A vaccination may be indicated in the presence of a precaution, with a risk that the person may experience a more severe reaction to the vaccine than normally expected. However, the risk for a severe reaction is less with a precaution than the risk expected with a contraindication.

Objectives

Using this case study, nursing students will:

- Identify contraindications and precautions by vaccine.
- Identify conditions commonly misperceived as vaccine contraindications.

Teaching Tools

Review the following to help complete the case study:

1. *Epidemiology and Prevention of Vaccine-Preventable Diseases* (the Pink Book), Chapter 2–General Recommendations on Immunization
2. Immunization Action Coalition's (IAC) Screening Checklist for Contraindications to Vaccines for Children and Teens
3. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 4–1: Contraindications and Precautions to Commonly Used Vaccines
4. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 4–2: Conditions Incorrectly Perceived as Contraindications to Vaccination
5. Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger

Glossary Words

Contraindication: A condition that increases the likelihood of a serious adverse reaction to a vaccine for a patient with that condition. If the vaccine is given in the presence of that condition, the resulting adverse reaction could seriously harm the recipient.

Immunity: Protection against a disease or an infection, usually associated with antibodies or certain cells in the blood that counteract microbes or toxin. Immunity can come from infection with a disease or from vaccination.

Precaution: A condition in a recipient that might increase the risk for a serious adverse reaction, might cause diagnostic confusion, or might compromise the ability of the vaccine to produce immunity.

Background

Kristoph is a new 2-year-old patient you are seeing in June (summer) for the first time. His medical history is significant because he received a cochlear implant 1 year ago. He has a written vaccination record. His mother reports that after receiving recommended vaccines at 12 months of age, Kristoph had a fever of 101°F for 2 days.

Immunization History

HepB – at birth

DTaP–IPV–HepB (Pediarix®) – 3 doses (2 months, 4 months, and 6 months of age)

RV5 (RotaTeq®) – 3 doses (2 months, 4 months, and 6 months of age)

DTaP – 1 dose (12 months of age)

ActHIB® (Hib) – 1 dose (12 months of age)

PCV13 – 3 doses (2 months, 4 months, and 6 months of age)

MMR – 1 dose (12 months of age)

VAR – 1 dose (12 months of age)

HepA – 1 dose (12 months of age)

IIV – 1 dose (14 months of age)

Activity

1. **Kristoph is due for Hib, PCV13, HepA, and PPSV23. Are there any contraindications for any of the vaccines he needs today?**

Step 1. Screen the patient for vaccine contraindications and precautions (use the Screening Checklist). In practice, parents should complete this form and health care providers should review it before vaccines are administered. A "yes" response does not mean vaccination is contraindicated. It means further evaluation needs to be done by the health care provider to determine any vaccine contraindication or precaution.

Step 2. Identify any contraindications or precautions for the child based on their current health status, reported medical history, or previous response to a vaccine (use the General Guidelines, Table 4–1).

Step 3. Identify conditions where vaccines can be given safely (use the General Guidelines, Table 4–2).

1f. 6-month-old, Vaccine Contraindications and Precautions (Moderate)

Overview

Screening for vaccine contraindications and precautions at every clinical encounter is considered a standard practice for nurses. A contraindication is a condition in a recipient that is likely to result in a life-threatening problem if a vaccine were given. A precaution is a condition in a recipient that might increase the risk for a serious adverse reaction, might cause diagnostic confusion, or might compromise the ability of the vaccine to produce immunity. A vaccination may be indicated in the presence of a precaution, with a risk that the person may experience a more severe reaction to the vaccine than normally expected. However, the risk for a severe reaction is less with a precaution than the risk expected with a contraindication.

Objectives

Using this case study, nursing students will:

- Identify contraindications and precautions by vaccine.
- Identify conditions commonly misperceived as vaccine contraindications.

Teaching Tools

Review the following to help complete the case study:

1. *Epidemiology and Prevention of Vaccine-Preventable Diseases* (the Pink Book), Chapter 2–General Recommendations on Immunization
2. Immunization Action Coalition's (IAC) Screening Checklist for Contraindications to Vaccines for Children and Teens
3. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 4–1: Contraindications and Precautions to Commonly Used Vaccines
4. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 4–2: Conditions Incorrectly Perceived as Contraindications to Vaccination
5. Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger

Glossary Words

Contraindication: A condition that increases the likelihood of a serious adverse reaction to a vaccine for a patient with that condition. If the vaccine is given in the presence of that condition, the resulting adverse reaction could seriously harm the recipient.

Immunity: Protection against a disease or an infection, usually associated with antibodies or certain cells in the blood that counteract microbes or toxin. Immunity can come from infection with a disease or from vaccination.

Precaution: A condition in a recipient that might increase the risk for a serious adverse reaction, might cause diagnostic confusion, or might compromise the ability of the vaccine to produce immunity.

Background

Lilly is a 6-month-old female infant who is being seen at the community health clinic for her immunizations in October. Her mother brings her to the clinic for her scheduled appointment to get vaccines due at 6 months of age. The mother reports that Lilly had a fever of 103°F for about 24 hours after she received her 4-month vaccines. She indicates that Lilly is sick today—she has been fussy all night, has mild diarrhea, and has been taking antibiotics for otitis media. Lilly currently has a temperature of 100.4°F. Her mother wonders if her vaccines need to be delayed.

Immunization History

HepB – 3 doses (birth, 2 months, and 4 months of age)

DTaP – 2 doses (2 months and 4 months of age)

IPV – 2 doses (2 months and 4 months of age)

RV1 (Rotarix®) – 2 doses (2 months and 4 months of age)

PCV13 – 2 doses (2 months and 4 months of age)

Hib (ActHIB®) – 2 doses (2 months and 4 months of age)

Activities

1. **Lilly is due for HepB, DTaP, IPV, PCV13, Hib, and IIV. Are there contraindications for any of the vaccines she needs today?**

Step 1. Screen the patient for vaccine contraindications and precautions (use the Screening Checklist). In practice, parents should complete this form and health care providers should review it before vaccines are administered. A "yes" response does not mean vaccination is contraindicated. It means further evaluation needs to be done by the health care provider to determine any vaccine contraindication or precaution.

Step 2. Identify any contraindications or precautions for the child based on their current health status, reported medical history, or previous response to a vaccine (use the General Guidelines, Table 4–1).

Step 3. Identify conditions where vaccines can be administered safely (use the General Guidelines, Table 4–2).

2. **Lilly's mother wonders if her vaccines need to be delayed. Based on your answer to Activity 1, how would you respond to her concern?**

1g. 15-month-old, Vaccine Contraindications and Precautions (Moderate)

Overview

Screening for vaccine contraindications and precautions at every clinical encounter is considered a standard practice for nurses. A contraindication is a condition in a recipient that is likely to result in a life-threatening problem if a vaccine were given. A precaution is a condition in a recipient that might increase the risk for a serious adverse reaction, might cause diagnostic confusion, or might compromise the ability of the vaccine to produce immunity. A vaccination may be indicated in the presence of a precaution, with a risk that the person may experience a more severe reaction to the vaccine than normally expected. However, the risk for a severe reaction is less with a precaution than the risk expected with a contraindication.

Objectives

Using this case study, nursing students will:

- Identify contraindications and precautions by vaccine.
- Identify conditions commonly misperceived as vaccine contraindications.

Teaching Tools

Review the following to help complete the case study:

1. *Epidemiology and Prevention of Vaccine-Preventable Diseases* (the Pink Book), Chapter 2–General Recommendations on Immunization
2. Immunization Action Coalition's (IAC) Screening Checklist for Contraindications to Vaccines for Children and Teens
3. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 4–1: Contraindications and Precautions to Commonly Used Vaccines
4. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 4–2: Conditions Incorrectly Perceived as Contraindications to Vaccination
5. Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger
6. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 3–5: Recommended Intervals between Administration of Antibody-Containing Products and Measles- or Varicella-Containing Vaccine, by Product and Indication for Vaccination

Glossary Words

Antibody: A special protein made by the body in response to antigens (foreign substances such as bacteria or viruses). Antibodies bind with antigens on microorganisms to protect the body against infection.

Antiviral: "Against virus"; any medicine capable of destroying or weakening a virus.

Contraindication: A condition that increases the likelihood of a serious adverse reaction to a vaccine for a patient with that condition. If the vaccine is given in the presence of that condition, the resulting adverse reaction could seriously harm the recipient.

Immunity: Protection against a disease or an infection, usually associated with antibodies or certain cells in the blood that counteract microbes or toxin. Immunity can come from infection with a disease or from vaccination.

Immune globulin (IG): Also called "immunoglobulin"; a sterile solution of plasma prepared from human blood that contains antibodies. Immune globulin is administered for passive immunization against measles and hepatitis A. There are also disease-specific globulins (e.g., tetanus, rabies, varicella zoster, hepatitis B, and respiratory syncytial virus). Immune globulin was previously called "gamma globulin."

Immune thrombocytopenic purpura (ITP): A systemic illness that causes bleeding into the mucous membranes and skin, which causes petechiae (pinpoint-size bruises) or larger bruises; associated with decreased platelets in the blood, prolonged bleeding times, anemia, and weakness.

Intravenous immune globulin (IGIV): A blood product prepared from the serum of between 1,000 and 15,000 donors per batch. It is the treatment of choice for patients with antibody deficiencies.

Live vaccine: A vaccine in which live antigen is weakened (attenuated) through chemical or physical processes to produce an immune response without causing the severe effects of the disease. Also known as an "attenuated vaccine."

Precaution: A condition in a recipient that might increase the risk for a serious adverse reaction, might cause diagnostic confusion, or might compromise the ability of the vaccine to produce immunity.

Background

Anna is a 15-month-old who has been cared for in the clinic since birth. Her mother brings her to the clinic in early June for a routine visit. At 11 months of age, she was diagnosed with immune thrombocytopenic purpura (ITP). She was treated with intravenous immune globulin (IGIV), and the ITP symptoms have now resolved. She has no other medical problems.

Immunization History

HepB – at birth

DTaP-IPV-HepB (Pediarix®) – 3 doses (8 weeks, 12 weeks, and 20 weeks of age)

Hib (ActHIB®) – 3 doses (8 weeks, 12 weeks, and 20 weeks of age)

PCV13 – 3 doses (8 weeks, 12 weeks, and 20 weeks of age)

RV1 (Rotarix®) – 2 doses (8 weeks and 16 weeks of age

Activity

1. **Anna is due for HepB, DTaP, Hib, PCV13, MMR, VAR, and HepA. Are there any contraindications and precautions for any of the vaccines she needs today?**

Step 1. Screen the patient for vaccine contraindications and precautions (use the Screening Checklist). In practice, parents should complete this form and health care providers should review it before vaccines are administered. A "yes" response does not mean vaccination is contraindicated. It means further evaluation needs to be done by the health care provider to determine any vaccine contraindication or precaution.

Step 2. Identify any contraindications or precautions for the child based on their current health status, reported medical history, or previous response to a vaccine (use the General Guidelines, Table 4–1).

Step 3. Identify conditions where vaccines can be given safely (use the General Guidelines, Table 4–2).

ANSWER GUIDE

Part 1: Birth through 5 Years of Age–Patient Encounters

A health care provider checking an infant's chest with a stethoscope.

Part 1 Case Studies–Answer Guide

Case Study	Topics	Level of Difficulty
1a. We Care Pediatric Facility	Vaccine Storage and Handling	Easy
1b. 5-year-old, Trinity	Pain, Communication, and Site and Needle Selection	Easy
1c. 5-year-old, Trinity	Simultaneous Administration	Easy
1d. 2-year-old, Jackson	Educating the Parent Using VISs	Easy
1e. 2-year-old, Kristoph	Vaccine Contraindications and Precautions	Moderate
1f. 6-month-old, Lilly	Vaccine Contraindications and Precautions	Moderate
1g. 15-month-old, Anna	Vaccine Contraindications and Precautions	Moderate

Answers to 1a. We Care Pediatric Facility, Vaccine Storage and Handling (Easy)

1. Should the HepA vaccine be stored in the refrigerator? If so, should the vaccine with the latest expiration dates be placed in the front of the unit and used first?

   HepA vaccine should be stored in a refrigerator between 36°F and 46°F. However, vaccine with the earliest expiration dates should be stored in the front of the unit and used first.

2. Should the diluent for any of these vaccines be stored with the corresponding vaccine? If so, which one(s) and why?

   Yes, the diluent for Menveo® vaccine contains vaccine antigen and should be stored in the refrigerator with the freeze-dried component. This will ensure that there are equal quantities of vaccine and diluent available for reconstitution and administration.

3. Should Tdap vaccine be placed next to existing supplies of DTaP vaccine within the storage unit?

   Tdap and DTaP sound and look similar, but they have different recommendations, age indications, and schedules. To prevent vaccine administration errors, it is recommended that they not be stored next to each other on the same shelf.

4. The clinic is doing an off-site flu vaccination clinic. How do you ensure the vaccine is not compromised once it has arrived at an off-site facility?

   Immediately upon arrival at an off-site facility, vaccines should be stored in an appropriate vaccine storage unit (e.g., a pharmaceutical-grade refrigerator) with a calibrated temperature monitoring device (e.g., a digital data logger) placed with the vaccines.

   If vaccines cannot be stored in an on-site vaccine storage unit, they should be kept in the portable vaccine refrigerator or qualified container and packout used for transport. During an off-site clinic, nurses should:

   - Keep the container(s) closed as much as possible.
   - Remove only 1 multidose vial or 10 doses at a time for preparation and administration by each nurse.
   - Place the calibrated temperature monitoring device (preferably a digital data logger with a buffered probe) as close as possible to the vaccines.
   - Read and document the temperature(s) inside the container(s) at least hourly.

Answers to 1b. 5-year-old, Pain, Communication, and Site and Needle Selection (Easy)

1. What are some ways you can decrease Trinity's pain and help with her fear?

Talk to her.

Children need to feel they can trust the health care provider. You can gain Trinity's trust by:

- Establishing eye contact and talking calmly to her
- Answering any questions she might have
- Explaining in simple terms the reasons for the vaccines
- Being honest about any potential pain (since many children have been bitten by mosquitoes, it might be helpful to compare the injection pain to a mosquito bite)

Ask her to help control the pain herself.

- Ask her to rub the site before the injection.
- Have her hold her breath and then blow out when she receives the injection.
- Ask her to sing a song or tell a story.

A parent or caregiver can also help with these techniques.

Make the process as quick and efficient as possible.

- Have all vaccines ready to administer before seeing the child. Preparing the medication in front of the child can add to her stress.
- Have the child sit up rather than lie down.
- Have a plan about which injection will go where and in what order (since some vaccines are more painful than others). Administering the most painful vaccines at the end can decrease pain.
- Use combination vaccines if possible. Trinity could receive MMRV and DTaP-IPV, resulting in only two rather than four injections.
- When multiple injections are required, make sure they are given in different sites in rapid succession. If administration is slow, the child will experience more stress and pain.
- Aspiration before injection (i.e., pulling back on the syringe plunger after needle insertion but before injection) is not necessary. A process that includes aspiration might be more painful for infants.
- Pain can also be decreased with the use of topical analgesics per manufacturer's guidelines.

2. What advice will you give Trinity's mother to help Trinity before, during, and after vaccine administration?

Before the injection(s)

Make sure you have allowed enough time to answer any questions the caregiver might have, including information about after-care. It is important to assess how much information the caregiver requires and at what educational level that information should be. Since the health care provider's views on vaccines are an important factor in motivating parents to vaccinate, sending a clear message to the caregiver that vaccines are recommended and needed is an essential communication step.

Provide the parent information about potential problems that can occur after vaccination (such as fever greater than 100.4°F or a swollen, hot, and red area that does not go away after 24 hours). Make sure the caregiver understands what to do in such situations.

During the injection(s)

During the injection(s), the parent should take an active role. The parent or caregiver can:

- Hold the child in a seated position. Holding the child before and during the injection may provide some comfort for both the parent and child. Children do better with vaccine administration when they are sitting.
- Help distract the child during the process (e.g., with a toy, book, or song).
- Make sure all limbs involved in vaccine administration are exposed and free from clothing so that the health care provider can give the injections quickly.

After the injection(s)

After the injection(s), the parent can:

- Support the child if they are crying.
- Provide non-aspirin pain relievers for any muscle pain related to the injections (see https://www.immunize.org/catg.d/p4015.pdf).
- Apply cool washcloths over the sore areas for 5–10 minutes at a time.
- Encourage the child to move the limbs that are affected. This will help the medication absorb and decrease the pain.

3. What are the age-appropriate sites for administering the vaccines she needs today and what needle size will you select? Complete the information in the table below (see example for DTaP). Refer to the General Guidelines, Table 6–1 and Table 6–2.

Table 1b-3: Vaccine route, site, needle size, and sample vaccination plan: Answers
The 1st row indicates an example entry.

Vaccine	Route(s)	Age-Appropriate Sites	Needle Size	Sample Plan
Example: DTaP	*IM**	*Deltoid* *Anterolateral thigh muscle*	*5/8″–1″* *1″–1.25″*	*IM in the L deltoid*
IPV	IM* Subcut	Deltoid Anterolateral thigh muscle Fatty tissue of triceps or Fatty tissue of anterolateral thigh	5/8″–1″ 1″–1.25″ 5/8″	IM in the L deltoid
MMR	Subcut	Fatty tissue of triceps or Fatty tissue of anterolateral thigh	5/8″	N/A – Antigens found in MMRV
VAR	Subcut	Fatty tissue of triceps or Fatty tissue of anterolateral thigh	5/8″	N/A – Antigens found in MMRV
MMRV	Subcut	Fatty tissue of triceps or Fatty tissue of anterolateral thigh	5/8″	Subcut in the R tricep

*If skin is stretched tightly and Subcutaneous tissues are not bunche

Answers to 1c. 5-year-old, Simultaneous Administration (Easy)

1. How do you respond to this mother's concerns about the number of vaccines Trinity will receive today? Practice saying aloud to another student what you would tell Trinity's mother.

   Vaccines contain weakened or killed versions of the germs that cause diseases. These vaccine elements and other molecules and microorganisms that stimulate the immune system are called "antigens." Scientific data show that getting several vaccines at the same time does not cause any chronic health problems. A number of studies have looked at the effects of giving various combinations of vaccines and, whenever a new vaccine is licensed, it is tested along with the vaccines already recommended for children at a particular age. The recommended vaccines have been shown to be as effective in combination as they are individually.

   Sometimes certain combinations of vaccines given together can cause fever and, occasionally, febrile seizures. However, these are temporary conditions that do not cause any lasting damage. Based on this information, both the Advisory Committee on Immunization Practices and the American Academy of Pediatrics recommend administering all routine childhood vaccines on time. Research has determined that it is safe for children to receive many vaccines during the same visit. Delaying vaccination leaves children vulnerable to disease. The risks of being exposed to vaccine-preventable diseases are greater than any risks posed by simultaneous administration of vaccines.

Answers to 1d. 2-year-old, Educating the Parent Using VISs (Easy)

1. When should Jackson's parent receive VISs and which VISs will they need?

   When vaccinating children, federal law requires that you give the parent or caregiver a VIS before each vaccine dose. The best practice is to give the VIS to the parent when they first arrive and complete the screening questionnaire. Even if the child has received the same vaccine before, the parent must be given a VIS each time the child receives a dose of vaccine. Since Jackson is receiving both IIV and PCV13, his parent will need a copy of the VIS for each of those vaccines. VISs are available in many different languages (see https://www.cdc.gov/vaccines/hcp/vis/about/facts-vis.html).

2. Jackson's mother expresses concern about the information provided in the VIS, which indicates young children who get IIV and PCV13 at the same visit might be more likely to have a seizure caused by fever. In what section of the VIS did she find this information? How should the nurse respond?

   The nurse should respond positively that Jackson can receive both PCV13 and IIV safely today. The section, "Risks of a vaccine reaction," in both the PCV13 and IIV VISs mentions a slight increase in risk for febrile seizure among children 6 months through 23 months of age who received influenza vaccine at the same visit as PCV13 and/or DTaP. Despite this finding, CDC made no change in its recommendations for use of IIV or PCV13 after careful review of the safety data (see https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/timing.html#ref-25).

3. What is the role of the nurse in regard to the VIS?

   The legal mandate of the VIS is to inform the parent, caregiver, or adult patient about the vaccine's risks and benefits and make them aware of the National Vaccine Injury Compensation Program. The nurse can make sure that the parent understands the VIS and allow enough time before vaccine administration to address any parental concerns about the vaccines or potential adverse reactions, or side effects. Nurses can consult the Pink Book to help answer questions. In addition to the Pink Book, CDC has a number of educational materials and handouts for parents (see www.cdc.gov/vaccines/ed/patient-ed.html).

4. What would you document about the VIS in the medical record and/or IIS?

   The nurse should document which VISs were given to the parent along with the dates printed on the VISs and the date they were given to the parent. They should also document any questions the caregiver had and how those questions were answered.

Answers to 1e. 2-year-old, Vaccine Contraindications and Precautions (Moderate)

1. Kristoph is due for Hib, PCV13, HepA, and PPSV23. Are there any contraindications for any of the vaccines he needs today?

   Step 1. *Screen the patient for vaccine contraindications and precautions (use the Screening Checklist). In practice, parents should complete this form and health care providers should review it before vaccines are administered. A "yes" response does not mean vaccination is contraindicated. It means further evaluation needs to be done by the health care provider to determine any vaccine contraindication or precaution.*

   Step 2. *Identify any contraindications or precautions for the child based on their current health status, reported medical history, or previous response to a vaccine (use the* General Guidelines, Table 4–1*).*

   Step 3. *Identify conditions where vaccines can be given safely (use the* General Guidelines, Table 4–2*).*

   Kristoph has no contraindications for Hib, PCV13, HepA, or PPSV23. Answers:

   Step 1. There is no positive response to any of the Screening Checklist questions.

   Step 2. Cochlear implant and temperature of 101°F after receiving MMR, VAR, DTaP, and Hib vaccines are not contraindications to any of the vaccines due today.

   Step 3. It is safe to administer any of the vaccines due to a person with cochlear implant.

   Kristoph's cochlear implant is not a contraindication for Hib, PCV13, HepA, or PPSV23 vaccines. In fact, a cochlear implant increases his risk for certain vaccine-preventable diseases, making it even more important that he receive the recommended vaccines. While both PCV13 and PPSV23 are due, these vaccines should not be administered at the same clinic visit (see the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, pneumococcal vaccination note.) When both vaccines are needed, ACIP recommends that PCV13 be administered first. A history of fever following the vaccine doses he received at 12 months of age is not uncommon, and it does not qualify as a contraindication for further doses of any of these vaccines.

Answers to 1f. 6-month-old, Vaccine Contraindications and Precautions (Moderate)

1. **Lilly is due for HepB, DTaP, IPV, PCV13, Hib, and IIV. Are there contraindications for any of the vaccines she needs today?**

   Step 1. *Screen the patient for vaccine contraindications and precautions (use the* Screening Checklist*). In practice, parents should complete this form and health care providers should review it before vaccines are administered. A "yes" response does not mean vaccination is contraindicated. It means further evaluation needs to be done by the health care provider to determine any vaccine contraindication or precaution.*

   Step 2. *Identify any contraindications or precautions for the child based on their current health status, reported medical history, or previous response to a vaccine (use the* General Guidelines, Table 4–1*).*

   Step 3. *Identify conditions where vaccines can be given safely (use the* General Guidelines, Table 4–2*).*

   Lilly has no contraindications for HepB, DTaP, IPV, PCV13, Hib, or IIV. Answers:

   Step 1. Lilly's current health status prompts a positive response to the question, "Is the child sick today?" (see the Screening Checklist, question 1).

   Step 2. Lilly has a mild illness with low-grade fever, diarrhea, otitis media, and ongoing antibiotic therapy. None of these conditions is listed as a contraindication or precaution to the six vaccines indicated (see the General Guidelines, Table 4–1). CDC recommends that the health care provider use clinical judgment to determine whether the patient has mild or moderate illness.

   Step 3. It is safe to administer any vaccines due given Lilly's current health conditions (see the General Guidelines, Table 4–2). Also, there is no evidence that having an acute illness reduces vaccine efficacy and increases vaccine adverse events (see the Screening Checklist, page 2).

   Lilly has a history of running a fever of 103°F after a previous vaccination. The DTaP dose she received was most likely the cause of that fever. A fever of less than 105°F for less than 48 hours after previous vaccination with DTaP or DTP is not a contraindication for further doses.

2. **Lilly's mother wonders if her vaccines need to be delayed. Based on your answer to Activity 1, how would you respond to her concern?**

   Reassure Lilly's mother and let her know the evidence that it is safe for Lilly to have her vaccines today, even with mild illness. If the mother prefers to wait until Lilly is feeling better, it is okay to reschedule Lilly's appointment. However, it is best to administer the vaccines while the child is in the office to avoid any delay if she does not return on time.

Answers to 1g.15-month-old, Vaccine Contraindications and Precautions (Moderate)

1. Anna is due for HepB, DTaP, Hib, PCV13, MMR, VAR, and HepA. Are there any contraindications and precautions for any of the vaccines she needs today?

   Step 1. *Screen the patient for vaccine contraindications and precautions (use the Screening Checklist). In practice, parents should complete this form and health care providers should review it before vaccines are administered. A "yes" response does not mean vaccination is contraindicated. It means further evaluation needs to be done by the health care provider to determine any vaccine contraindication or precaution.*

   Step 2. *Identify any contraindications or precautions for the child based on their current health status, reported medical history, or previous response to a vaccine (use the General Guidelines, Table 4–1).*

   Step 3. *Identify conditions where vaccines can be given safely (use the General Guidelines,* Table 4–2).

Anna has precautions for MMR and VAR. She has no contraindications or precautions for receiving HepB, DTaP, Hib, PCV13, or HepA vaccines today. Answers:

Step 1. While screening her for vaccine contraindications and precautions, you realize that, because of the treatment she received for immune thrombocytopenic purpura (ITP), there is a positive response to the question, *"In the past year, has the child received a transfusion of blood or blood products, or been given immune (gamma) globulin or an antiviral drug?" (see the* Screening Checklist, question 10). This raises a question about whether she should receive live vaccines (e.g., MMR and VAR.)

Step 2. The intravenous immune globulin (IGIV) treatment she received 4 months ago to treat her ITP makes her ineligible for MMR and VAR vaccines at this visit (see the General Guidelines, Table 4–1). The antibodies contained in IGIV may interfere with the replication that is needed for a live vaccine to provide adequate protection.

Step 3. It is safe to administer any inactivated vaccines despite her history of ITP and IGIV treatment (see the General Guidelines, Table 4–2.*)*

Anna received IGIV 4 months ago, and the interval between IGIV and MMR and VAR vaccines should be 8 or 10 months, depending on the IGIV dosage (see the General Guidelines, Table 3–5). You need to contact the provider who administered IGIV to find out the dosage she was given.

Knowing the IGIV dosage is the only way to accurately determine the correct minimum interval between IGIV and MMR and VAR vaccines.

Anna's history of ITP is a precaution to receiving a measles-containing vaccine (see the General Guidelines, Table 4–1), since a person with this history could be at increased risk of having another episode of ITP if they are exposed to measles vaccine. The health care provider will need to discuss with the parents the risks and benefits of administering MMR to Anna. If she is not vaccinated, the risk of ITP following measles disease may be much higher than potential risk from the vaccine. ACIP advises that, in almost every case, the benefit of measles immunity outweighs the risk of a recurrence of ITP and recommends that she receive MMR on schedule.

A mother smiling at her baby.

Part 2: Birth through 12 Years of Age–Vaccination Schedule

A smiling mother sitting with her two young children.

Part 2 Case Studies

Case Study	Topics	Level of Difficulty
2a. 4-month-old, Lauren	Healthy Infants and Children	Easy
2b. 6 1/2-month-old, Caleb	Healthy Infants and Children	Moderate
2c. 15-month-old, Molly	Healthy Infants and Children	Moderate
2d. 4 1/2-year-old, Tyler	Healthy Infants and Children	Moderate
2e. 12-year-olds, Emma and Ethan	Healthy Adolescents	Moderate

2a. 4-month-old, Healthy Infants and Children (Easy)

Overview

The CDC-recommended immunization schedule provides information on the use of vaccines that protect infants and children by providing immunity through vaccination early in life—before they are exposed to life-threatening diseases..

Vaccine recommendations are generally based on the youngest age group at risk for a disease for whom vaccine efficacy and safety have been demonstrated. Most vaccines in the childhood immunization schedule require 2 or more doses. Doses of an antigen administered at the recommended age and interval provide optimal protection and have the best evidence of efficacy. It is important to follow the CDC-recommended immunization schedule to ensure that infants have adequate immunity to diseases for which they are at risk. Otherwise, they may be at increased risk for developing diseases during the time vaccines are delayed.

Objective

Using this case study, nursing students will:

- Determine which vaccines are recommended for healthy infants and children now and at future visits.

Teaching Tools

Review the following to help complete the case study:

1. Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger
2. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 3–1: Recommended and Minimum Ages and Intervals between Vaccine Doses

Glossary Words

Antigen: A foreign substance (e.g., bacterium or virus) in the body that is capable of causing disease. The presence of antigens in the body triggers an immune response, usually the production of antibodies.

Immunity: Protection against a disease or an infection, usually associated with antibodies or certain cells in the blood that counteract microbes or toxin. Immunity can come from infection with a disease or from vaccination.

Immunization: The process of being made immune or resistant to an infectious disease, typically by the administration of a vaccine. It implies that you've had an immune response.

Immunization schedule (vaccination schedule): A summary of vaccination recommendations by the Advisory Committee on Immunization Practices/CDC that gives health care providers information on recommended timelines, conditions, and other indications for administering vaccines. There are child/adolescent, adult, and catch-up immunization schedules.

Invalid vaccine doses: Doses administered sooner than the recommended age or interval.

Vaccination: The use of vaccines to produce immunity to a disease. This usually entails administering antigenic material, or vaccine, by injection.

Background

Lauren is a healthy 4-month-old female who is being seen at the community health clinic in August for her immunizations. She has received her previous immunizations at the same clinic, as indicated on her chart (see "Immunization History" below).

Immunization History

HepB – 2 doses (birth and 2 months of age)

DTaP –1 dose (2 months of age)

IPV – 1 dose (2 months of age)

RV1 (Rotarix®) – 1 dose (2 months of age)

PCV13 – 1 dose (2 months of age)

Hib (ActHIB®) – 1 dose (2 months of age)

Activities

1. Assess for needed vaccines by comparing Lauren's immunization history to the current childhood schedule. Determine if Lauren is missing any recommended vaccines and if the doses she has already received are valid or invalid. In the table below, place ✓s to indicate valid doses, ✗s to indicate invalid doses, and Os to indicate missed doses. Not all doses may apply for each vaccine (N/A).

Table 2a-1: Vaccines valid, invalid, and missed

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Dose 1	Dose 2
Example: HepB	✓	✓
RV1 (Rotarix®)		
DTaP		
Hib (ActHIB®)		
PCV13		
IPV		

2. Which vaccines and dose numbers should be administered today? Your office stocks Rotarix® and ActHIB®. Complete the table below. Refer to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger (see Table 1, column 4 mos).

   Age:_____ Month (Today's Visit): _____

Table 2a-2: Vaccines due for Lauren today

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine due today (name)	Dose number
Example: RV1 (Rotarix®)	*2*

3. Which vaccines will be needed at the next visit and when should she be scheduled to return for her next doses? Assume that your clinic will have Rotarix® and ActHIB® at this next visit. Complete the table below. Refer to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger.

   Age (Next Visit): _____ Month (Next Visit): _____

Table 2a-3: Vaccines needed at next visit by dose and age

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Dose number	Age dose is due
Example: HepB	*3*	*6 mos*

2b. 6 ½-month-old, Healthy Infants and Children (Moderate)

Overview

The CDC-recommended immunization schedule provides information on the use of vaccines that protect infants and children by providing immunity through vaccination early in life—before they are exposed to life-threatening diseases..

Vaccine recommendations are generally based on the youngest age group at risk for a disease for whom vaccine efficacy and safety have been demonstrated. Most vaccines in the childhood immunization schedule require 2 or more doses. Doses of an antigen administered at the recommended age and interval provide optimal protection and have the best evidence of efficacy. It is important to follow the CDC-recommended immunization schedule to ensure that infants have adequate immunity to diseases for which they are at risk. Otherwise, they may be at increased risk for developing diseases during the time vaccines are delayed.

Objectives

Using this case study, nursing students will:

- Determine which vaccines are recommended for healthy infants and children now and at future visits.
- Discuss the advantages of combination vaccines.
- Recognize which antigens are included in selected combination vaccines.

Teaching Tools

Review the following to help complete the case study:

1. Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger
2. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 3–1: Recommended and Minimum Ages and Intervals between Vaccine Doses
3. Immunization Action Coalition's (IAC) Ask the Experts: Combination Vaccines

Glossary Words

Antigen: A foreign substance (e.g., bacterium or virus) in the body that is capable of causing disease. The presence of antigens in the body triggers an immune response, usually the production of antibodies.

Contraindication: A condition that increases the likelihood of a serious adverse reaction to a vaccine for a patient with that condition. If the vaccine is administered in the presence of that condition, the resulting adverse reaction could seriously harm the recipient.

Immunity: Protection against a disease or an infection, usually associated with antibodies or certain cells in the blood that counteract microbes or toxin. Immunity can come from infection with a disease or from vaccination.

Immunization: The process of being made immune or resistant to an infectious disease, typically by the administration of a vaccine. It implies that you've had an immune response.

Immunization information system (IIS): Confidential, population-based, computerized database that records all vaccine doses administered by participating providers to persons residing within a given geopolitical area. Also known as "immunization registry."

Immunization schedule (vaccination schedule): A summary of vaccination recommendations by the Advisory Committee on Immunization Practices/CDC that gives health care providers information on recommended timelines, conditions, and other indications for administering vaccines. There are child/adolescent, adult, and catch-up immunization schedules.

Precaution: A condition in a recipient that might increase the risk for a serious adverse reaction, might cause diagnostic confusion, or might compromise the ability of the vaccine to produce immunity.

Vaccination: The use of vaccines to produce immunity to a disease. This usually entails administering antigenic material, or vaccine, by injection.

Background

Caleb is a 6½-month-old male who is in the clinic for a well-child visit in October (during early influenza season). His birth was uneventful. The clinic staff was able to locate Caleb's vaccination record in the state immunization information system (IIS). Note that he previously received a combination vaccine, DTaP-IPV-HepB (Pediarix®). Caleb has no contraindications or precautions for any vaccines.

Immunization History

From the state immunization information system:

HepB – 1 dose (birth)

RV1 (Rotarix®) – 2 doses (2 months and 4 months of age)

DTaP-IPV-HepB (Pediarix®) – 2 doses (2 months and 4 months of age)

PCV13 – 2 doses (2 months and 4 months of age)

Hib (ActHIB®) – 2 doses (2 months and 4 months of age)

Activities

1. Complete the table below and assess what vaccines are due today (see example for HepB). Review the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger (refer to the notes for each vaccine for important details). Note that not all vaccines listed are due today (e.g., complete, next dose not due today)

Age: _____ **Month** (Today's Visit): _____

Table 2b–1: Immunization history and vaccines due today

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Age Dose 1 administered	Age Dose 2 administered	Age Dose 3 administered	Vaccines due today
Example: HepB	*Birth*	*2 mos**	*4 mos**	*HepB #3*
RV1 (Rotarix®)				
DTaP				
Hib (ActHIB®)				
PCV13				
IPV				
IIV				

*Doses from combination vaccine DTaP-IPV-HepB (Pediarix®)

2. In what way did the HepB component of Pediarix® administered at 4 months affect Caleb's vaccination schedule? Review the Immunization Action Coalition's Ask the Experts section on combination vaccines. Review the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger and the hepatitis B vaccination note. Note that not all vaccines listed will require future doses between now and ages 12–18 months (e.g., complete).

3. After administering all the vaccines due today, list remaining vaccines required between now and ages 12–18 months. List the dose numbers and ages they are due. Complete the chart below. Note that not all vaccines listed will require future doses between now and ages 12–18 months (e.g., complete).

   Age: _____

Table 2b-3: Vaccines due between today and ages 12–18 months

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Dose number of the vaccine dose due next	Age when the next vaccine dose due
Example: HepB	*Complete*	*Complete*
RV1 (Rotarix®)		
DTaP		
Hib (ActHIB®)		
PCV13		
IPV		
IIV		
MMR		
VAR		
HepA		

2c. 15-month-old, Healthy Infants and Children (Moderate)

Overview

The CDC-recommended immunization schedule provides information on the use of vaccines that protect infants and children by providing immunity through vaccination early in life—before they are exposed to life-threatening diseases..

Vaccine recommendations are generally based on the youngest age group at risk for a disease for whom vaccine efficacy and safety have been demonstrated. Most vaccines in the childhood immunization schedule require 2 or more doses. Doses of an antigen administered at the recommended age and interval provide optimal protection and have the best evidence of efficacy. It is important to follow the CDC-recommended immunization schedule to ensure that infants have adequate immunity to diseases for which they are at risk. Otherwise, they may be at increased risk for developing diseases during the time vaccines are delayed.

Objectives

Using this case study, nursing students will:

- Determine which vaccines are recommended for healthy infants and children now and at future visits.
- Discuss the advantages of combination vaccines.
- Recognize which antigens are included in selected combination vaccines.
- Practice communication with parents about common vaccination concerns.

Teaching Tools

Review the following to help complete the case study:

1. Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger
2. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 3–1: Recommended and Minimum Ages and Intervals between Vaccine Doses
3. Provider Resources for Vaccine Conversations with Patients–CDC: Talking with Parents About Vaccines for Infants
4. Immunization Action Coalition's (IAC) Ask the Experts: Combination Vaccines
5. CDC (2013): Understanding MMR Safety
6. Immunization Action Coalition's (IAC) Screening Checklist for Contraindications to Vaccines for Children and Teens

Glossary Words

Antigen: A foreign substance (e.g., bacterium or virus) in the body that is capable of causing disease. The presence of antigens in the body triggers an immune response, usually the production of antibodies.

Autism: A chronic developmental disorder usually diagnosed between 18 and 30 months of age. Symptoms include problems with social interaction and communication, as well as repetitive interests and activities. There are likely many causes for multiple types of autism spectrum disorder (ASD). There may be many different factors that make a child more likely to have an ASD, including environmental, biologic, and genetic factors.

Immunity: Protection against a disease or an infection, usually associated with antibodies or certain cells in the blood that counteract microbes or toxin. Immunity can come from infection with a disease or from vaccination.

Immunization: The process of being made immune or resistant to an infectious disease, typically by the administration of a vaccine. It implies that you've had an immune response.

Immunization schedule (vaccination schedule): A summary of vaccination recommendations by the Advisory Committee on Immunization Practices/CDC that gives health care providers information on recommended timelines, conditions, and other indications for administering vaccines. There are child/adolescent, adult, and catch-up immunization schedules.

Immunocompromised: A condition in which the immune system is unable to protect the body from disease. This condition can be caused by disease (like HIV infection or cancer) or by certain drugs (like those used in chemotherapy). Individuals whose immune systems are compromised should not receive live, attenuated vaccines.

Measles: Also known as "rubeola"; an acute viral infection that causes fever, nasal discharge (coryza), redness of the eyes (conjunctivitis), and a rash. Measles usually begins as flat red spots that appear on the face at the hairline and then spread downward to the neck, trunk, arms, legs, and feet. Complications can include pneumonia, encephalitis, and death.

Mercury: A metal found naturally in the environment that is used in the manufacturing process for thimerosal, a preservative that prevents the growth of bacteria and fungi in multidose vials of medications, including vaccines.

Rubella: Also known as "German measles"; a usually mild viral disease that causes fever and skin rash. If it occurs during early pregnancy, rubella can cause congenital rubella syndrome (CRS), which can result in congenital defects, fetal death, spontaneous abortion, and stillbirth. Up to 85% of infants infected with rubella in the first trimester will have CRS-related problems, including deafness, cataracts, heart defects, microcephaly, mental retardation, bone alterations, and liver and spleen damage.

Thimerosal: A mercury-containing preservative that has been used in some vaccines and other products since the 1930s. There is no evidence that the low concentrations of thimerosal in vaccines have caused any harm other than minor reactions such as redness or swelling at the injection site. However, in July 1999, the US Public Health Service, the American Academy of Pediatrics, and vaccine manufacturers agreed that thimerosal should be reduced or eliminated from vaccines as a precautionary measure. Today all routinely recommended childhood vaccines manufactured for the US market (except some influenza vaccines) contain either no thimerosal or only trace amounts.

Vaccination: The use of vaccines to produce immunity to a disease. This usually entails administering antigenic material, or vaccine, by injection.

Background

Molly is a healthy 15-month-old who is being seen at the community health clinic in November for a well-child check-up and required immunizations. She was ill at age 12 months, so her mother rescheduled her appointment for today. Molly received all of her previous immunizations at the same clinic, as indicated on her chart (see "Immunization History" below). Molly's mother expresses worry that the MMR vaccine could cause autism. Molly has no contraindications or precautions for any vaccines.

Immunization History

HepB – 3 doses (birth, 2 months, and 6 months of age)

DTaP-IPV/Hib (Pentacel®) – 3 doses (2 months, 4 months, and 6 months of age)

RV5 (RotaTeq®) – 3 doses (2 months, 4 months, and 6 months of age)

PCV13 – 3 doses (2 months, 4 months, and 6 months of age)

IIV – 1 dose (6 months)

Activities

1. List the age when each dose should be administered to a healthy infant (birth to age 15 months). Complete the information in the table below (see example for HepB). Refer to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger (review Table 1 and information included in the notes).

Table 2c–1: Recommended infant vaccines from birth to 15 months old

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Dose 1	Dose 2	Dose 3	Dose 4
Example: HepB	*Birth*	*1–2 mos*	*6–18 mos*	*N/A*
RV • RV1 – Rotarix®				
RV • RV5 – RotaTeq®				
DTaP				
Hib • PedvaxHiB®				
Hib • ActHIB® • Hiberix® or Pentacel®				
PCV13				
IPV				
IIV				
MMR				
VAR				
HepA				

2. Assess for needed vaccines by comparing Molly's immunization history to the current childhood schedule. Determine whether Molly is missing any recommended vaccines and whether the doses she has already received are valid or invalid. Refer to the General Guidelines, Table 3–1: Recommended and Minimum Ages and Intervals between Vaccine Doses. Note that the Hib dose in Pentacel® combination vaccine is equivalent to an ActHIB® dose, and not all vaccines listed have doses due today (e.g., complete, next dose not due today).

   Age: _____ Month (Today's Visit): _____

Table 2c–2: Immunization history and vaccines due today

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Age Dose 1 administered	Age Dose 2 administered	Age Dose 3 administered	Vaccines due today
Example: HepB	*Birth*	*2 mos*	*6 mos*	*Complete*
RV5 (RotaTeq®)				
DTaP				
Hib (ActHIB®)				
PCV13				
IPV				
IIV				
MMR				
VAR				
HepA				

3. Molly needs MMR and VAR today. How would you suggest using combination vaccines to decrease the number of injections she will need? Review the Immunization Action Coalition's Ask the Experts section on combination vaccines and the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, measles, mumps, and rubella vaccination note.

4. How will you respond to Molly's mother's concerns about MMR vaccine possibly causing autism? Review Provider Resources for Vaccine Conversations with Patients–CDC: Talking with Parents About Vaccines for Infants and Understanding MMR Safety.

5. After administering all vaccines due today, which vaccines will Molly need at her next visit and when will she be scheduled to return to the clinic? Complete the table below. Note that not all vaccines listed will require future doses (e.g., complete).

Table 2c-5: Vaccines due at future visits

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Recent valid dose number	Dose number of the vaccine dose due next	Age when the next vaccine dose is due
Example: HepB	*3*	*Complete*	*Complete*
RV5 (RotaTeq®)			
DTaP			
Hib (ActHIB®)			
PCV13			
IPV			
IIV			
MMR			
VAR			
HepA			

2d. 4 ½-year-old, Healthy Infants and Children (Moderate)

Overview

The CDC-recommended immunization schedule provides information on the use of vaccines that protect infants and children by providing immunity through vaccination early in life—before they are exposed to life-threatening diseases

Vaccine recommendations are generally based on the youngest age group at risk for a disease for whom vaccine efficacy and safety have been demonstrated. Most vaccines in the childhood immunization schedule require 2 or more doses. Doses of an antigen administered at the recommended age and interval provide optimal protection and have the best evidence of efficacy. It is important to follow the CDC-recommended immunization schedule to ensure that infants have adequate immunity to diseases for which they are at risk. Otherwise, they may be at increased risk for developing diseases during the time vaccines are delayed.

Objectives

Using this case study, nursing students will:

- Determine which vaccines are recommended for healthy infants and children now and at future visits.
- Recognize which antigens are included in selected combination vaccines.
- Practice communication with parents about common vaccination concerns.

Teaching Tools

Review the following to help complete the case study:

1. Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger
2. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 3–1: Recommended and Minimum Ages and Intervals between Vaccine Doses

Glossary Words

Antigen: A foreign substance (e.g., bacterium or virus) in the body that is capable of causing disease. The presence of antigens in the body triggers an immune response, usually the production of antibodies.

Immunity: Protection against a disease or an infection, usually associated with antibodies or certain cells in the blood that counteract microbes or toxin. Immunity can come from infection with a disease or from vaccination.

Immunization: The process of being made immune or resistant to an infectious disease, typically by the administration of a vaccine. It implies that you've had an immune response.

Immunization schedule (vaccination schedule): A summary of vaccination recommendations by the Advisory Committee on Immunization Practices/CDC that gives health care providers information on recommended timelines, conditions, and other indications for administering vaccines. There are child/adolescent, adult, and catch-up immunization schedules.

Vaccination: The use of vaccines to produce immunity to a disease. This usually entails administering antigenic material, or vaccine, by injection.

Background

Tyler is a 4½-year-old who is getting ready to start kindergarten in the fall. His mother brought him to the immunization clinic in July to receive any needed vaccines. His immunization history is online in the state immunization information system. According to screening, he has no contraindications or precautions for any vaccines.

Immunization History

HepB – 1 dose (birth)

RV1 (Rotarix®) – 2 doses (2 months and 6 months of age)

DTaP-IPV-HepB (Pediarix®) – 3 doses (2 months, 4 months, and 6 months of age)

DTaP – 1 dose (15 months of age)

PCV13 – 4 doses (2 months, 4 months, 6 months, and 15 months of age)

Hib (PedvaxHIB®) – 3 doses (2 months, 4 months, and 12 months of age)

MMR – 1 dose (12 months of age)

VAR – 1 dose (12 months of age)

HepA – 2 doses (12 months and 18 months of age)

Activities

1. List the number of doses, vaccination schedule, immunization history, and valid doses for the vaccines shown below. Complete the table below (see example for HepB).

Table 2d-1: Recommended vaccines for school-age child (age 4–6 years)

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Number of doses in the series	Vaccination schedule	Patient immunization history	Valid doses
Example: HepB	*3*	*Birth, 1–2 mos, 6–18 mos*	*Birth, 2 mos, 6 mos*	*Dose 1–3*
RV1 (Rotarix®)				
DTaP				
Hib (PedvaxHIB®)				
PCV13				
IPV				
IIV				
MMR				
VAR				
HepA				

2. Which vaccines (if any) from the recommended vaccination schedule did Tyler miss? Were any doses invalid?

3. Which vaccines does Tyler need today and in the future? Complete the table below (see example for HepB). Note that not all vaccines listed will require future doses (e.g., complete, N/A).

Table 2d-3: Vaccines needed today

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Recent valid dose number	Vaccine doses due today	Dose number of the vaccine dose due next	Age when the next vaccine dose is due
Example: HepB	*3*	*None, complete*	*N/A*	*N/A*
RV1 (Rotarix®)				
DTaP				
Hib (PedvaxHIB®)				
PCV13				
IPV				
IIV				
MMR				
VAR				
HepA				

4. When will Tyler need to be scheduled for his next recommended vaccines?

2e. 12-year-olds, Healthy Adolescents (Moderate)

Overview

Vaccines recommended for adolescents include human papillomavirus (HPV), tetanus, diphtheria, and acellular pertussis (Tdap), and meningococcal vaccine (MenACWY). Administering all indicated vaccines at a single visit increases the likelihood that adolescents and young adults will receive each vaccine on schedule.

Objectives

Using this case study, nursing students will:

- Identify vaccines recommended for adolescents.
- Identify contraindications and precautions to adolescent vaccines.
- Identify conditions incorrectly perceived as contraindications to vaccination.

Teaching Tools

Review the following to help complete the case study:

1. Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger
2. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 3–1: Recommended and Minimum Ages and Intervals between Vaccine Doses
3. Immunization Action Coalition's Screening Checklist for Contraindications to Vaccines for Children and Teens
4. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 4–1: Contraindications and Precautions to Commonly Used Vaccines
5. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 4–2: Conditions Incorrectly Perceived as Contraindications to Vaccination
6. Clinician FAQs: CDC Recommendations for HPV Vaccine 2-Dose Schedules
7. CDC (May 2018): Talking to Parents about HPV Vaccine (page 2)

For the purpose of this case study, a dose counts toward completion of the series if administered no earlier than the minimum age (see the General Guidelines, Table 3–1, third column) and no earlier than the minimum interval from a previous dose (see the General Guidelines, Table 3–1, fifth column).

Glossary Words

Acellular pertussis: One of the vaccine components in the DTaP and Tdap combination vaccines. It contains partial cellular pertussis material rather than complete cells.

***Campylobacter* infection:** Also called "campylobacteriosis"; an infectious disease caused by *Campylobacter* bacteria. It is one of the most common causes of diarrheal illness in the United States.

Catch-up schedule: A schedule for persons whose vaccinations have been delayed. www.cdc.gov/vaccines/schedules/downloads/child/0-18yrs-child-combined-schedule.pdf#page=3

Chemotherapy: Anticancer medicines or drug treatments for cancer in which chemicals are administered to destroy cancer cells.

Diphtheria: A disease caused by *Corynebacterium diphtheriae* bacteria. It may involve infection of any mucous membrane in the body, but most commonly the tonsils and pharynx. The disease is marked by the formation of a false membrane, usually in the throat, that can obstruct the airway. Most complications, including death, are caused by the effects of the bacteria's toxin on organs in the body.

Guillain-Barré syndrome (GBS): A rare, autoimmune disorder in which a person's own immune system damages the nerves, causing muscle weakness and sometimes paralysis. GBS can cause symptoms that last for a few weeks to several years. Most people recover fully, but some have permanent nerve damage. Some people have died of GBS.

Immunocompromised: A condition in which the immune system is unable to protect the body from disease. This condition can be caused by disease (like HIV infection or cancer) or by certain drugs (like those used in chemotherapy). Individuals whose immune systems are compromised should not receive live, attenuated vaccines.

Immunologic memory: The persistence of protection for many years after an infection.

Live vaccine: A vaccine in which live antigen is weakened (attenuated) through chemical or physical processes to produce an immune response without causing the severe effects of the disease. Also known as an "attenuated vaccine."

Syncope: Fainting or a temporary loss of consciousness caused by decreased blood flow to the brain. Although fainting has a variety of possible causes, it is usually triggered by pain or anxiety. Sometimes people faint after vaccination. People who faint might fall and injure themselves if they are not sitting or lying down at the time that they lose consciousness. Sometimes when people faint, their muscles twitch and their bodies make jerking movements. This can sometimes be confused with a seizure but is not actually a seizure.

Tetanus: An infection caused by the bacteria *Clostridium tetani*. When the bacteria invade the body, usually through a wound, they produce a poison (toxin) that causes painful muscle contractions. Another name for tetanus is "lockjaw." It often causes a person's neck and jaw muscles to lock, making it hard to open the mouth or swallow.

Vaccinia (smallpox) vaccine: A vaccine that contains live vaccinia virus, which is a poxvirus similar to smallpox, but less harmful. It is used to prevent smallpox and is administered percutaneously using a jabbing technique with a special needle (bifurcated). The vaccination results in a skin reaction that includes the appearance of a pustular lesion.

Varicella (chickenpox): An acute, highly contagious viral infection, usually appearing in childhood, that causes fever, skin lesions, and malaise; caused by varicella zoster virus.

Background

Emma and Ethan are healthy 12-year-old twins. They have been patients in the pediatric clinic since birth. They are in the pediatrician's office in May for a routine adolescent visit and vaccinations. Emma and Ethan both have documentation that they completed all recommended childhood vaccines at 5 years of age, except that they have received only 1 dose of VAR at 5 years of age.

Ethan has had no vaccines since age 5. Emma had a dose of Tdap at age 11 years.

Emma experienced a syncopal episode after receiving her Tdap vaccine 1 year ago. She was evaluated in the emergency department and released without specific treatment. Ethan was diagnosed with Guillain-Barre syndrome (GBS) at 8 years of age, believed to have been due to a *Campylobacter* infection he acquired on a trip to Mexico with the family. The twins' grandmother lives with them and is currently receiving chemotherapy for renal cancer.

The twins' mother is concerned about the safety of the HPV vaccine. She wonders why they need to have it at such a young age, especially when they are not sexually active yet.

Immunization History

Emma

Completed childhood vaccines at 5 years of age (except only had 1 dose of VAR at 5 years of age)

Tdap – 1 dose (11 years of age)

Ethan

Completed childhood vaccines at 5 years of age (except only had 1 dose of VAR at 5 years of age)

Activities

1. **Which vaccine or vaccines does Emma need today (see example for varicella)? Use the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger and the General Guidelines, Table 3–1, to complete the table below.**

Age: _____ **Month** (Today's Visit): _____

Table 2e–1: Vaccines due today for Emma

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Number of doses in the series	Vaccination schedule	Patient immunization history	Vaccines due today
Example: VAR	*2*	*12–15 mos, 4–6 yrs*	*Dose 1 at 5 yrs*	*Dose 2*

2. Are there contraindications for any vaccines Emma needs today?

Step 1. Screen the individual for vaccine contraindications (use the Screening Checklist).

Step 2. Identify contraindications and precautions by vaccine (use the General Guidelines, Table 4–1).

Step 3. Identify commonly misperceived contraindications (use the General Guidelines, Table 4–2).

3. Which vaccines does Ethan need today? Use the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger and the General Guidelines, Table 3–1, to complete the table below.

Age: _____ Month (Today's Visit): _____

Table 2e-3: Vaccines due today for Ethan

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Number of doses in the series	Vaccination schedule	Patient immunization history	Vaccines due today
Example: VAR	*2*	*12–15 mos, 4–6 yrs*	*Dose 1 at 5 yrs*	*Dose 2*

4. Are there contraindications for any vaccines Ethan needs today?

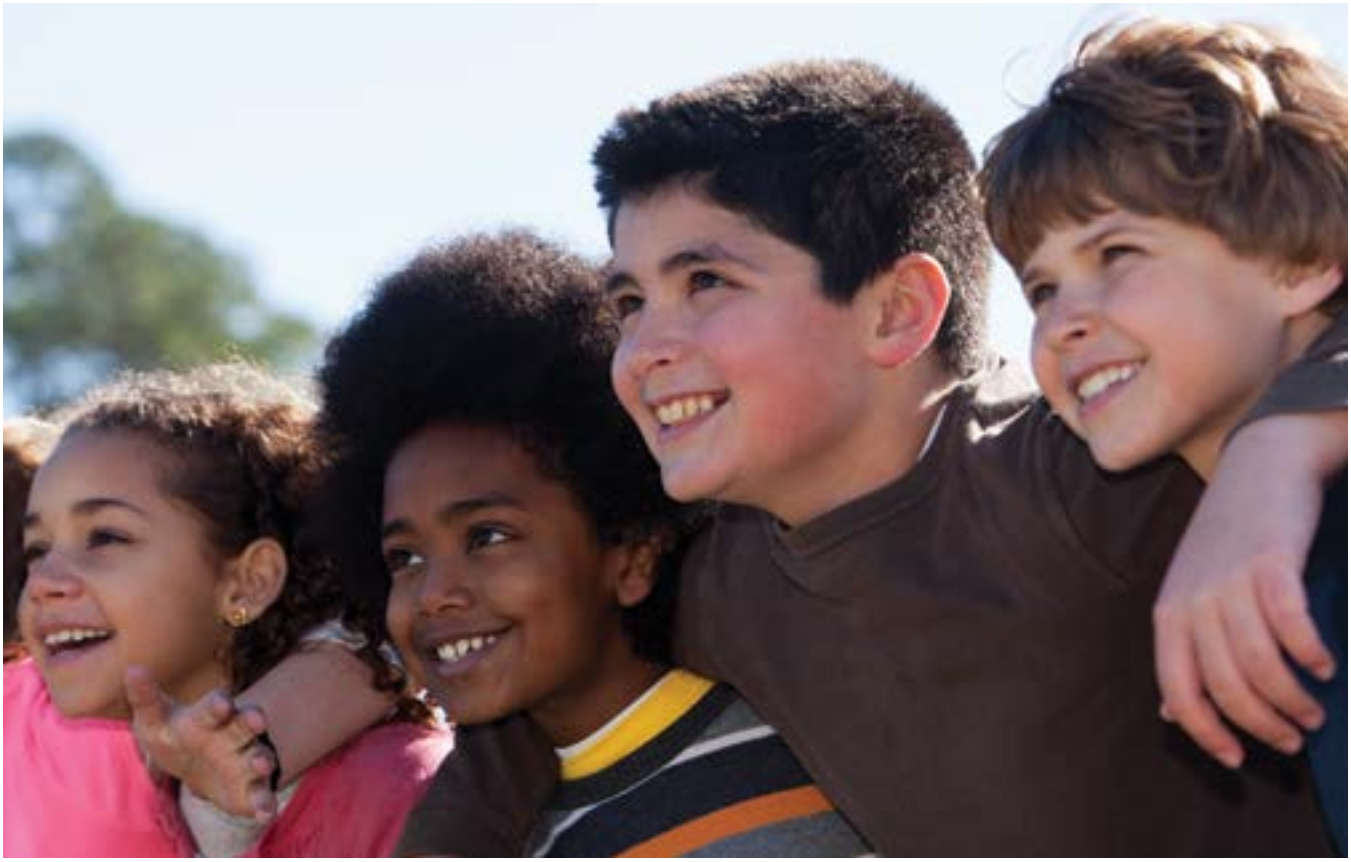
Step 1. Screen the individual for vaccine contraindications (use the Screening Checklist).

Step 2. Identify contraindications and precautions by vaccine (use the General Guidelines, Table 4–1).

Step 3. Identify commonly misperceived contraindications (use the General Guidelines, Table 4–2).

5. How will you respond to the concerns Emma and Ethan's mother has about the safety of the HPV vaccine? What actions can you take to ensure her children's safety during and after HPV vaccine administration? Refer to Talking to Parents about HPV Vaccine (page 2).

6. When will Emma and Ethan need to receive further doses of any of the vaccines they will receive today? Use the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger and the General Guidelines, Table 3–1, to determine when the next doses are due.



A smiling, adolescent boy resting his arms on the shoulders of his friends.

ANSWER GUIDE

Part 2: Birth through 12 Years of Age–Vaccination Schedule

A smiling mother sitting with her two young children.

Part 2 Case Studies – Answer Guide

Case Study	Topics	Level of Difficulty
2a. 4-month-old, Lauren	Healthy Infants and Children	Easy
2b. 6 1/2-month-old, Caleb	Healthy Infants and Children	Moderate
2c. 15-month-old, Molly	Healthy Infants and Children	Moderate
2d. 4 1/2-year-old, Tyler	Healthy Infants and Children	Moderate
2e. 12-year-olds, Emma and Ethan	Healthy Adolescents	Moderate

Answers to 2a. 4-month-old, Healthy Infants and Children (Easy)

1. Assess for needed vaccines by comparing Lauren's immunization history to the current childhood schedule. Determine if Lauren is missing any recommended vaccines and if the doses she has already received are valid or invalid. In the table below, place ✓s to indicate valid doses, ✗s to indicate invalid doses, and Os to indicate missed doses. Not all doses may apply for each vaccine (N/A).

Table 2a-1: Vaccines valid, invalid, and missed: Answers

The 1st row indicates an example entry.

Vaccine	Dose 1	Dose 2
Example: HepB	✓	✓
RV1 (Rotarix®)	✓	N/A
DTaP	✓	N/A
Hib (ActHIB®)	✓	N/A
PCV13	✓	N/A
IPV	✓	N/A

Rationale:

- Lauren has received all recommended vaccines and doses from birth through age 2 months. No recommended vaccines or doses have been missed or invalid for Lauren up until now.
- Missed doses are doses that are not administered at the recommended age. If a vaccine is administered earlier than recommended, then it is considered an invalid dose. To find out if previous vaccine doses received were valid, you must determine whether they met the minimum age and minimum interval requirements (see the General Guidelines, Table 3–1).

2. Which vaccines and dose numbers should be administered today? Your office stocks Rotarix® and ActHIB®. Complete the table below. Refer to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger (see Table 1, column 4 mos).

   Age: 4 months **Month** (Today's Visit): August

Table 2a-2: Vaccines due for Lauren today: Answers

The 1st row indicates an example entry.

Vaccine due today (name)	Dose number
Example: RV1 (Rotarix®)	*2*
DTaP	2
Hib (ActHIB®)	2
PCV13	2
IPV	2

Rationale:

- RV1 (Rotarix®): 2 doses are required—at 2 months and 4 months. She had dose 1 at 2 months and needs dose 2 today at 4 months.
- DTaP: She had dose 1 at age 2 months. Dose 2 is due today at 4 months.
- Hib (ActHIB®): She had dose 1 at 2 months. Dose 2 is due today.
- PCV13: She had dose 1 at 2 months. Dose 2 is due today.
- IPV: She had dose 1 at 2 months. Dose 2 is due today.

3. Which vaccines will be needed at the next visit and when should she be scheduled to return for her next doses? Assume that your clinic will have Rotarix® and ActHIB® at this next visit. Complete the table below. Refer to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger.

   Age (Next Visit): 6 months **Month (Next Visit):** October

Table 2a-3: Vaccines needed at next visit by dose and age: Answers

The 1st row indicates an example entry.

Vaccine	Dose number	Age dose is due
Example: HepB	*3*	*6 mos*
DTaP	3	6 mos
Hib (ActHIB®)	3	6 mos
PCV13	3	6 mos
IPV	3	6 mos
IIV	1 of 2	6 mos

Lauren will be scheduled to return at age 6 months to receive the recommended vaccines: HepB, DTaP, Hib (ActHIB®), PCV13, IPV, and IIV.

Rationale:

- Since she will be 6 months old during flu season in October, she is eligible for IIV. Since it is the first time she is receiving flu vaccine, she will need 2 doses, scheduled 4 weeks apart.

Answers to 2b. 6 1/2-month-old, Healthy Infants and Children (Moderate)

1. Complete the table below and assess what vaccines are due today (see example for HepB). Review the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger (refer to the notes for each vaccine for important details). Note that not all vaccines listed are due today (e.g., complete, next dose not due today).

   Age: 6½ months **Month** (Today's Visit): October

Table 2b–1: Immunization history and vaccines due today: Answers

The 1st row indicates an example entry.

Vaccine	Age Dose 1 was administered	Age Dose 2 was administered	Age Dose 3 was administered	Vaccines due today
Example: HepB	*Birth*	*2 mos**	*4 mos**	*HepB #3*
RV1 (Rotarix®)	2 mos	4 mos	N/A	Complete
DTaP	2 mos*	4 mos*	N/A	DTaP #3
Hib (ActHIB®)	2 mos	4 mos	N/A	ActHib® #3
PCV13	2 mos	4 mos	N/A	PCV13 #3
IPV	2 mos*	4 mos*	N/A	IPV #3
IIV	N/A	N/A	N/A	IIV #1 of 2

*Doses from combination vaccine DTaP–IPV–HepB (Pediarix®)

Rationale:

- HepB: The HepB component of the Pediarix® dose given at 4 months is invalid, so he should receive a third dose of HepB today.
- RV: Caleb received 2 doses of Rotarix® (RV1) and has completed the rotavirus vaccine series. Depending on the brand, RV vaccine can follow either a 2-dose or 3-dose schedule (see Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, rotavirus vaccination note).
- DTaP: The schedule for DTaP vaccine is 2, 4, 6, and 15–18 months and 4–6 years (see Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, DTaP vaccination note). He should receive a third dose of DTaP today.
- Hib (ActHIB®): ActHIB® is administered as a 4-dose series at 2, 4, 6, and 12–15 months (see the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, *Haemophilus influenzae* type b note). He should receive a third dose of ActHIB® today. A fourth dose should be administered at 12–15 months of age.
- PCV13: PCV13 is administered as a 4-dose series at age 2, 4, 6, and 12–15 months (see the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, pneumococcal vaccination note). He should receive a third dose of PCV13 today.

(Rationale continued on next page)

Rationale, continued:

- IPV: IPV is administered as a 4-dose series at 2, 4, and 6–18 months and 4–6 years (see the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, inactivated poliovirus vaccination note). He should receive a third dose of IPV today.
- IIV: Since the clinic visit is during influenza season and he is now over the minimum age of 6 months, he needs the first of 2 doses of influenza vaccine. Dose 2 should be separated from dose 1 by at least 4 weeks. This 2-dose series is recommended for children ages 6 months to 8 years receiving influenza vaccine for the first time (see the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, influenza vaccination note).
- Caleb will receive a total of six vaccines at this visit. A combination vaccine such as DTaP-IPV-HepB (Pediarix®) can be used to reduce the number of injections. If a combination vaccine is administered, he will receive a total of four instead of six injections (Pediarix®, Hib, PCV13, and IIV).
- DTaP-IPV-HepB (Pediarix®) is a combination vaccine. Caleb already had 2 doses of Pediarix® at 2 months and 4 months. Pediarix® is only licensed for the first 3 doses of the DTaP series. It should not be administered to children age 7 years or older.
- Note that when documenting combination vaccines, each antigen should be documented with the generic name of the combination vaccine rather than the trade name because trade names can change or be discontinued. So for each antigen, document DTaP-IPV-HepB if Pediarix® is administered.

2. **In what way did the HepB component of Pediarix® administered at 4 months affect Caleb's vaccination schedule? Review the Immunization Action Coalition's Ask the Experts section on combination vaccines. Review the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger and the hepatitis B vaccination note.**

   The combination vaccine, DTaP-IPV-HepB (Pediarix®), includes the HepB antigen. The initial dose of monovalent HepB was administered within 24 hours of birth. Doses 2 and 3 of HepB were included in the combination vaccine, Pediarix®, administered at 2 months and 4 months. However, the third dose of HepB (Pediarix®) did not meet the minimum age requirement of 6 months and, therefore, is invalid (see the General Guidelines, Table 3–1). He will need another HepB dose today to complete the series. Administration of a total of 4 doses of HepB is permitted when a combination vaccine containing HepB is administered after the birth dose (see the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, hepatitis B vaccination note).

3. After administering all the vaccines due today, list remaining vaccines required between now and ages 12–18 months. List the dose numbers and ages they are due. Complete the table below. Note that not all vaccines listed will require future doses between now and ages 12–18 months (e.g., complete).

   Age: 6½ months

Table 2b-3: Vaccines due between today and ages 12–18 months: Answers
The 1st row indicates an example entry.

Vaccine	Dose number of the vaccine dose due next	Age when the next vaccine dose due
Example: HepB	*Complete*	*Complete*
RV1 (Rotarix®)	Complete	Complete
DTaP	4	15–18 mos or as early as 12 mos
Hib (ActHIB®)	4	12–15 mos
PCV13	4	12–15 mos
IPV	Complete	Complete
IIV	2	7 1/2 mos
MMR	1	12–15 mos
VAR	1	12–15 mos
HepA	1	12–23 mos

Caleb should return in 4 weeks to receive the second dose of IIV. He should return in 6 months (between 12–15 months of age) for dose 4 of DTaP, dose 4 of Hib, dose 4 of PCV13, and dose 1 of MMR, VAR, and HepA vaccines.

Rationale:

- DTaP: The fourth dose of DTaP is due at 15–18 months of age. However, it may be administered as early as age 12 months if at least 6 months have elapsed since the third dose (see the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, DTaP vaccination note).
- Hib (ActHIB®) is administered as a 3-dose series. A booster dose of Hib vaccine should be administered at age 12–15 months (see the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, *Haemophilus influenzae* type b vaccination note).

(Rationale continued on next page)

Rationale, continued:

- PCV13: The last dose of the 4-dose series is administered at 12–15 months of age (see the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, pneumococcal vaccination note).
- IIV: Because Caleb is receiving influenza vaccine for the first time, he should receive 2 doses, separated by at least 4 weeks, during this influenza season. He should return in 4 weeks to receive the second dose. When the next flu season begins, he will only need 1 dose of IIV. The 2-dose series is recommended for children ages 6 months to 8 years (see the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, influenza vaccination note).
- MMR: The first of 2 MMR doses is due at 12–15 months of age (see the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, measles, mumps, and rubella vaccination note).
- VAR: The first of 2 VAR doses is due at 12–15 months of age (see the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, varicella vaccination note).
- HepA: HepA is administered as a 2-dose series that should be started at age 12–23 months of age. Dose 2 is due 6–18 months after dose 1 (see the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, hepatitis A vaccination note).

Answers to 2c. 15-month-old, Healthy Infants and Children (Moderate)

1. List the age when each dose should be administered to a healthy infant (birth to age 15 months). Complete the information in the table below (see example for HepB). Refer to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger (review Table 1 and the information included in the notes).

Table 2c-1: Recommended infant vaccines from birth to 15 months old: Answers
The 1st row indicates an example entry.

Vaccine	Dose 1	Dose 2	Dose 3	Dose 4
Example: HepB	*Birth*	*1–2 mos*	*6–18 mos*	*N/A*
RV • RV1 – Rotarix®	2 mos	4 mos	N/A	N/A
RV • RV5 – RotaTeq®	2 mos	4 mos	6 mos	N/A
DTaP	2 mos	4 mos	6 mos	15–18 mos
Hib • PedvaxHiB®	2 mos	4 mos	12–15 mos	N/A
Hib • ActHIB® • Hiberix® or Pentacel®	2 mos	4 mos	6 mos	12–15 mos
PCV13	2 mos	4 mos	6 mos	12–15 mos
IPV	2 mos	4 mos	6–18 mos	N/A
IIV	6 mos	4 weeks after dose 1	N/A	N/A
MMR	12–15 mos	N/A*	N/A	N/A
VAR	12–15 mos	N/A*	N/A	N/A
HepA	12–23 mos	12–23 mos	N/A	N/A

*Dose 2 should be administered at 4 through 6 years of age

2. Assess for needed vaccines by comparing Molly's immunization history to the current childhood schedule. Determine whether Molly is missing any recommended vaccines and whether the doses she has already received are valid or invalid. Refer to the General Guidelines, Table 3–1: Recommended and Minimum Ages and Intervals between Vaccine Doses. Note that the Hib dose in Pentacel® combination vaccine is equivalent to an ActHIB® dose, and not all vaccines listed have doses due today (e.g., complete, next dose not due today).

   Age: 15 months **Month** (Today's Visit): November

Table 2c-2: Immunization history and vaccines due today: Answers

The 1st row indicates an example entry.

Vaccine	Age Dose 1 administered	Age Dose 2 administered	Age Dose 3 administered	Vaccines due today
Example: HepB	*Birth*	*2 mos*	*6 mos*	*Complete*
RV5 (RotaTeq®)	2 mos	4 mos	6 mos	Complete
DTaP	2 mos	4 mos	6 mos	DTaP #4
Hib (ActHIB®)	2 mos	4 mos	6 mos	ActHIB® #4
PCV13	2 mos	4 mos	6 mos	PCV13 #4
IPV	2 mos	4 mos	6 mos	Next dose not due today*
IIV	6 mos	N/A	N/A	IIV #1
MMR	N/A	N/A	N/A	MMR #1
VAR	N/A	N/A	N/A	VAR #1
HepA	N/A	N/A	N/A	HepA #1

*Dose 4 should be administered at 4–6 years of age

Rationale:

- DTaP: Molly needs the fourth dose of DTaP today. This dose is usually recommended at 15–18 months. However, the fourth dose can be administered as early as age 12 months if at least 6 months have elapsed since the third dose.
- Hib and PCV13: She needs the fourth dose of ActHIB® and PCV13 vaccines recommended at 12–15 months of age.
- IIV: She needs the first of 2 doses of IIV. Since she only received 1 IIV dose during last flu season, she will need 2 doses this flu season. Thereafter, she will only need 1 dose of seasonal flu vaccine annually.
- MMR and VAR: She needs the first of 2 doses of MMR and VAR vaccines recommended at 12–15 months of age.
- HepA: She needs the first of 2 doses of HepA recommended between ages 12 and 23 months.

3. **Molly needs MMR and VAR today. How would you suggest using combination vaccines to decrease the number of injections she will need? Review the** Immunization Action Coalition's Ask the Experts section on combination vaccines **and the** Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger**, measles, mumps, and rubella vaccination note.**

   You may consider administering separate MMR and VAR vaccines or using the combination vaccine MMRV. CDC recommends that MMR and VAR vaccines be administered separately at age 12 through 47 months unless Molly's parents express a preference for MMRV. Available data suggest that there is a slightly increased risk of febrile seizures if the first dose is administered as MMRV in this age group. If MMRV is being considered, it is important to discuss the risks and benefits of the MMRV vaccine with Molly's parents. In addition, the patient should be screened for a history of seizures, both in the patient and in the patient's parents and siblings (see the Screening Checklist, question 7).

4. **How will you respond to Molly's mother's concerns about MMR vaccine possibly causing autism? Review** Provider Resources for Vaccine Conversations with Patients–CDC: Talking with Parents About Vaccines for Infants and Understanding MMR Safety.

   Key Points:

   - MMR does not cause autism.
   - As of June 2020, studies have found no link between MMR and autism. One reason people believe there is a link is a study conducted in the UK in 1998 that reported a link between MMR and autism. The report received a lot of media coverage. However, the study was later found to be poorly conducted. The lead author misrepresented data, drawing erroneous conclusions, and most of the coauthors later withdrew support for the study. The lead author lost his license to practice medicine in the UK.
   - Another reason people think there is a link is because the signs of autism may manifest at about the same age as when MMR is administered. However, signs of regression due to autism may begin even earlier than when MMR is administered.
   - Measles was eliminated in the US in 2000 because so many people were vaccinated that it was difficult for measles to spread. However, the US still has measles outbreaks and unvaccinated children or adults can become very ill.
   - Because of global travel, measles can be brought back to the US by unvaccinated residents and visitors who were infected in other countries.
   - MMR vaccine does not and never did contain thimerosal, a mercury-based preservative. Thimerosal was reduced or eliminated in vaccines for young children as a precautionary measure in 1999.
   - Recommend that Molly receive MMR vaccine because measles can be dangerous. In addition, if Molly did get rubella, there is a chance that an unvaccinated pregnant woman could be exposed, with potential harm to her fetus. If an immunocompromised person was exposed, measles could be life-threatening for them.

5. After administering all vaccines due today, which vaccines will Molly need at her next visit and when will she be scheduled to return to the clinic? Complete the table below. Note that not all vaccines listed will require future doses (e.g., complete).

Table 2c-5: Vaccines due at future visits: Answers

The 1st row indicates an example entry.

Vaccine	Recent valid dose number	Dose number of the vaccine dose due next	Age when the next vaccine dose is due
Example: HepB	*3*	*Complete*	*Complete*
RV5 (RotaTeq®)	3	Complete	Complete
DTaP	4	Complete	Complete
Hib (ActHIB®)	4	Complete	Complete
PCV13	4	Complete	Complete
IPV	3	4	4–6 yrs
IIV	1	2	4 wks after dose 1
MMR	1	2	4–6 yrs
VAR	1	2	4–6 yrs
HepA	1	2	6–18 mos after dose 1

Molly will need to return in 4 weeks for a second dose of IIV.

Rationale:

- The fourth dose of DTaP can be administered as early as 12 months of age because it has been at least 6 months since the third dose.
- Other vaccines will be due as follows:
  - Dose 4 of IPV is due between ages 4–6 years.
  - Dose 2 of MMR and VAR will be due between ages 4–6 years.
  - Dose 2 of HepA should be scheduled in another 6–18 months.

Answers to 2d. 4 ½-year-old, Healthy Infants and Children (Moderate)

1. List the number of doses, vaccination schedule, immunization history, and valid doses for the vaccines shown below. Complete the table below (see example for HepB).

Table 2d–1: Recommended vaccines for school-age child (age 4–6 years): Answers
The 1st row indicates an example entry.

Vaccine	Number of doses in the series	Vaccination schedule	Patient immunization history	Valid doses
Example: HepB	*3*	*Birth, 1–2, 6–18 mos*	*Birth, 2, 6 mos*	*Dose 1–3*
RV1 (Rotarix®)	2	2, 4 mos	2, 6 mos	Dose 1–2
DTaP	5	2, 4 , 6, 12–18 mos, 4–6 yrs	2, 4, 6, 15 mos	Dose 1–4
Hib (PedvaxHIB®)	3	2, 4 , 12–15 mos	2, 4, 12 mos	Dose 1–3
PCV13	4	2, 4 ,6, 12–15 mos	2, 4, 6, 15 mos	Dose 1–4
IPV	4	2, 4 , 6–18 mos, 4–6 yrs	2, 4, 6 mos	Dose 1–3
IIV	1	2 doses, 4 weeks apart, or 1 dose every flu season	N/A	N/A
MMR	2	12–15 mos, 4–6 yrs	12 mos	Dose 1
VAR	2	12–15 mos, 4–6 yrs	12 mos	Dose 1
HepA	2	2 doses, 6–18 mos apart, between ages 12–23 mos	12, 18 mos	Dose 1–2

2. Which vaccines (if any) from the recommended vaccination schedule did Tyler miss? Were any doses invalid?

   No vaccine doses were missed or invalid. The only vaccine not listed in Tyler's immunization history is IIV for seasonal flu.

3. Which vaccines does Tyler need today and in the future? Complete the table below. Note that not all vaccines listed have doses due today or require future doses (e.g., complete, N/A).

Table 2d-3: Vaccines needed today: Answers

The 1st row indicates an example entry.

Vaccine	Recent valid dose number	Vaccine doses due today	Dose number of the vaccine dose due next	Age when the next vaccine dose is due
Example: HepB	*3*	*Complete*	*N/A*	*N/A*
RV1 (Rotarix®)	2	Complete	N/A	N/A
DTaP	4	5	Complete	N/A
Hib (PedvaxHIB®)	3	Complete	N/A	N/A
PCV13	4	Complete	N/A	N/A
IPV	3	4	Complete	N/A
IIV	N/A	N/A	1, next flu season	N/A
MMR	1	2	Complete	N/A
VAR	1	2	Complete	N/A
HepA	2	Complete	Complete	N/A

Rationale:

- DTaP: Tyler had 4 doses of DTaP—3 of those doses were included in the combination vaccine, Pediarix® (DTaP-IPV-HepB). He received the doses on schedule at 2 months, 4 months, and 6 months and a fourth dose of DTaP at age 15 months old. According to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, he should receive a fifth dose today since he is between ages 4–6 years.
- IPV: He had 3 doses of IPV at 2, 4, and 6 months. These were a part of the combination vaccine, Pediarix® (DTaP-IPV-HepB). According to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, he can have dose 4 today since he is between 4–6 years of age.
- IIV: Since it is not flu season yet, he does not need a dose of IIV at this time. When flu season begins, if he never had seasonal flu vaccine, he should receive 2 doses of IIV, spaced 4 weeks apart. Thereafter, he will only receive 1 dose of seasonal flu vaccine each year. This 2-dose series is recommended for children ages 6 months to 8 years.
- MMR and VAR: He only had 1 dose of MMR and 1 dose of VAR at age 12 months. The second dose of each vaccine can be administered today since he is within the recommended age range for these doses.

4. When will Tyler need to be scheduled for his next recommended vaccines?

Tyler will be up to date on all immunizations after he receives the recommended vaccines today. He will only need to return during flu season for IIV each year for protection from seasonal flu.

Rationale:

- Tyler will need to return for seasonal flu vaccine. If he has never had IIV before and is younger than 8 years, he will need to receive 2 doses of IIV the first year he is vaccinated, then only 1 dose annually. This 2-dose series is recommended for children ages 6 months to 8 years.
- When he is age 11–12 years, he can receive MenACWY, HPV, and Tdap.

Answers to 2e.12-year-olds, Healthy Adolescents (Moderate)

1. Which vaccine or vaccines does Emma need today (see example for varicella)? Use the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger and the General Guidelines, Table 3–1, to complete the table below.

   Age: 12 years **Month** (Today's Visit): May

Table 2e-1: Vaccines due today for Emma: Answers
The 1st row indicates an example entry.

Vaccine	Number of doses in the series	Vaccination schedule	Patient immunization history	Vaccines due today
Example: VAR	*2*	*12–15 mos, 4–6 yrs*	*Dose 1 at 5 yrs*	*Dose 2*
MenACWY	2	11–12 yrs, 16 yrs	None	Dose 1
Tdap	1	11–12 yrs	11 yrs	None
HPV	2	0, 6–12 mos (age 9–14 yrs at initiation)	None	Dose 1
IIV or LAIV	1	1 dose annually	N/A	N/A

Rationale:

- VAR: Because Emma has only received 1 dose of VAR vaccine during childhood, she needs the second and final dose today to complete the 2-dose series.
- MenACWY: Emma should also receive 1 dose of MenACWY. She may receive either MenACWY-D (Menactra®) or MenACWY-CRM (Menveo®). The first dose is routinely recommended for all children between 11 and 12 years of age.
- HPV: HPV vaccine is recommended for all adolescents at 11 or 12 years of age, so Emma should receive her first dose today. ACIP recommends that healthy adolescents who receive their first HPV dose before their 15th birthday follow a 2-dose schedule with a minimum interval of 6 months between doses. Otherwise, a 3-dose schedule should be followed.
- IIV or LAIV: Emma also needs a dose of influenza vaccine during the flu season.

2. Are there contraindications for any vaccines Emma needs today?

   Step 1. *Screen the individual for vaccine contraindications (use* the Screening Checklist).

   Step 2. *Identify contraindications and precautions by vaccine (use the General Guidelines,* Table 4–1).

   Step 3. *Identify commonly misperceived contraindications (use the General Guidelines,* Table 4–2).

   No, Emma does not have any contraindications to the vaccines she needs today.

   Rationale:

   - Emma had a syncopal episode when she received her Tdap dose 1 year ago. A prior history of syncope after vaccination is not a contraindication to subsequent vaccination. However, this history should remind her health care provider to have her seated when she is vaccinated and to observe her—seated or lying down—for 15 minutes after vaccination.
   - An immunocompromised household contact, such as Emma's grandmother is not a contraindication to any vaccine except smallpox. Even though it is a live vaccine, VAR is not contraindicated. If Emma were to develop a rash after vaccination, she and her parent should be advised to cover the rash with a bandage and not let the grandmother go near the dressing.

3. Which vaccines does Ethan need today? Use the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger and the General Guidelines, Table 3–1 to complete the table below.

   Age: 12 years **Month** (Today's Visit): May

Table 2e–3: Vaccines due today for Ethan: Answers
The 1st row indicates an example entry.

Vaccine	Number of doses in the series	Vaccination schedule	Patient immunization history	Vaccines due today
Example: VAR	*2*	*12–15 mos, 4–6 yrs*	*Dose 1 at 5 yrs*	*Dose 2*
MenACWY	2	11–12 yrs, 16 yrs	None	Dose 1
Tdap	1	11–12 yrs	None	Dose 1
HPV	2	0, 6–12 mos (age 9–14 yrs at initiation)	None	Dose 1
IIV or LAIV	1	1 dose annually	N/A	N/A

Rationale:

- VAR: Ethan needs 1 dose of VAR and will complete the series today.
- MenACWY: He will also need 1 dose of MenACWY vaccine today.
- Tdap: A dose of Tdap is required for children between 11–12 years old.
- HPV: HPV vaccine is also routinely recommended at age 11 or 12 years for both boys and girls.
- IIV or LAIV: Ethan will need 1 dose of influenza vaccine in the upcoming influenza season.

4. Are there contraindications for any vaccines Ethan needs today?

Step 1. *Screen the individual for vaccine contraindications (use the* Screening Checklist).

Step 2. *Identify contraindications and precautions by vaccine (use the General Guidelines,* Table 4–1).

Step 3. *Identify commonly misperceived contraindications (use the General Guidelines,* Table 4–2).

No, Ethan does not have any contraindications to the vaccines he needs today.

Rationale:

- A family history of syncope after vaccination—even in a twin—is not a contraindication to any vaccine.
- An immunocompromised household contact, such as Ethan's grandmother, is not a contraindication to any vaccine except smallpox. Even though it is a live vaccine, VAR is not contraindicated. If Ethan were to develop a rash after vaccination, he and his parent should be advised to cover the rash with a bandage and not let the grandmother go near the dressing.
- Ethan's history of GBS is not a precaution for receipt of meningococcal conjugate vaccine. In 2010, ACIP recommended removing GBS as a precaution.

5. How will you respond to the concerns Emma and Ethan's mother has about the safety of the HPV vaccine? What actions can you take to ensure her children's safety during and after HPV vaccine administration? Refer to Talking to Parents about HPV Vaccine, page 2.

Key Points:

- Assure the mother that the vaccine is very safe. Review some of the expected side effects such as pain, swelling, or redness at the injection site that may last a couple of days.
- Emma has a history of syncope after a previous Tdap vaccination, so it is natural for her mother to be concerned for her safety. Let her know that some adolescents do faint after the HPV vaccine and that precautions will be taken to observe both of the children after the injection. They should be seated when they are vaccinated and then observed either seated or lying down for 15 minutes after vaccination. Appropriate precautions to avoid injuries resulting from syncope should always be taken when vaccinating, particularly for adolescents.
- Remind the mother that the HPV vaccine protects against cancers caused by HPV infection. One benefit of starting the series early at age 12 is that preteens have a better immune response to the vaccine than those in their late teens or early 20s. Also, if Emma and Ethan initiate the HPV vaccine series before they are 15 years old, they will only need 2 doses of HPV vaccine instead of 3 doses. No evidence shows any link between getting the HPV vaccine and starting sexual activity early. Give a strong recommendation for them to have the HPV vaccine.

6. When will Emma and Ethan need to receive further doses of any of the vaccines they will receive today?

- Both Emma and Ethan will need a dose of MenACWY at 16 years of age.
- They will both need a second and final dose of HPV vaccine 6–12 months after today's dose.
- Ethan does not need further doses of Tdap vaccine. However, if Emma ever becomes pregnant, she will need Tdap vaccine in the third trimester of each pregnancy. They will both need a tetanus-toxoid-containing vaccine (Td or Tdap) every 10 years.
- They should both receive IIV or LAIV during the upcoming influenza season.

A health care provider reviewing a screening form with a patient.

Part 3: Adult Vaccination Schedule

A group of smiling, healthy adults of various ages.

Part 3 Case Studies

Case Study	Topics	Level of Difficulty
3a. 65-year-old, Paul	Healthy Older Adults	Moderate
3b. 22-year-old, Michelle	Health Care Personnel	Moderate
3c. 63-year-old, Hank	Health Care Personnel	Advanced
3d. 27-year-old, Janet	Healthy Pregnancy	Advanced
3e. 19-year-old, Lara	Healthy Pregnancy	Advanced
3f. 21-year-old, Rosalie	Healthy Pregnancy	Advanced

3a. 65-year-old, Healthy Older Adults (Moderate)

Overview

Older adults are at increased risk for vaccine-preventable diseases because of comorbidities and an aging immune system. It is important to keep their vaccinations current, as they might not have been vaccinated in childhood and may not be familiar with new vaccines recommended for them.

Objectives

Using this case study, nursing students will:

- Practice using the CDC adult immunization schedule to determine what vaccines are recommended now and at future visits.
- Identify contraindications for vaccination in an older adult.

Teaching Tools

Review the following to help complete the case study:

1. Recommended Adult Immunization Schedule for ages 19 years or older
2. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 3–1: Recommended and Minimum Ages and Intervals between Vaccine Doses
3. *Epidemiology and Prevention of Vaccine-Preventable Diseases* (the Pink Book), Chapter 16– Pertussis
4. *Epidemiology and Prevention of Vaccine-Preventable Diseases* (the Pink Book), Chapter 22– Varicella
5. CDC's Pneumococcal Vaccine Timing for Adults job aid
6. Immunization Action Coalition's Screening Checklist for Contraindications to Vaccines for Adults
7. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 4–1: Contraindications and Precautions to Commonly Used Vaccines
8. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 4–2: Conditions Incorrectly Perceived as Contraindications to Vaccination

For the purpose of this case study, a dose counts toward completion of the series if administered no earlier than the minimum age (see the General Guidelines, Table 3–1, third column) and no earlier than the minimum interval from a previous dose (see the General Guidelines, Table 3–1, fifth column).

Glossary Words

Advisory Committee on Immunization Practices (ACIP): A group of medical and public health experts who develop recommendations on the use of vaccines in the civilian population of the United States. The recommendations stand as public health guidance for the safe use of vaccines and related biological products.

Antigen: A foreign substance (e.g., bacterium or virus) in the body that is capable of causing disease. The presence of antigens in the body triggers an immune response, usually the production of antibodies.

Comorbidity: More than one disease or condition is present in the same person at the same time. Conditions described as "comorbidities" are often chronic or long-term conditions.

Herpes zoster: Also known as "shingles"; a disease characterized by a painful rash that occurs most often on the trunk (back and stomach) of the body. Herpes zoster can also develop on other parts of the body, including the face and mouth. The rash has a dermatomal distribution and does not typically cross the body's midline. The most common complication of herpes zoster is postherpetic neuralgia, which is severe pain in the areas of the shingles rash that occurs weeks or months after the rash clears up. Other complications include eye involvement with blindness, pneumonia, and brain inflammation (encephalitis). Herpes zoster is caused by the same virus that is responsible for varicella zoster (chickenpox). After primary infection (chickenpox), the virus becomes dormant or inactivated. In some persons, the virus reactivates years or even decades later and causes herpes zoster.

High-risk condition: Any behavioral, medical, or occupational condition that increases a person's risk for vaccine-preventable disease.

Pneumococcal vaccine: A vaccine that protects against pneumococcal disease, which is any type of infection caused by *Streptococcus pneumoniae* bacteria. There are two kinds of pneumococcal vaccines available in the United States: pneumococcal conjugate vaccine and pneumococcal polysaccharide vaccine.

Background

Paul is a 65-year-old, established patient in your practice. He has no significant medical history. He is in your office in November—during influenza season—for a check-up. He lives with his daughter, who is expecting her first child in a month. He reports that he had chickenpox as a child, but his medical records lack a health care provider diagnosis or verification of varicella disease. His vaccination records show that he received valid doses of smallpox vaccine, DTP, and IPV in childhood and HepB and MMR as an adult. The state immunization registry shows his recent vaccination records below.

Immunization History

Tdap – 1 dose (11 years ago)

Td – 2 doses (11 years ago)

IIV – 1 dose (1 year ago)

Td – 1 dose (1 year ago)

Activities

1. Should Tdap be administered today? Explain your rationale. Refer to the Recommended Adult Immunization Schedule for ages 19 years or older (Tdap vaccination note) and review the Pink Book, Chapter 16, Pertussis (Vaccination Schedule and Use).

2. Listed in the table below are vaccines recommended for a 65-year-old adult. Which vaccines, if any, should Paul receive today? Complete the information in the table below (see example for inactivated influenza vaccine). Refer to the Recommended Adult Immunization Schedule for ages 19 years or older (review Table 2 and the information included in the notes).

Table 3a-2: Immunization history and vaccines due today

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Number of doses in the series	Vaccination schedule	Patient immunization history	Valid doses	Vaccine due today
Example: IIV	*1*	*1 dose every flu season*	*0 current season*	*0*	*1 dose of IIV*
Tdap or Td					
MMR					
VAR					
RZV					
PCV13					
PPSV23					

3. Are there contraindications for any of the vaccines he needs today? Paul and his provider discussed the PCV13 vaccine and decided that Paul should receive the PCV13 vaccine today. Use the Screening Checklist and the General Guidelines, Table 4–1.

4. When should Paul return, and what vaccine(s) should he receive at the next visit? Complete the information in the table below. Refer to the Recommended Adult Immunization Schedule for ages 19 years or older and CDC's Pneumococcal Vaccine Timing for Adults job aid.

Table 3a-4: Vaccines due at next visit

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Recent valid dose number	Dose number of the vaccine dose due next	Minium interval for the next dose
Example: IIV	*1 current season*	*1*	*Administer next flu season*
Tdap or Td			
MMR			
VAR			
RZV			
PCV13			
PPSV23			

3b. 22-year-old, Health Care Personnel (Moderate)

Overview

Methods used to assess which vaccines are indicated for health care personnel (HCP), including nursing students, may vary based on state or health care organization requirements. In some nursing programs, student health centers review a student's vaccination and immunity status at the start of the semester when clinical rotation begins (and then on a regular basis following the initial assessment).

If they are not able to receive a vaccine (e.g., because of immunosuppressive treatment), HCP can meet other criteria for immunity through documented history of disease or serologic testing.

Objectives

Using this case study, nursing students will:

- Determine which vaccines are indicated for health care personnel.
- Determine vaccine contraindications due to medical conditions and/or treatments.
- Determine if serologic testing is needed.

Teaching Tools

Review the following to help complete the case study:

1. Recommended Adult Immunization Schedule for ages 19 years or older
2. Immunization of Health-Care Personnel, Table 2: Immunizing agents and immunization schedule for health-care personnel (HCP)
3. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 3–1: Recommended and Minimum Ages and Intervals between Vaccine Doses
4. Immunization Action Coalition's (IAC) Screening Checklist for Contraindications to Vaccines for Adults

Glossary Words

Albuterol: Belongs in a class of medications called "bronchodilators." It is used to prevent and treat difficulty breathing, wheezing, shortness of breath, coughing, and chest tightness caused by lung diseases such as asthma and chronic obstructive pulmonary disease (COPD—a group of diseases that affect the lungs and airways). It works by relaxing and opening air passages to the lungs to make breathing easier.

Immunosuppressive therapy: Medication or other treatments (e.g., high doses of oral corticosteroids or radiation therapy) that impair the natural immune (protective) responses of the body; can be used to prevent rejection of a transplanted organ.

Serologic testing: A procedure done on a blood serum sample to measure either antigens or antibodies.

Background

Michelle is a 22-year-old nursing student. She is in the clinic—during influenza season—to receive certain vaccinations before starting her nursing school clinical rotation. She has mild asthma, which is controlled with the occasional use of an albuterol inhaler. She was told by her parents that she had chickenpox at age 5 years, but has no documentation of this illness. She received 2 doses of MMR at least 28 days apart in childhood. She can only locate some of her childhood immunization records since her family moved a lot (see "Immunization History" below). The nursing school requires serologic proof of hepatitis B immunity since the training may involve exposure to blood or body fluids. Note: The clinic only has the Engerix-B® brand of HepB vaccine in stock.

Immunization History

DTaP – 5 valid doses (childhood)

MMR – 2 valid doses (childhood)

Influenza – 1 dose (1 month ago)

Instructions

Follow these steps to complete the corresponding activities on the next page.

Step 1. Determine recommended vaccines by age. Refer to the Recommended Adult Immunization Schedule for ages 19 years or older, Table 1. (Hint: Recommended vaccines have a yellow box under the respective age groups.)

Step 2a. Identify vaccine recommendations based on medical conditions (if applicable) (use the Recommended Adult Immunization Schedule for ages 19 years or older, Table 2).

Step 2b. Assess need for additional recommended vaccines by medical condition and other indications (i.e., HCP). Refer to the Recommended Adult Immunization Schedule for ages 19 years or older, Table 2. (Hint: Vaccines recommended for HCP have a yellow box under the health care personnel column.)

Step 2c. Identify vaccine recommendations based on HCP requirements by evaluating whether the individual met any of the HCP criteria for immunity (use Immunization of Health-Care Personnel, Table 2). If not met, identify ways for them to meet the HCP criteria for immunity.

Step 3. Review vaccine types, frequencies, intervals, and considerations for special situations (use the Recommended Adult Immunization Schedule for ages 19 years or older and information included in the notes).

Step 4. Summarize all vaccine recommendations (Steps 1–3) based on the routine schedule, HCP requirements, and medical conditions. Review the patient's immunization history and compare it with the list of recommended vaccines. Identify all vaccines due at today's visit and future visits.

Step 5. Identify serologic testing that may be indicated for the individual.

For the purpose of these case studies, a dose counts toward completion of the series if administered no earlier than the minimum age (see the General Guidelines, Table 3–1, third column) and no earlier than the minimum interval from a previous dose (see the General Guidelines, Table 3–1, fifth column). Also, assume that the patient has been screened for all vaccine contraindications and precautions.

Activities

1. List recommended vaccines for a 22-year-old adult. Refer to the Recommended Adult Immunization Schedule for ages 19 years or older, Table 1.

2. List recommended vaccines for 22-year-old persons with chronic lung disease (e.g., asthma) and 22-year-old health care personnel. Refer to the Recommended Adult Immunization Schedule for ages 19 years or older, Table 2.

3. Evaluate whether Michelle meets any of the HCP criteria for immunity. If not, indicate other way(s) to meet criteria for immunity. Complete the information in the table below (see example for HepB vaccine). Use Immunization of Health-Care Personnel, Table 2.

Table 3b-3: HCP vaccination requirements

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	HCP criteria for immunity met by patient	If not immune, indicate way(s) to meet criteria for immunity
Example: HepB	*None*	*Administer a complete HepB series, followed by anti-HBs testing 1–2 months later*
IIV		
MMR		
VAR		
Tdap or Td		

4. In this case study, reasons for vaccine recommendations are based on the routine schedule, health care personnel requirements, and/or medical conditions. Determine what vaccines Michelle should receive during this visit and at future visits. Use the Recommended Adult Immunization Schedule for ages 19 years or older, Tables 1 and 2. The answer for influenza vaccine is provided as an example. Also, assume that the patient has been screened for all vaccine contraindications and precautions. Note: The clinic only has the Engerix-B® brand of HepB in stock.

Table 3b-4: Vaccine recommendations for Michelle

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Vaccine due today	Vaccine due at future visits
Example: IIV	*N/A*	*Influenza vaccine in the next flu season*
Tdap		
MMR		
VAR		
HPV		
PPSV23		
HepB		

5. What, if any, serologic testing should be done at today's visit?

3c. 63-year-old, Health Care Personnel (Advanced)

Overview

Methods used to assess which vaccines are indicated for health care personnel (HCP), including nursing students, may vary based on state or health care organization requirements. In some nursing programs, student health centers review a student's vaccination and immunity status at the start of the semester when clinical rotation begins (and then on a regular basis following the initial assessment).

If they are not able to receive a vaccine (e.g., because of immunosuppressive treatment), HCP can meet other criteria for immunity through documented history of disease or serologic testing.

Objectives

Using this case study, nursing students will:

- Determine which vaccines are indicated for health care personnel.
- Determine vaccine contraindications due to medical conditions and/or treatments.
- Determine if serologic testing is needed.

Teaching Tools

Review the following to help complete the case study:

1. Recommended Adult Immunization Schedule for ages 19 years or older
2. Immunization of Health-Care Personnel, Table 2: Immunizing agents and immunization schedule for health-care personnel (HCP)
3. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 3–1: Recommended and Minimum Ages and Intervals between Vaccine Doses
4. Immunization Action Coalition's (IAC) Screening Checklist for Contraindications to Vaccines for Adults

Glossary Words

Enbrel® (etanercept): A brand of tumor necrosis factor (TNF) blocker. TNF blockers suppress the immune system by blocking the activity of TNF, a substance in the body that can cause inflammation and lead to immune system diseases, such as Crohn's disease, ulcerative colitis, rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis, and plaque psoriasis.

Immunosuppressive therapy: Medication or other treatments (e.g., high doses of oral corticosteroids or radiation therapy) that impair the natural immune (protective) responses of the body; can be used to prevent rejection of a transplanted organ.

Mumps: An acute, contagious viral illness marked by swelling, especially of the parotid glands. It can also cause fever, testicular swelling, meningoencephalitis, pancreatitis, and heart and thyroid involvement.

Psoriatic arthritis: An inflammatory type of arthritis that eventually occurs in 10% to 20% of people with psoriasis. It is different from more common types of arthritis (such as osteoarthritis or rheumatoid arthritis) and is thought to be related to the underlying problem of psoriasis. Psoriasis and psoriatic arthritis are sometimes considered together as psoriatic disease.

Serologic testing: A procedure done on a blood serum sample to measure either antigens or antibodies.

Background

Hank is a 63-year-old retired librarian applying for a volunteer position at a children's hospital during influenza season. As part of the application process, he is meeting with the infection control nurse to determine his vaccination status. He has a history of psoriatic arthritis diagnosed 6 months ago. The arthritis is being treated with etanercept (Enbrel®), an immunosuppressive drug, twice a week.

Hank had severe varicella (documented by a health care provider) at 22 years of age that was complicated by varicella pneumonia and required hospitalization. The nurse is aware of a current mumps outbreak in the community served by the hospital and several children with mumps have recently been admitted to the hospital. His childhood vaccination record was lost in a fire several years ago. Listed below are his only documented vaccine doses.

Immunization History

IIV – 1 dose (1 month ago)

HepB – 3 doses (completed 3 valid doses 1 month ago)

Tdap/Td – 3 doses (completed primary series of Tdap-Td-Td 1 month ago)

Instructions

Follow these steps to complete the corresponding activities on the next page.

Step 1. Determine recommended vaccines by age. Refer to the Recommended Adult Immunization Schedule for ages 19 years or older, Table 1. (Hint: Recommended vaccines have a yellow box under the respective age groups.)

Step 2a. Identify vaccine recommendations based on medical conditions (if applicable) (use the Recommended Adult Immunization Schedule for ages 19 years or older, Table 2).

Step 2b. Assess need for additional recommended vaccines by medical condition and other indications (i.e., HCP). Refer to the Recommended Adult Immunization Schedule for ages 19 years or older, Table 2. (Hint: Vaccines recommended for HCP have a yellow box under the health care personnel column.)

Step 2c. Identify vaccine recommendations based on HCP requirements by evaluating whether the individual met any of the HCP criteria for immunity (use Immunization of Health-Care Personnel, Table 2). If not met, identify ways for them to meet the HCP criteria for immunity.

Step 3. Review vaccine types, frequencies, intervals, and considerations for special situations (use the Recommended Adult Immunization Schedule for ages 19 years or older and information included in the notes).

Step 4. Summarize all vaccine recommendations (Steps 1–3) based on the routine schedule, HCP requirements, and medical conditions. Review the patient's immunization history and compare it with the list of recommended vaccines. Identify all vaccines due at today's visit and future visits.

Step 5. Identify serologic testing that may be indicated for the individual.

For the purpose of these case studies, a dose counts toward completion of the series if administered no earlier than the minimum age (see the General Guidelines, Table 3–1, third column) and no earlier than the minimum interval from a previous dose (see the General Guidelines, Table 3–1, fifth column). Also, assume that the patient has been screened for all vaccine contraindications and precautions.

Activities

1. List recommended vaccines for a 63-year-old adult. Refer to the Recommended Adult Immunization Schedule for ages 19 years or older, Table 1.

2. Hank's medical record states a history of psoriatic arthritis diagnosed 6 months ago and treated with etanercept (Enbrel®), an immunosuppressive drug. Aside from vaccines identified in Activity 1, what additional vaccine(s) should he receive based on this medical condition? What, if any, vaccine(s) are contraindicated? Use the Recommended Adult Immunization Schedule for ages 19 years or older, Table 2. (Hint: Vaccine recommendations are in yellow boxes under respective medical conditions.)

3. Evaluate whether Hank meets any of the HCP criteria for immunity. If not, indicate other way(s) to meet criteria for immunity. Complete the information in the table below (see example for HepB vaccine). Use Immunization of Health-Care Personnel, Table 2.

Table 3c-3: HCP vaccination requirements

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	HCP criteria for immunity met by patient	If not immune, indicate way(s) to meet criteria for immunity
Example: HepB	*Completed HepB series*	*Anti- HBs testing 1–2 months after completion of HepB series (depending on health care facility protocol)*
IIV		
MMR		
VAR		
Tdap or Td		

4. In this case study, reasons for vaccine recommendations are based on the routine schedule, health care personnel requirements, and/or medical conditions. Indicate the reasons for receiving each vaccine. Determine what vaccines Hank should receive at this visit and future visits. Use the Recommended Adult Immunization Schedule for ages 19 years or older, Tables 1 and 2. The answer for influenza vaccine is provided as an example.

Table 3c-4: Vaccine recommendations for Hank

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Indicate reason(s) (routine schedule, HCP requirements, or medical condition)	Vaccine due today	Vaccine due at future visits
Example: IIV	*Routine schedule, HCP requirements, and medical condition*	*No, complete*	*Influenza vaccine in the next flu season*
Tdap			
MMR			
VAR			
RZV			
PCV13			
PPSV23			
HepB			

3d. 27-year-old, Healthy Pregnancy (Advanced)

Overview

The importance of vaccinations for a healthy pregnancy cannot be overstated. Pregnant women and their babies are at increased risk for complications of vaccine-preventable diseases if they are exposed and contract a disease. For example, a woman who contracts rubella during pregnancy can transmit it to her fetus, causing the infant to be born with congenital rubella syndrome (CRS). CRS can cause serious health conditions, including visual defects, deafness, heart defects, or intellectual disability.

Pregnant women who contract the flu during pregnancy can become seriously ill and require hospitalization, and may be more prone to preterm labor and delivery. Some vaccines (Tdap and seasonal flu vaccine) are specifically recommended for pregnant women, while others are contraindicated (e.g., live, attenuated virus vaccines such as MMR and VAR). If the mother is vaccinated prior to or during pregnancy, passive antibodies will be transferred to her infant. This can help protect the newborn early in life when the baby is at high risk for severe illness, but too young to be vaccinated.

Vaccines may be safely administered to mothers who are breastfeeding, with the exception of smallpox and yellow fever vaccines.

Objectives

Using this case study, nursing students will:

- Determine which vaccines are indicated for a pregnant woman and whether any vaccines are contraindicated until after delivery.
- Determine which vaccines are indicated for a pregnant woman's household contacts.

Teaching Tools

Review the following to help complete the case study:

1. Recommended Adult Immunization Schedule for ages 19 years or older
2. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 4–1: Contraindications and Precautions to Commonly Used Vaccines
3. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Special Situations

Glossary Words

Asymptomatic: The presence of an infection without symptoms; also known as an "inapparent" or "subclinical" infection.

Congenital rubella syndrome (CRS): A pattern of birth defects caused by rubella virus exposure during pregnancy. CRS-related problems include deafness, cataracts, heart defects, microcephaly, mental retardation, bone alterations, and liver and spleen damage.

Contraindication: A condition that increases the likelihood of a serious adverse reaction to a vaccine for a patient with that condition. If the vaccine is given in the presence of that condition, the resulting adverse reaction could seriously harm the recipient.

Diphtheria: A disease caused by *Corynebacterium diphtheriae* bacteria. It may involve infection of any mucous membrane in the body, but most commonly the tonsils and pharynx. The disease is marked by the formation of a false membrane, usually in the throat, that can obstruct the airway. Most complications, including death, are caused by the effects of the bacteria's toxin on organs in the body.

G2P1: Means a woman is pregnant for the second time and has birthed a viable offspring once. "G" (gravida) indicates the number of pregnancies and "P" (para) indicates the number of births of viable offspring.

Gestation: The period from conception to delivery; pregnancy.

Glucose challenge test: Also called a "glucose tolerance test," it measures the body's response to sugar (glucose). It is done during pregnancy to screen for gestational diabetes—diabetes that develops during pregnancy.

Hepatitis B surface antibody (anti-HBs): The presence of anti-HBs is generally interpreted as indicating recovery and immunity from HBV infection. Anti-HBs also develop in a person who has been successfully vaccinated against hepatitis B.

Hepatitis B surface antigen (HBsAg): The presence of HBsAg, a protein on the surface of hepatitis B virus (HBV), indicates that the person is infectious. It can be detected as high levels in serum during acute or chronic HBV infection. The body normally produces antibodies to HBsAg as part of the normal immune response to infection. HBsAg is the antigen used to make hepatitis B vaccine.

Immunity: Protection against a disease or an infection, usually associated with antibodies or certain cells in the blood that counteract microbes or toxin. Immunity can come from infection with a disease or from vaccination.

Immunization information system (IIS): Confidential, population-based, computerized database that records all vaccine doses administered by participating providers to persons residing within a given geopolitical area. Also known as "immunization registry."

Immunoglobulin G (IgG): The most abundant class of antibodies; found in blood serum and lymph and active against bacteria, fungi, viruses, and foreign particles.

Influenza: A highly contagious viral infection characterized by sudden onset of fever, severe aches and pains, and inflammation of the mucous membrane.

Live vaccine: A vaccine in which live antigen is weakened (attenuated) through chemical or physical processes to produce an immune response without causing the severe effects of the disease. Also known as an "attenuated vaccine."

Passive immunity: Protection against disease through antibodies produced by another human or animal. Passive immunity is effective, but protection diminishes with time (usually within several weeks or months).

Pertussis: Also known as "whooping cough"; a highly contagious respiratory disease caused by the bacterium *Bordetella pertussis*. Pertussis is known for causing uncontrollable, violent coughing that often makes it hard to breathe. After coughing fits, someone with pertussis often needs to take deep breaths, which result in a "whooping" sound. Pertussis can affect people of all ages, but can be very serious, even deadly, for babies less than a year old.

(Glossary Words continued on next page)

Glossary Words, continued

Rubella: Also known as "German measles"; a usually mild viral disease that causes fever and skin rash. If it occurs during early pregnancy, rubella can cause congenital rubella syndrome (CRS), which can result in congenital defects, fetal death, spontaneous abortion, and stillbirth. Up to 85% of infants infected with rubella in the first trimester will have CRS-related problems, including deafness, cataracts, heart defects, microcephaly, mental retardation, bone alterations, and liver and spleen damage.

Seasonal influenza vaccine: A vaccine that protects against three (trivalent) or four (quadrivalent) influenza viruses that research suggests will be most common during the influenza season.

Serologic testing: A procedure done on a blood serum sample to measure either antigens or antibodies.

Tetanus: An infection caused by the bacteria *Clostridium tetani*. When the bacteria invade the body, usually through a wound, they produce a poison (toxin) that causes painful muscle contractions. Another name for tetanus is "lockjaw." It often causes a person's neck and jaw muscles to lock, making it hard to open the mouth or swallow.

Theoretical risk: Something that possibly could happen according to theory, but for which there is no evidence it has ever happened in reality. For example, there is no evidence that any live vaccine has ever caused birth defects but, in theory, a possibility exists that it could happen.

Titer: Measure of the amount of antibody against a specific antigen in the blood; a blood test that shows rising titers usually means that a specific disease or antigen (e.g., from a vaccine) is present and that the body is making antibodies to fight the disease.

Vaccination: The use of vaccines to produce immunity to a disease. This usually entails administering antigenic material, or vaccine, by injection.

Vaccinia (smallpox) vaccine: A vaccine that contains live vaccinia virus, which is a poxvirus similar to smallpox, but less harmful. It is used to prevent smallpox and is administered percutaneously using a jabbing technique with a special needle (bifurcated). The vaccination results in a skin reaction that includes the appearance of a pustular lesion.

Varicella (chickenpox): An acute, highly contagious viral infection, usually appearing in childhood, that causes fever, skin lesions, and malaise; caused by varicella zoster virus.

Yellow fever: An infectious tropical disease transmitted by mosquitoes; characterized by high fever, jaundice, and gastrointestinal bleeding.

Background

Janet is a 27-year-old G2P1 at 28 weeks' gestation. She is in the OB-GYN office in October—during influenza season—for a routine prenatal visit, including a glucose challenge test. She lives with her husband, her mother, and her 2-year-old son. Her medical record indicates she was diagnosed with varicella as a child. Her childhood vaccination records show 1 valid dose of MMR vaccine and 3 valid doses of HepB vaccine. Her laboratory results from 5 months ago show a non-immune rubella titer, a negative hepatitis B surface antigen (HBsAg), and positive hepatitis B surface antibody (anti-HBs ≥10mIU/mL). The state immunization registry shows her recent vaccination records below.

Immunization History

HepB – 3 doses (childhood)

MMR – 1 dose (childhood)

Tdap – 1 dose (during previous pregnancy at 25 years of age)

Td – 2 doses (25 and 26 years of age)

Instructions

Follow these steps to complete the corresponding activities on the next page.

Step 1. Determine recommended vaccines by age. Refer to the Recommended Adult Immunization Schedule for ages 19 years or older, Table 1. (Hint: Recommended vaccines have a yellow box under the respective age groups.) Review patient's immunization history and compare it with the list of recommended vaccines.

Step 2. Assess need for additional recommended vaccines by medical condition (i.e., pregnancy) and other indications. Refer to the Recommended Adult Immunization Schedule for ages 19 years or older, Table 2. (Hint: Vaccines recommended during pregnancy have a yellow box under the pregnancy column.)

Step 3. Review vaccine types, frequencies, intervals, and considerations for special situations (use the Recommended Adult Immunization Schedule for ages 19 years or older and the information included in the notes).

Step 4. Identify contraindications and precautions due to pregnancy by vaccine (use the General Guidelines, Table 4–1).

Step 5. Review the General Guidelines, Special Situations.

Activities

1. Listed in the table below are vaccines recommended for a 27-year-old adult. Review Janet's immunization history and compare it with the list of recommended vaccines. Which vaccines, if any, should she receive today? Complete the information in the table below (see example for IIV). Refer to the Recommended Adult Immunization Schedule for ages 19 years or older (review Table 2 and the information included in the notes).

Table 3d-1: Immunization history and vaccines due today

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Number of doses in the series	Vaccination schedule	Patient immunization history	Valid doses	Vaccine due today
Example: IIV	*1*	*1 dose every flu season*	*0 current season*	*0*	*1 dose of IIV*
Tdap or Td					
MMR					
VAR					

2. Are there any contraindications for any of the vaccines due today?

3. Should Janet's husband receive Tdap vaccine or any other vaccines before the birth of the baby? Explain.

4. Should she receive any other vaccines after delivery? Explain.

5. Sometimes parents wonder whether it is safe to breastfeed after receiving live-virus vaccines. Can Janet breastfeed after receiving any vaccines that are indicated? Explain.

A health care provider reviewing a screening form with a pregnant patient.

3e. 19-year-old, Healthy Pregnancy Postpartum (Advanced)

Overview

The importance of vaccinations for a healthy pregnancy cannot be overstated. Pregnant women and their babies are at increased risk for complications of vaccine-preventable diseases if they are exposed and contract a disease. For example, a woman who contracts rubella during pregnancy can transmit it to her fetus, causing the infant to be born with congenital rubella syndrome (CRS). CRS can cause serious health conditions, including visual defects, deafness, heart defects, or intellectual disability.

Pregnant women who contract the flu during pregnancy can become seriously ill and require hospitalization, and may be more prone to preterm labor and delivery. Some vaccines (Tdap and seasonal flu vaccine) are specifically recommended for pregnant women, while others are contraindicated (e.g., live, attenuated virus vaccines such as MMR and VAR). If the mother is vaccinated prior to or during pregnancy, passive antibodies will be transferred to her infant. This can help protect the newborn early in life when the baby is at high risk for severe illness, but too young to be vaccinated.

Vaccines may be safely administered to mothers who are breastfeeding, with the exception of smallpox and yellow fever vaccines.

Objective

Using this case study, nursing students will:

- Determine which vaccines are indicated for a pregnant woman and whether any vaccines are contraindicated until after delivery.

Teaching Tools

Review the following to help complete the case study:

1. Recommended Adult Immunization Schedule for ages 19 years or older
2. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 3–1: Recommended and Minimum Ages and Intervals between Vaccine Doses
3. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 4–1: Contraindications and Precautions to Commonly Used Vaccine
4. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Special Situations

Glossary Words

Conception: Fertilization of an oocyte by a sperm.

Congenital rubella syndrome (CRS): A pattern of birth defects caused by rubella virus exposure during pregnancy. CRS-related problems include deafness, cataracts, heart defects, microcephaly, mental retardation, bone alterations, and liver and spleen damage.

Contraindication: A condition that increases the likelihood of a serious adverse reaction to a vaccine for a patient with that condition. If the vaccine is given in the presence of that condition, the resulting adverse reaction could seriously harm the recipient.

Influenza: A highly contagious viral infection characterized by sudden onset of fever, severe aches and pains, and inflammation of the mucous membrane.

Live vaccine: A vaccine in which live antigen is weakened (attenuated) through chemical or physical processes to produce an immune response without causing the severe effects of the disease. Also known as an "attenuated vaccine."

Passive immunity: Protection against disease through antibodies produced by another human or animal. Passive immunity is effective, but protection diminishes with time (usually within several weeks or months).

Postpartum: The period between delivery and 12 weeks after birth.

Rubella: Also known as "German measles"; a usually mild viral disease that causes fever and skin rash. If it occurs during early pregnancy, rubella can cause congenital rubella syndrome (CRS), which can result in congenital defects, fetal death, spontaneous abortion, and stillbirth. Up to 85% of infants infected with rubella in the first trimester will have CRS-related problems, including deafness, cataracts, heart defects, microcephaly, mental retardation, bone alterations, and liver and spleen damage.

Seasonal influenza vaccine: A vaccine that protects against three (trivalent) or four (quadrivalent) influenza viruses that research suggests will be most common during the influenza season.

Vaccination: The use of vaccines to produce immunity to a disease. This usually entails administering antigenic material, or vaccine, by injection.

Vaccinia (smallpox) vaccine: A vaccine that contains live vaccinia virus, which is a poxvirus similar to smallpox, but less harmful. It is used to prevent smallpox and is administered percutaneously using a jabbing technique with a special needle (bifurcated). The vaccination results in a skin reaction that includes the appearance of a pustular lesion.

Yellow fever: An infectious tropical disease transmitted by mosquitoes; characterized by high fever, jaundice, and gastrointestinal bleeding.

Background

Lara is a 19-year-old who delivered a male infant this morning. Her prenatal record titers for rubella and varicella show that she is non-immune to both viruses. She does not have any documented doses of MMR and varicella vaccines. She is HBsAg-negative. She received Tdap at 30 weeks' gestation and flu vaccine at 28 weeks' gestation during pregnancy. Lara stated that she plans to breastfeed.

Immunization History

Tdap – 1 dose (30 weeks' gestation)

IIV – 1 dose (28 weeks' gestation)

Instructions

Follow these steps to complete the corresponding activities on the next page.

Step 1. Determine recommended vaccines by age. Refer to the Recommended Adult Immunization Schedule for ages 19 years or older, Table 1. (Hint: Recommended vaccines have a yellow box under the respective age groups.) Review patient's immunization history and compare it with the list of recommended vaccines.

Step 2. Assess need for additional recommended vaccines by medical condition (i.e., pregnancy) and other indications. Refer to the Recommended Adult Immunization Schedule for ages 19 years or older, Table 2. (Hint: Vaccines recommended during pregnancy have a yellow box under the pregnancy column.)

Step 3. Review vaccine types, frequencies, intervals, and considerations for special situations (use the Recommended Adult Immunization Schedule for ages 19 years or older and the information included in the notes).

Step 4. Identify contraindications and precautions due to pregnancy by vaccine (use the General Guidelines, Table 4–1).

Step 5. Review the General Guidelines, Special Situations.

Activities

1. Listed in the table below are vaccines recommended for a 19-year-old. Which vaccine(s) is (are) recommended for Lara postpartum prior to discharge? Complete the information in the table below (see example for inactivated influenza vaccine). Refer to the Recommended Adult Immunization Schedule for ages 19 years or older (review Table 2 and the information included in the notes).

Table 3e-1: Immunization history and vaccines due today

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Number of doses in the series	Vaccination schedule	Patient immunization history	Valid doses	Vaccine due today
Example: IIV	*1*	*1 dose every flu season*	*1 current flu season*	*1*	*N/A*
Tdap or Td					
MMR					
VAR					
HPV					

2. Are there any contraindications for any of the vaccines due today?

3. Are there any special instructions Lara should know before receiving the recommended vaccine(s)? Explain. Review the General Guidelines, Special Situations.

3f. 21-year-old, Healthy Pregnancy (Advanced)

Overview

The importance of vaccinations for a healthy pregnancy cannot be overstated. Pregnant women and their babies are at increased risk for complications of vaccine-preventable diseases if they are exposed and contract a disease. For example, a woman who contracts rubella during pregnancy can transmit it to her fetus, causing the infant to be born with congenital rubella syndrome (CRS). CRS can cause serious health conditions, including visual defects, deafness, heart defects, or intellectual disability.

Pregnant women who contract the flu during pregnancy can become seriously ill and require hospitalization, and may be more prone to preterm labor and delivery. Some vaccines (Tdap and seasonal flu vaccine) are specifically recommended for pregnant women, while others are contraindicated (e.g., live, attenuated virus vaccines such as MMR and VAR). If the mother is vaccinated prior to or during pregnancy, passive antibodies will be transferred to her infant. This can help protect the newborn early in life when the baby is at high risk for severe illness, but too young to be vaccinated.

Vaccines may be safely administered to mothers who are breastfeeding, with the exception of smallpox and yellow fever vaccines.

Objectives

Using this case study, nursing students will:

- Determine which vaccines are indicated for a pregnant woman and whether any vaccines are contraindicated until after delivery.
- Determine which vaccines are indicated for a pregnant woman's household contacts.

Teaching Tools

Review the following to help complete the case study:

1. Recommended Adult Immunization Schedule for ages 19 years or older
2. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 3–1: Recommended and Minimum Ages and Intervals between Vaccine Doses
3. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 4–1: Contraindications and Precautions to Commonly Used Vaccines
4. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Special Situations

Glossary Words

Congenital rubella syndrome (CRS): A pattern of birth defects caused by rubella virus exposure during pregnancy. CRS-related problems include deafness, cataracts, heart defects, microcephaly, mental retardation, bone alterations, and liver and spleen damage.

Contraindication: A condition that increases the likelihood of a serious adverse reaction to a vaccine for a patient with that condition. If the vaccine is given in the presence of that condition, the resulting adverse reaction could seriously harm the recipient.

G1P0: Means a woman is pregnant for the first time and has not yet delivered. "G" (gravida) indicates the number of pregnancies and "P" (para) indicates the number of births of viable offspring.

Immunocompetence: Able to mount a normal immune response (e.g., the ability to develop antibodies in response to antigens).

Influenza: A highly contagious viral infection characterized by sudden onset of fever, severe aches and pains, and inflammation of the mucous membrane.

Live vaccine: A vaccine in which live antigen is weakened (attenuated) through chemical or physical processes to produce an immune response without causing the severe effects of the disease. Also known as an "attenuated vaccine."

Passive immunity: Protection against disease through antibodies produced by another human or animal. Passive immunity is effective, but protection diminishes with time (usually within several weeks or months).

Rubella: Also known as "German measles"; a usually mild viral disease that causes fever and skin rash. If it occurs during early pregnancy, rubella can cause congenital rubella syndrome (CRS), which can result in congenital defects, fetal death, spontaneous abortion, and stillbirth. Up to 85% of infants infected with rubella in the first trimester will have CRS-related problems, including deafness, cataracts, heart defects, microcephaly, mental retardation, bone alterations, and liver and spleen damage.

Seasonal influenza vaccine: A vaccine that protects against three (trivalent) or four (quadrivalent) influenza viruses that research suggests will be most common during the influenza season.

Vaccination: The use of vaccines to produce immunity to a disease. This usually entails administering antigenic material, or vaccine, by injection.

Vaccinia (smallpox) vaccine: A vaccine that contains live vaccinia virus, which is a poxvirus similar to smallpox, but less harmful. It is used to prevent smallpox and is administered percutaneously using a jabbing technique with a special needle (bifurcated). The vaccination results in a skin reaction that includes the appearance of a pustular lesion.

Virus shedding: Excretion of virus by any route from the infected host.

Yellow fever: An infectious tropical disease transmitted by mosquitoes; characterized by high fever, jaundice, and gastrointestinal bleeding.

Background

Rosalie is a 21-year-old G1P0 at her first prenatal visit. She had a positive pregnancy test at home and the pregnancy was confirmed at the clinic. Her last menstrual period (LMP) was 1 month ago. She works in a child care setting and is assigned to the infant room. She recently received vaccinations as part of a work requirement (see "Immunization History" below). She was counseled not to get pregnant for at least 4 weeks after receiving live vaccines, but did not know she was already pregnant. She lives with her sister, Jane, and 2-month-old nephew, Marcus.

Immunization History

Tdap – 1 dose (18 weeks ago)

IIV – 1 dose (18 weeks ago – current season)

MMR – 2 doses (18 weeks and 8 weeks ago)

VAR – 2 doses (8 weeks and 2 weeks ago)

HPV – 2 doses (8 weeks and 2 weeks ago)

Instructions

Follow these steps to complete the corresponding activities on the next page.

Step 1. Determine recommended vaccines by age. Refer to the Recommended Adult Immunization Schedule for ages 19 years or older, Table 1. (Hint: Recommended vaccines have a yellow box under the respective age groups.) Review patient's immunization history and compare it with the list of recommended vaccines.

Step 2. Assess need for additional recommended vaccines by medical condition (i.e., pregnancy) and other indications. Refer to the Recommended Adult Immunization Schedule for ages 19 years or older, Table 2. (Hint: Vaccines recommended during pregnancy have a yellow box under the pregnancy column.)

Step 3. Review vaccine types, frequencies, intervals, and considerations for special situations (use the Recommended Adult Immunization Schedule for ages 19 years or older and the information included in the notes).

Step 4. Identify contraindications and precautions due to pregnancy by vaccine (use the General Guidelines, Table 4–1).

Step 5. Review the General Guidelines, Special Situations.

Activities

1. Rosalie is concerned that the fetus could be negatively affected because she received VAR and HPV vaccines and got pregnant within the time frame when she was supposed to avoid pregnancy. She wonders if the baby will have major health problems because she got pregnant too soon. How will you respond to Rosalie's concerns? Review the General Guidelines, Special Situations (Vaccination During Pregnancy).

2. Listed in the table below are vaccines recommended for a 21-year-old. Which vaccines will Rosalie need during her pregnancy? Complete the information in the table below (see example for IIV vaccine). Refer to the Recommended Adult Immunization Schedule for ages 19 years or older (review Table 2 and the information included in the notes). Note that not all vaccines listed will need additional doses during pregnancy (e.g., complete, delay dose until after pregnancy).

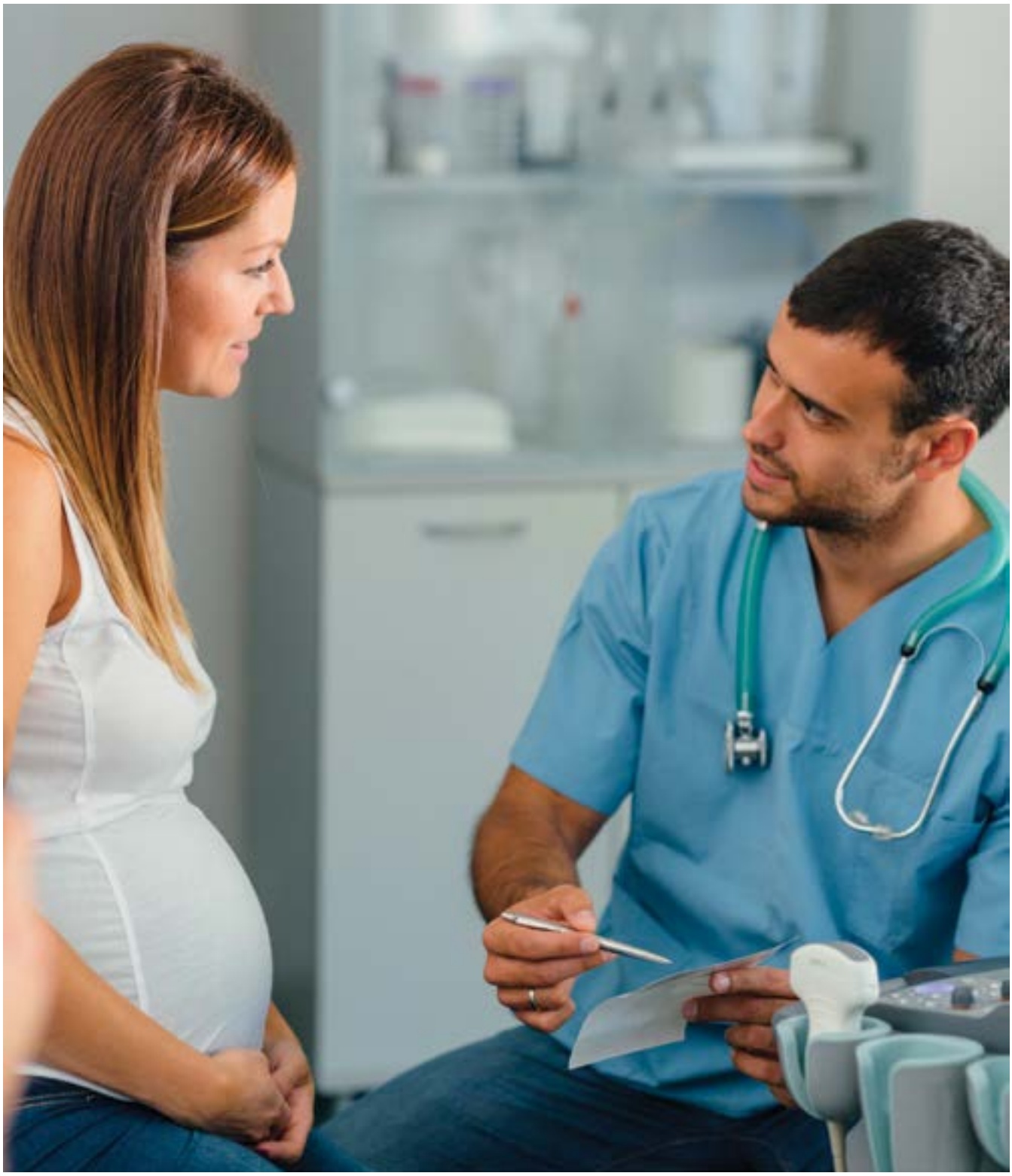
Table 3f-2: Immunization history and vaccine needs during pregnancy

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Number of doses in the series	Vaccination schedule	Patient immunization history	Valid doses	Vaccine needs during pregnancy
Example: IIV	*1*	*1 dose every flu season*	*1 current season*	*1*	*Administer next flu season*
Tdap					
MMR					
VAR					
HPV					

3. Does Rosalie have any contraindications to vaccines recommended during her pregnancy?

4. Rosalie's nephew, Marcus, is due for his second dose of RV this week. Are there any concerns about Rosalie's pregnancy since RV is a live-virus vaccine? Are there any special precautions she needs to take? Review the General Guidelines, Special Situations (Vaccination During Pregnancy).



A health care provider speaking with a pregnant patient.

ANSWER GUIDE

Part 3: Adult Vaccination Schedule

A group of smiling, healthy adults of various ages.

Part 3 Case Studies – Answer Guide

Case Study	Topics	Level of Difficulty
3a. 65-year-old, Paul	Healthy Older Adults	Moderate
3b. 22-year-old, Michelle	Health Care Personnel	Moderate
3c. 63-year-old, Hank	Health Care Personnel	Advanced
3d. 27-year-old, Janet	Healthy Pregnancy	Advanced
3e. 19-year-old, Lara	Healthy Pregnancy	Advanced
3f. 21-year-old, Rosalie	Healthy Pregnancy	Advanced

Answers to 3a. 65-year-old, Healthy Older Adults (Moderate)

1. **Should Tdap be administered today? Explain your rationale. Refer to the Recommended Adult Immunization Schedule for ages 19 years or older (Tdap vaccination note) and review the Pink Book, Chapter 16, Pertussis (Vaccination Schedule and Use).**

   Paul should not receive Tdap today since he has already received a dose.

   Rationale:

   - Tdap is not indicated for Paul because his record shows that he received a dose of Td last year. Once a person has received Tdap vaccine, that person should receive a dose of Td or Tdap vaccine every 10 years thereafter. Women should receive a dose of Tdap during every pregnancy, preferably at 27–36 weeks' gestation, regardless of Tdap or Td vaccination history.

A health care provider speaking with an older adult patient.

2. Listed in the table below are vaccines recommended for a 65-year-old adult. Which vaccines, if any, should Paul receive today? Complete the information in the table below (see example for IIV). Refer to the Recommended Adult Immunization Schedule for ages 19 years or older (review Table 2 and the information included in the notes).

Table 3a-2: Immunization history and vaccines due today: Answers
The 1st row indicates an example entry.

Vaccine	Number of doses in the series	Vaccination schedule	Patient immunization history	Valid doses	Vaccine due today
Example: IIV	*1*	*1 dose every flu season*	*0 current season*	*0*	*1 dose of IIV*
Tdap or Td	1 Tdap 2 Td	Primary series of Tdap-Td-Td at 0, 1m, 6–12m	3	4	N/A
MMR	1	1	1	1	N/A
VAR	2	2 doses, 4–8 weeks apart	0	0	N/A
RZV	2	2 doses, 2–6 months apart	0	0	Dose 1
PCV13	1	1 dose for adults ≥65 years old, based on shared clinical decision-making	0	0	1 dose of PCV13
PPSV23	1	1 dose for adults ≥65 years old, 1 year after PCV13 (if PCV13 is to be administered)	0	0	N/A

Paul should receive IIV and RZV today. Shared clinical decision-making for PCV13 is recommended for persons aged ≥65 years who have not previously received PCV13 and do not have an immunocompromising condition, anatomic and functional asplenia (e.g., sickle cell disease), renal disease, CSF leak, or cochlear implant.

Rationale:

- Paul should receive influenza vaccine since his visit is during influenza season. It is important to vaccinate persons 65 years of age and older because the risk for influenza-related complications and hospitalizations is higher in this age group. He is eligible to receive high-dose seasonal flu vaccine, Fluzone® High-Dose, which is licensed specifically for persons age 65 years and older. It has four times the amount of antigen found in standard-dose inactivated flu vaccine.
- As discussed in Activity 1, Paul should not receive Tdap today.
- Paul received 1 dose of MMR as an adult. No additional doses are needed. In fact, Paul meets a second criterion for immunity—birth before 1957.
- Paul's vaccination record shows that he received all childhood vaccines that were appropriate at the time. Varicella vaccine, now routinely recommended for children, did not exist when Paul was a child. However, he reports having had chickenpox as a child. Though that illness is not documented, his birth prior to 1980 is considered evidence of immunity to varicella, even in the absence of other evidence. Individuals born in the United States before 1980 are presumed to be immune to varicella. They were likely infected naturally because varicella was prevalent in the United States at that time. Therefore, Paul does not need varicella vaccine. Note that birth before 1980 and/or a patient's undocumented report of having had varicella disease are not acceptable evidence of immunity for health care personnel, pregnant women, and immunocompromised persons.

(Rationale continued on next page)

Rationale, continued:

- Although Paul does not need varicella vaccine, he is eligible to receive RZV. Persons age 50 years or older who have no medical contraindications should receive 2 doses of RZV, 2–6 months apart. They should receive RZV regardless of any past episode of herpes zoster (shingles) or receipt of zoster vaccine live (ZVL).

3. Are there contraindications for any of the vaccines he needs today? Note: Paul and his provider discussed the PCV13 vaccine and decided that Paul should receive the PCV13 vaccine today. Use the Screening Checklist and the General Guidelines, Table 4–1.

   Paul has no contraindications for IIV, RZV, or PCV13.

   Rationale:

   - Paul has no significant medical history or condition that is a contraindication to any vaccine. RZV is not contraindicated for a U.S.-born person with an uncertain history of varicella disease (see the General Guidelines, Table 4–2). Also, the fact that Paul's daughter is pregnant is not a contraindication to any of the recommended vaccines.

4. When should Paul return, and what vaccine(s) should he receive at the next visit? Use the Recommended Adult Immunization Schedule for ages 19 years or older and CDC's Pneumococcal Vaccine Timing for Adults job aid.

Table 3a-4: Vaccines due at next visit: Answers
The 1st row indicates an example entry.

Vaccine	Recent valid dose number	Dose number of the vaccine dose due next	Minium interval for the next dose
Example: IIV	*1 current season*	*1*	*Administer next flu season*
Tdap or Td	1	0	N/A – complete
MMR	1	0	N/A – complete
VAR	0	0	N/A – immune
RZV	1	2	2–6 months
PCV13	1	0	N/A – complete
PPSV23	0	1	1 year after PCV13

Paul should return in 2–6 months to complete the RZV series, and in 1 year to receive PPSV23 and next season's dose of influenza vaccine.

Rationale:

- RZV: Paul needs to return in 2–6 months to complete the RZV series.
- PPSV23: Only 1 dose of PPSV23 is recommended for persons age 65 years and older, even if they develop a comorbidity or high-risk condition. Once Paul has received a dose of PPSV23, no further doses are needed.
- In general, it is a good practice to administer either pneumococcal vaccine, if needed, to persons age 65 years and older at the same time they receive their annual dose of influenza vacccine.

Answers to 3b. 22-year-old, Health Care Personnel (Moderate)

1. List recommended vaccines for a 22-year-old adult. Refer to the Recommended Adult Immunization Schedule for ages 19 years or older, Table 1.

   Vaccines routinely recommended for a 22-year-old adult include IIV or LAIV, Tdap, MMR, VAR, and HPV.

2. List recommended vaccines for 22-year-old persons with chronic lung disease (e.g., asthma) and 22-year-old health care personnel. Refer to the Recommended Adult Immunization Schedule for ages 19 years or older, Table 2.

   Recommended vaccines for 22-year-old persons with chronic lung disease and health care personnel are IIV, Tdap, MMR, VAR, HPV, PPSV23, and HepB.

   Rationale:

   - Vaccines recommended for 22-year-old persons with chronic lung disease are IIV, Tdap, MMR, VAR, HPV, and PPSV23. There is a precaution for LAIV in persons with lung disease.
   - Vaccines recommended for 22-year-old health care personnel are IIV or LAIV, Tdap, MMR, VAR, HPV, and HepB.

3. Evaluate whether Michelle meets any of the HCP criteria for immunity. If not, indicate other way(s) to meet criteria for immunity. Complete the information in the table below (see example for HepB vaccine). Use Immunization of Health-Care Personnel, Table 2.

Table 3b-3: HCP vaccination requirements: Answers
The 1st row indicates an example entry.

Vaccine	HCP criteria for immunity met by patient	If not immune, indicate way(s) to meet criteria for immunity
Example: HepB	*None*	*Administer a complete HepB series, followed by anti-HBs testing 1–2 months later*
IIV	Receipt of flu vaccine during current flu season	N/A
MMR	2 doses, 28 days apart	N/A
VAR	None	2 doses, 4–8 weeks apart, or • Laboratory evidence of immunity • Laboratory confirmation of disease • Diagnosis or verification of history of varicella or herpes zoster (shingles) by health care provider
Tdap or Td	None	1 dose of Tdap, followed by 1 dose of Td every 10 years, and 1 dose of Tdap during every pregnancy

Rationale:

- HepB: Michelle did not meet any of the HCP criteria for immunity to hepatitis B. She will need to complete a series of either 2 doses of Heplisav-B® or 3 doses of Recombivax HB® or Engerix- B®. Anti-HBs testing should be done 1–2 months after completion of the HepB series since her training may involve exposure to blood or body fluids.
- IIV: She met one criterion for immunity to influenza. HCP should receive influenza vaccine, which is recommended annually for all persons age 6 months and older. They are exposed to patients with influenza in the workplace, and her asthma puts her at increased risk for complications from influenza. They can also spread influenza to others, including patients, even if they do not feel sick.
- MMR: She met one criterion for immunity to measles, mumps, and rubella, which is 2 valid doses of MMR for measles and mumps or 1 valid dose of MMR for rubella.
- VAR: Although her mother informed her that she had chickenpox at age 5, this is not acceptable evidence of immunity unless there is documentation of the diagnosis by a health care provider or laboratory confirmation of disease. Assuming that there is no such documentation, she can either complete a series of 2 doses of VAR., 4–8 weeks apart, or have a serologic test (laboratory evidence of immunity). If the serologic test comes back negative, she will need to complete a VAR series. Serologic screening of HCP without evidence of immunity to varicella is likely to be cost-effective.
- Tdap: She should receive a dose of Tdap vaccine—1 dose is recommended for persons 11 years or older who have not previously received it, regardless of the interval since they last received Td vaccine (see the Recommended Adult Immunization Schedule for ages 19 years or older, Tdap vaccination note). The diphtheria-tetanus-pertussis-containing vaccine she received in childhood does not count toward the adult recommendations. She will need to get a dose of Tdap now (and during every pregnancy) and a dose of Td every 10 years.
- Health care vaccination requirements vary by state and by health care facility.
- Health care personnel should keep a copy of their immunization records and titer results.

4. In this case study, reasons for vaccine recommendations are based on routine schedule, health care personnel requirements, and/or medical conditions. Determine what vaccines Michelle should receive during this visit and at future visits. Use the Recommended Adult Immunization Schedule for ages 19 years or older, Tables 1 and 2. The answer for influenza vaccine is provided as an example. Also, assume that the patient has been screened for all vaccine contraindications and precautions. Note: The clinic only has the Engerix-B® brand of HepB in stock.

Table 3b-4: Vaccine recommendations for Michelle: Answers
The 1st row indicates an example entry.

Vaccine	Vaccine due today	Vaccine due at future visits
Example: Influenza	*N/A*	*Influenza vaccine in the next flu season*
Tdap	1 dose of Tdap	Tdap during each pregnancy and Td every 10 years
MMR	N/A	Series complete
VAR	Dose 1 of 2 or serologic testing	• Dose 2 after 4–8 weeks • No doses if serology is positive
HPV	Dose 1 of 3	• Dose 2 at 1–2 months • Dose 3 at 6 months
PPSV23	1 dose of PPSV23	No further doses until age 65
HepB	Dose 1 of 3 of Engerix-B®	• Dose 2 at 1 month • Dose 3 at 6 months • Followed by anti-HBs testing 1–2 months later

Michelle can receive Tdap, VAR, HPV, PPSV23, and HepB at today's visit.

Rationale:

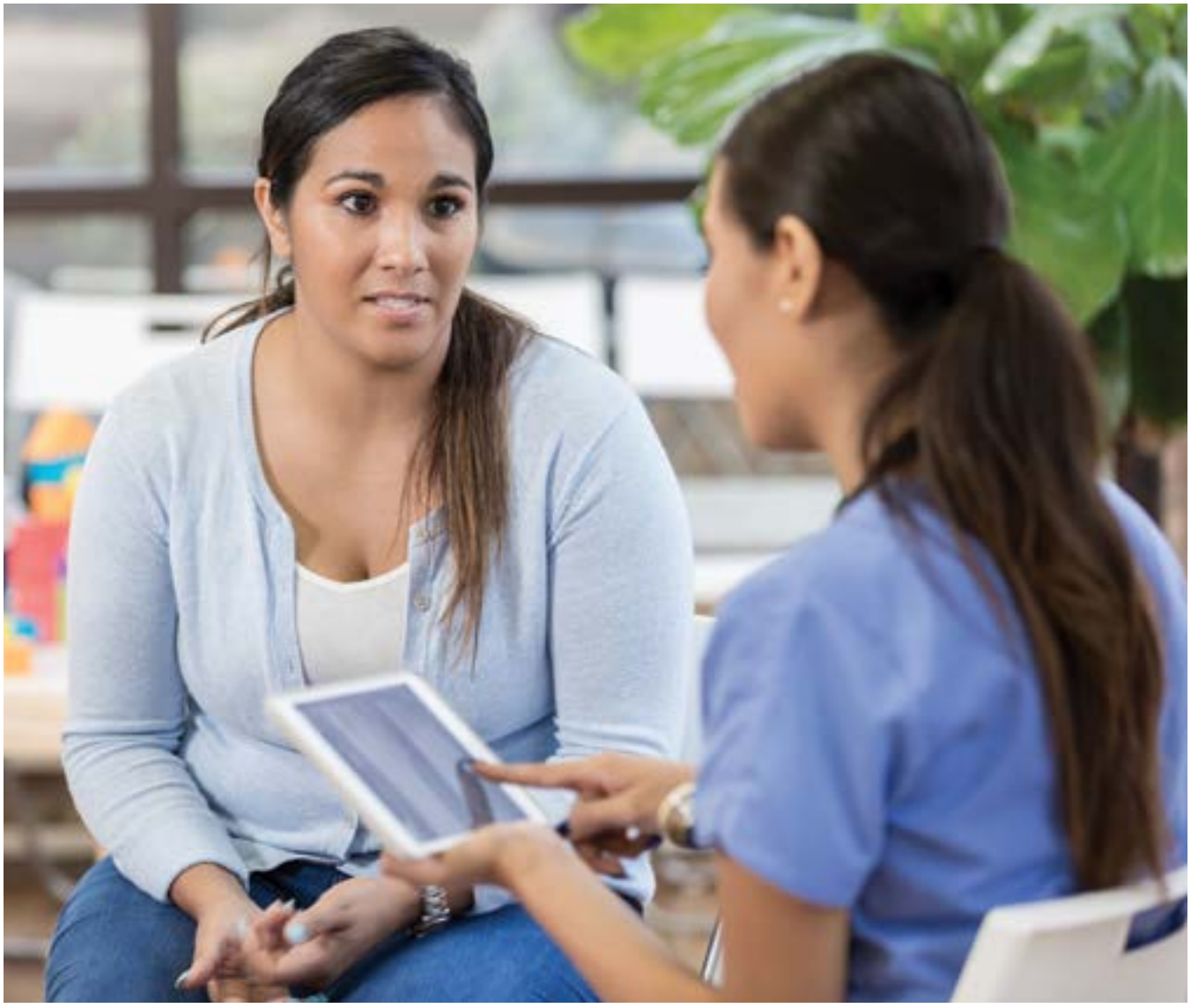
- Routine vaccine recommendations for healthy, immunocompetent persons are outlined in the Recommended Adult Immunization Schedule for ages 19 years or older, Table 1. Sometimes medical conditions (e.g., asthma) and other indications (e.g., HCP requirements) may indicate additional vaccination needs (as shown in the Recommended Adult Immunization Schedule for ages 19 years or older, Table 2). Note that these vaccine recommendations overlap.
- She should receive Tdap, VAR (unless serologic testing is done), HPV, PPSV23, and HepB today.
- She should return in a month to receive dose 2 of VAR (unless serologic testing is done), dose 2 of HPV, and dose 2 of HepB.

5. What, if any, serologic testing should be done at today's visit?

   Michelle can get serologic testing for varicella IgG antibody.

   Rationale:

   - Michelle can either receive 2 doses of VAR vaccine or have blood drawn to check for varicella IgG antibody. She does not meet any of the criteria for evidence of varicella immunity for HCP (i.e., written documentation of 2 doses of VAR vaccine or history of varicella or zoster disease diagnosed or verified by a clinician). If her serology comes back negative, she needs to complete a VAR series. Serologic screening of HCP without evidence of immunity to varicella is likely to be cost-effective.



A health care provider reviewing a screening form with a female patient.

Answers to 3c. 63-year-old, Health Care Personnel (Advanced)

1. List recommended vaccines for a 63-year-old adult. Refer to the Recommended Adult Immunization Schedule for ages 19 years or older, Table 1.

   Vaccines routinely recommended for a 63-year-old adult include IIV, Tdap, MMR, VAR, and RZV.

2. Hank's medical record states a history of psoriatic arthritis diagnosed 6 months ago and treated with etanercept (Enbrel®), an immunosuppressive drug. Aside from vaccines identified in Activity 1, what additional vaccine(s) should he receive based on this medical condition? What, if any, vaccine(s) are contraindicated? Use the Recommended Adult Immunization Schedule for ages 19 years or older, Table 2. (Hint: Vaccine recommendations are in yellow boxes under respective medical conditions.)

   Hank should also receive PCV13 and PPSV23 because he is immunocompromised. MMR and VAR are contraindicated for Hank.

   Rationale:

   - The Recommended Adult Immunization Schedule for ages 19 years or older, Table 2, lists four vaccination recommendations for adults who are immunocompromised (see yellow boxes under column 3): IIV, Tdap, PCV13, and PPSV23. IIV and Tdap are covered in the routine immunization schedule, as discussed in Activity 1.
   - The Recommended Adult Immunization Schedule for ages 19 years or older, Table 2, indicates that MMR and VAR, both live vaccines, are contraindicated.
   - Hank should receive PCV13 first, followed by PPSV23 8 weeks later (see the Recommended Adult Immunization Schedule for ages 19 years or older, pneumococcal vaccination note).

3. Evaluate whether Hank meets any of the HCP criteria for immunity. If not, indicate other way(s) to meet criteria for immunity. Complete the information in the table below (see example for HepB vaccine). Use Immunization of Health-Care Personnel, Table 2.

Table 3c-3: HCP vaccination requirements: Answers

The 1st row indicates an example entry.

Vaccine	HCP criteria for immunity met by patient	If not immune, indicate way(s) to meet criteria for immunity
Example: HepB	*Completed HepB series*	*Anti- HBs testing 1–2 months after completion of HepB series (depending on health care facility protocol)*
IIV	Receipt of flu vaccine during current flu season	N/A
MMR	Birth before 1957	N/A
VAR	Diagnosis or verification of history of varicella or herpes zoster (shingles) by health care provider	N/A
Tdap or Td	1 dose of Tdap	N/A

Rationale:

- HepB: Hank met one criterion for immunity to hepatitis B. He needs to get anti-HBs testing done 1–2 months after completion of the HepB series.
- IIV: He met one criterion for immunity to influenza.
- MMR: He was born before 1957 and meets a criterion for immunity to measles, mumps, and rubella.
- VAR: He met one criterion for immunity to varicella since he has documentation of diagnosis by a health care provider.
- Tdap: He met the criterion for immunity to pertussis—1 dose is recommended for persons 11 years or older who have not previously received it, regardless of the interval since they last received Td vaccine. Note that adults who have not received any diphtheria-tetanus-pertussis-containing vaccines should complete a primary series of Tdap-Td-Td on a schedule of 0, 1, and 6–12 months (see the Recommended Adult Immunization Schedule for ages 19 years or older, Tdap vaccination note).
- As stated earlier, health care personnel vaccination requirements vary by state and by health care facility.
- Health care personnel should keep a copy of their immunization records and titer results.

4. In this case study, reasons for vaccine recommendations are based on routine schedule, health care personnel requirements, and/or medical conditions. Indicate the reasons for receiving each vaccine. Determine what vaccines Hank should receive at this visit and future visits. Use the Recommended Adult Immunization Schedule for ages 19 years or older, Tables 1 and 2. The answer for influenza vaccine is provided as an example.

Table 3c-4: Vaccine recommendations for Hank: Answers

The 1st row indicates an example entry.

Vaccine	Indicate reason(s) (routine schedule, HCP requirements, or medical condition)	Vaccine due today	Vaccine due at future visits
Example: IIV	*Routine schedule, HCP requirements, and medical condition*	*No, complete*	*Influenza vaccine in the next flu season*
Tdap	Routine schedule, HCP requirements, and medical condition	No, complete	Td every 10 years
MMR	Routine schedule, HCP requirements	No, met criterion for immunity	N/A
VAR	Routine schedule, HCP requirements	No, met criterion for immunity due to disease	N/A
RZV	Routine schedule	No, not recommended for immunocompromised persons	N/A
PCV13	Medical condition	Yes, 1 dose of PCV13	N/A
PPSV23	Medical condition	No, not on the same day as PCV13	1 dose of PPSV23 8 weeks after PCV13
HepB	HCP requirements	No, complete	Anti-HBs testing 1–2 months after completion of HepB series

Hank should receive a dose of PCV13 today and have an anti-HBs test.

Rationale:

- Routine vaccine recommendations for healthy, immunocompetent persons are outlined in the Recommended Adult Immunization Schedule for ages 19 years or older, Table 1. Sometimes medical conditions (e.g., immunocompromised persons) and other indications (e.g., HCP requirements) may indicate additional vaccination needs or vaccine contraindications (as shown in the Recommended Adult Immunization Schedule for ages 19 years or older, Table 2). Note that these vaccine recommendations overlap.
- Tdap: Hank should receive a dose of Tdap today and have an anti-HBs test.
- MMR: He met a criterion for immunity to measles, mumps, and rubella—birth before 1957. Persons born before 1957 are likely to have been infected naturally and may be presumed to be immune, even if they have not had clinically recognizable mumps disease. In the event of a mumps outbreak, depending on local and state requirements, health care facility policies should recommend 2 doses of MMR vaccine for unvaccinated personnel born before 1957 who lack laboratory evidence of mumps immunity or laboratory confirmation of disease.
- RZV: RZV is indicated today according to the routine schedule, but it is not recommended for Hank due to his immunosuppression (see Recommended Adult Immunization Schedule for ages 19 years or older, zoster vaccination note). This is indicated by a white box in the Recommended Adult Immunization Schedule for ages 19 years or older, Table 2. As of 2020, the use of RZV in immunocompromised populations is under review.
- PPSV23: He should return in 8 weeks to receive PPSV23 and receive the results of anti-HBs testing.

Answers to 3d. 27-year-old, Healthy Pregnancy (Advanced)

1. Listed in the table below are vaccines list of recommended for a 27-year-old adult. Review Janet's immunization history and compare it with the list of recommended vaccines. Which vaccines, if any, should she receive today? Complete the information in the table below (see example for IIV). Refer to the Recommended Adult Immunization Schedule for ages 19 years or older (review Table 2 and the information included in the notes).

Table 3d-1: Immunization history and vaccines due today: Answers

The 1st row indicates an example entry.

Vaccine	Number of doses in the series	Vaccination schedule	Patient immunization history	Valid doses	Vaccine due today
Example: IIV	*1*	*1 dose every flu season*	*0 current season*	*0*	*1 dose of IIV*
Tdap or Td	1	1 dose of Tdap every pregnancy	0 current pregnancy	1 Tdap previous pregnancy, 2 Td	1 dose of Tdap, recommended at 27–36 weeks
MMR	1	1 dose	1	1	No, contraindicated now. If indicated, administer after delivery and before discharge.
VAR	2	2 doses, 4–8 weeks apart	0	0	No, immune due to disease

Janet should receive Tdap and influenza vaccine.

Rationale:

- IIV: Janet needs influenza vaccine since it is October and influenza season has begun. Influenza vaccine is recommended for pregnant women because they are at increased risk for influenza-related complications. Data show that pregnant women pass influenza antibodies to the fetus in the last few weeks of pregnancy. Pregnant women should only receive inactivated—not live, attenuated—influenza vaccine.
- Tdap: Pregnant women should also receive Tdap during each pregnancy, preferably at 27–36 weeks' gestation, regardless of the interval since any prior Td or Tdap vaccination. When a mother receives Tdap at 27–36 weeks' gestation, it maximizes the amount of pertussis antibody transferred passively to the newborn. This protects the baby against pertussis in early life before the baby is old enough to receive DTaP vaccine. Janet's immunization record shows she received a dose of Tdap while she was pregnant with her now 2-year-old son and 2 doses of Td after that delivery. The Tdap dose she received while pregnant also counts toward the completion of a primary series of Tdap-Td-Td. A primary series of Tdap-Td-Td is recommended for adults who did not receive the primary vaccination series for tetanus, diphtheria, and pertussis in childhood (see Recommended Adult Immunization Schedule for ages 19 years or older, Tdap vaccination note).
- The glucose challenge test is not a contraindication to receiving Tdap and influenza vaccines.
- MMR and VAR: Live vaccines, such as MMR and VAR, are contraindicated during pregnancy because they pose a theoretical risk to the fetus (see the Recommended Adult Immunization Schedule for ages 19 years or older, Table 2, and the General Guidelines, Special Situations, Vaccination During Pregnancy). If the mother is not immune and live vaccines are indicated, they should be administered after delivery and before discharge.
- HepB: During routine prenatal care, laboratory tests are performed for hepatitis B. If the mother is infected with hepatitis B virus, it can be passed to the baby. Laboratory results show that Janet is immune to hepatitis B (anti-HBs ≥10mIU/mL) and not currently infected with hepatitis B (negative HBsAg).

2. Are there any contraindications for any of the vaccines due today?

   Janet has no contraindications for Tdap or IIV.

   Rationale:

   - Tdap and IIV are not contraindicated in pregnancy (see the General Guidelines, Table 4–1).

3. Should Janet's husband receive Tdap vaccine or any other vaccines before the birth of the baby? Explain.

   Janet's husband should receive Tdap and influenza vaccine if he has not previously received them.

   Rationale:

   - Vaccination of people who will be in close contact with the infant may be an effective way to help protect the infant against pertussis until the baby can be vaccinated to gain immunity to the virus. Janet's husband should receive a dose of Tdap at least 2 weeks prior to the delivery if he has not previously received a dose of Tdap.
   - A single lifetime dose of Tdap is recommended for adults who have not previously received Tdap (except for pregnant women, who should receive a dose of Tdap during every pregnancy). A dose of Tdap is recommended for Janet's husband and other household contacts (i.e., her mother) if they have no documentation of prior Tdap vaccination. A dose administered during adolescence counts.
   - Household contacts who are 6 months of age and older should also receive influenza vaccine if they have not already been vaccinated during the current influenza season.

4. Should Janet receive any other vaccines after delivery? Explain.

   Janet needs another dose of MMR after delivery.

   Rationale:

   - Live-virus vaccines such as MMR are contraindicated for pregnant women. Since Janet's titers do not show immunity to rubella and she has only 1 documented dose of MMR in childhood, she should receive another dose of MMR after delivery and before discharge from the hospital.
   - Maternal rubella infection during pregnancy can lead to serious birth defects. Janet should be advised to stay away from anyone who has a rubella infection during pregnancy. She should contact her health care provider if she is exposed to someone who possibly has rubella.
   - Women of childbearing age who have 1 or 2 documented doses of rubella-containing vaccine and have rubella-specific IgG levels that are not clearly positive should be administered 1 additional dose of MMR vaccine (maximum of 3 doses) and do not need to be retested for serologic evidence of rubella immunity.
   - Because of a theoretical risk to the fetus, women of childbearing age are counseled to avoid becoming pregnant for 28 days after receiving live-virus vaccines such as MMR and VAR.

5. Sometimes parents wonder whether it is safe to breastfeed after receiving live-virus vaccines. Can Janet breastfeed after receiving MMR? Explain.

   Breastfeeding is not contraindicated after receiving most vaccines except smallpox and yellow fever.

   Rationale:

   - According to the General Guidelines, Special Situations (Breastfeeding and Vaccination), Janet can safely breastfeed after she receives MMR or any other vaccines following delivery.
   - Smallpox and yellow fever vaccines are contraindicated in breastfeeding women because of a theoretical risk of transmission from mother to infant. Studies have shown that most live virus in vaccines—except smallpox vaccine—is not excreted in human breast milk. In the case of rubella, the vaccine virus may be transmitted via breast milk, but any resulting infections in infants have been shown to be asymptomatic.

Answers to 3e. 19-year-old, Healthy Pregnancy Postpartum (Advanced)

1. Listed in the table below are vaccines recommended for a 19-year-old. Which vaccine(s) is (are) recommended for Lara postpartum prior to discharge? Complete the information in the table below (see example for inactivated influenza vaccine). Refer to the Recommended Adult Immunization Schedule for ages 19 years or older (review Table 2 and the information included in the notes).

Table 3e-1: Immunization history and vaccines due today: Answers

The 1st row indicates an example entry.

Vaccine	Number of doses in the series	Vaccination schedule	Patient immunization history	Valid doses	Vaccine due today
Example: IIV	*1*	*1 dose every flu season*	*1 current flu season*	*1*	*N/A*
Tdap or Td	1	1 dose every pregnancy	1	1	N/A
MMR	2	1 dose	0	0	Dose 1
VAR	2	2 doses, 4–8 weeks apart	0	0	Dose 1
HPV	3	0,1–2, 6 months	0	0	Dose 1

Lara should receive MMR, VAR, and HPV vaccines.

Rationale:

- Lara should receive MMR and VAR vaccines before discharge. Unvaccinated, rubella-susceptible women who state they are or may be pregnant should be counseled about the potential risk for congenital rubella syndrome (CRS) and the importance of being vaccinated as soon as they are no longer pregnant (see www.cdc.gov/vaccines/pregnancy/hcp-toolkit/guidelines.html#mmr).
- Note that she is not a candidate for the combination MMRV vaccine because it is only licensed for children 12 months through 12 years.
- Lara should also receive a 3-dose series of HPV vaccine because she is older than 15 years of age.

2. Are there any contraindications for any of the vaccines due today?

Lara has no contraindications for MMR, VAR, or HPV vaccines.

Rationale:

- MMR, VAR, and HPV are not contraindicated postpartum (see the General Guidelines, Table 4–1).

3. Are there any special instructions Lara should know before receiving the recommended vaccine(s)? Explain. Review the General Guidelines, Special Situations.

   Rationale:

   - Assess Lara's plans for future pregnancy and counsel her to prevent pregnancy for the next 4 weeks after MMR and VAR vaccines are administered because of the theoretical risk to the fetus when the mother receives a live-virus vaccine.
   - Schedule her for a second dose of VAR and HPV 4–8 weeks from today. She should remember to avoid getting pregnant until at least 4 weeks after each dose of VAR vaccine.
   - With the exception of smallpox and yellow fever vaccines, live-virus vaccines are safe for breastfeeding mothers and their infants. The majority of live viruses in vaccines have been demonstrated not to be excreted in human milk. If infection does occur from the vaccine virus, it is well-tolerated because the virus is attenuated (see the General Guidelines, Special Situations [Breastfeeding and Vaccination]).

Answers to 3f. 21-year-old, Healthy Pregnancy (Advanced)

1. Rosalie is concerned that the fetus could be negatively affected because she received VAR and HPV vaccines and got pregnant within the time frame when she was supposed to avoid pregnancy. She wonders if the baby will have major health problems because she got pregnant too soon. How will you respond to Rosalie's concerns? Review the General Guidelines, Special Situations (Vaccination During Pregnancy).

   Rationale:

   - It is understandable for Rosalie to be concerned. Give her time to express her fears. Explain to her that there are theoretical risks to the fetus (see the General Guidelines, Special Situations [Vaccination During Pregnancy]). However, no cases of congenital varicella or abnormalities attributable to VAR vaccine have been observed among infants born to women who inadvertently received VAR vaccine during pregnancy. VAR vaccination during early pregnancy is not an indication for termination of the pregnancy.
   - Although HPV vaccination is not recommended until after pregnancy, no intervention is needed if a woman is vaccinated while pregnant.

A smiling, pregnant woman looking at ultrasound photos.

2. Listed in the table below are vaccines recommended for a 21-year-old. Which vaccines will Rosalie need during her pregnancy? Complete the information in the table below (see example for inactivated influenza vaccine). Refer to the Recommended Adult Immunization Schedule for ages 19 years or older (review Table 2 and the information included in the notes). Note that not all vaccines listed will need additional doses during pregnancy (e.g., complete, delay dose until after pregnancy).

Table 3f-2: Immunization history and vaccine needs during pregnancy: Answers

The 1st row indicates an example entry.

Vaccine	Number of doses in the series	Vaccination schedule	Patient immunization history	Valid doses	Vaccine needs during pregnancy
Example: IIV	*1*	*1 dose every flu season*	*1 current season*	*1*	*Administer next flu season*
Tdap or Td	1	1 dose every pregnancy	0 current pregnancy	0	Administer at 27–36 weeks
MMR	2	2 doses, 4–8 weeks apart	2	2	Complete
VAR	2	2 doses, 4–8 weeks apart	2	2	Complete
HPV	3	0,1–2, 6 months	2	2	Delay dose 3 until after pregnancy

During Rosalie's pregnancy, she will need IIV during flu season and Tdap at 27–36 weeks.

Rationale:

- IIV: Rosalie should be vaccinated with IIV during flu season while pregnant because flu during pregnancy can be serious.
- Tdap or Td: She also needs to know that she will need a dose of Tdap vaccine during each pregnancy to help protect herself from pertussis around the time of delivery and the infant from pertussis if exposed after birth (see the Recommended Adult Immunization Schedule for ages 19 years or older, Tdap vaccination note). She will need to be vaccinated with Tdap during the third trimester, specifically at 27–36 weeks.
- MMR or VAR: She has completed the MMR and VAR series and is considered immune. Live vaccines, such as MMR and VAR, are contraindicated during pregnancy. Counsel her that the VAR received during her early pregnancy is not an indication for termination of the pregnancy. If Rosalie is found to be non-immune to rubella during her pregnancy, CDC recommends another dose of MMR postpartum. She can receive up to 3 doses of MMR and does not need to be retested for serologic evidence of rubella immunity.
- HPV: She will need to wait until after this pregnancy to receive her last dose of HPV vaccine.

3. Does Rosalie have any contraindications to vaccines recommended during her pregnancy?

   Rosalie has no contraindications to Tdap or IIV.

   Rationale:

   - Tdap and IIV are not contraindicated during pregnancy (see the General Guidelines, Table 4–1).

4. Rosalie's nephew, Marcus, is due for his second dose of RV this week. Are there any concerns about Rosalie's pregnancy since RV is a live-virus vaccine? Are there any special precautions she needs to take? Review the General Guidelines, Special Situations (Vaccination During Pregnancy).

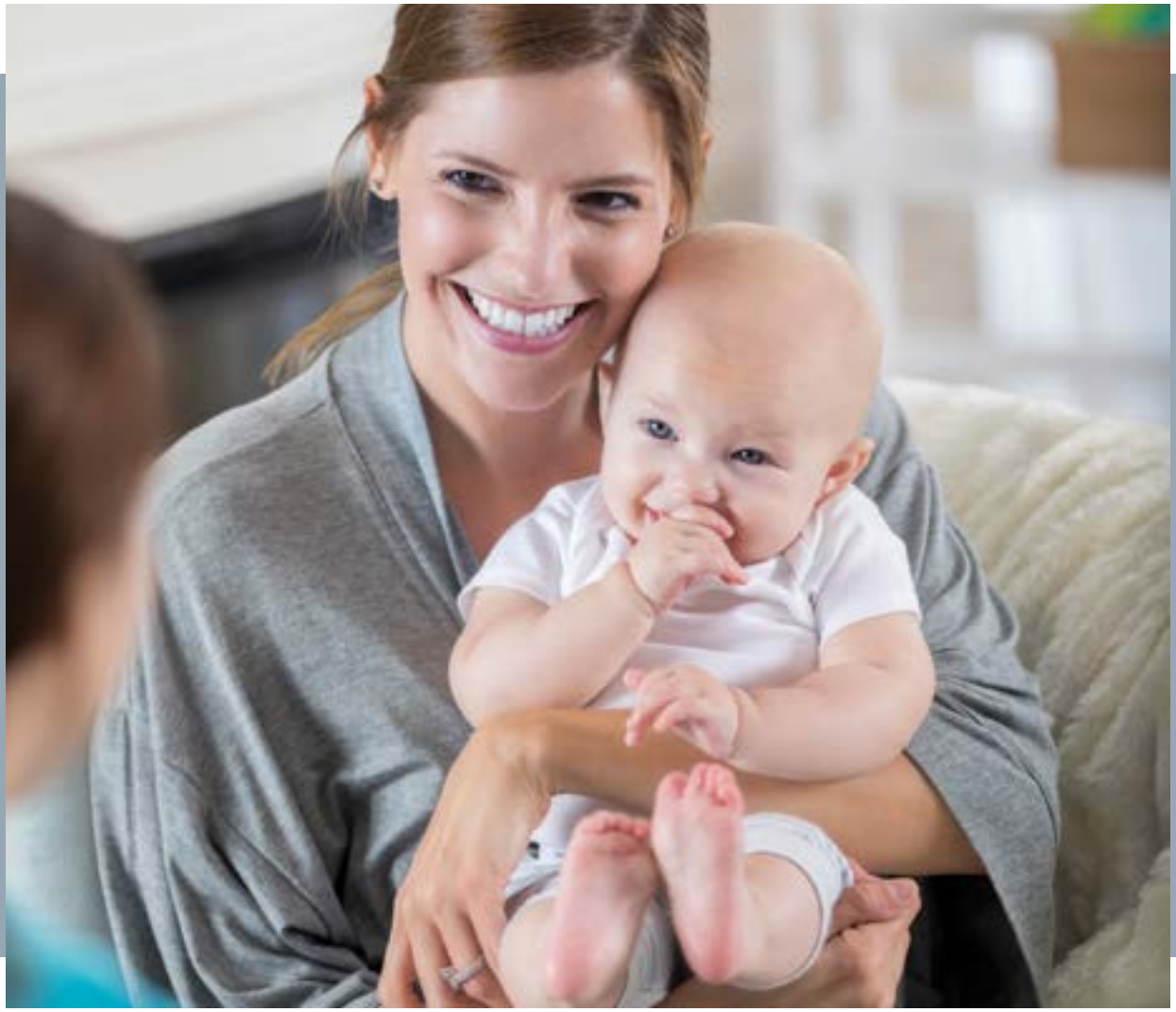
   There is a low risk of infection from attenuated RV vaccine among pregnant women..

   Rationale:

   - Infants living in households with pregnant women should be vaccinated with RV vaccine according to the same schedule as infants living in households without pregnant women (see the General Guidelines, Special Situations [Vaccination During Pregnancy]).
   - All members of the household should wash their hands after changing the diaper of an infant who received RV vaccine. This minimizes the possibility of rotavirus transmission, as shedding may occur up to one month after the last dose (see the General Guidelines, Altered Immunocompetence). The same hand hygiene guidance applies when Rosalie is taking care of infants at the child care center where she is working.
   - The risk for infection from attenuated RV vaccine is very low since most women of childbearing age have acquired immunity to rotavirus (see the Pink Book, Chapter 19, Rotavirus).

A health care provider reviewing a screening form with a patient.

Part 4: Catch-Up Vaccination Schedule



A health care provider speaking with a mother who is holding an infant.

Part 4 Case Studies

Case Study	Topics	Level of Difficulty
4a. 19-month-old, Logan	Catch-Up Schedule	Moderate
4b. 2-year-old, Trisha	Catch-Up Schedule	Advanced
4c. 5-year-old, Sedia	Catch-Up Schedule	Advanced

4a. 19-month-old, Catch-Up Schedule (Moderate)

Overview

It is common to encounter children 4 months through 18 years of age whose immunizations are not up to date. The catch-up schedule will assist health care providers in bringing children's immunizations up to date so the recommended schedule can be resumed.

Objectives

Using this case study, nursing students will:

- Review appropriate timing and spacing of vaccine doses when the vaccination schedule is delayed.
- Practice using the catch-up schedule for children who are behind.
- Recognize how recommended vaccination schedules may change when a child is behind schedule.

Teaching Tools

Review the following to help complete the case study:

1. Recommended Adult Immunization Schedule for ages 19 years or older
2. Catch-up immunization schedule for persons aged 4 months–18 years who start late or who are more than 1 month behind
3. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 3–1: Recommended and Minimum Ages and Intervals between Vaccine Doses

Glossary Word

Catch-up schedule: A schedule for persons whose vaccinations have been delayed. www.cdc.gov/vaccines/schedules/downloads/child/0-18yrs-child-combined-schedule.pdf#page=3

Background

Logan is 19 months old and healthy, with no significant medical history. He is being seen in the office in June for a well-child evaluation. He has a history of missed appointments due to his parents' work schedules and is behind on his immunizations.

Immunization History

HepB – 3 doses (birth, 2 months, and 4 months of age)

DTaP – 3 doses (2 months, 4 months, and 12 months of age)

Hib (ActHIB®) – 1 dose (4 months of age)

IPV – 2 doses (2 months and 4 months of age)

Instructions

Follow these steps to complete the corresponding activities on the next page.

Step 1. Determine recommended vaccines by age.

Step 2. Review the patient's immunization history and determine which doses are valid (use the General Guidelines, Table 3–1).

Step 3. Develop a vaccination catch-up plan for the patient to begin getting their vaccinations. The goal is to catch up the patient with doses needed at the current age. Then the provider should resume vaccinating according to the routine schedule. Refer to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 1, to determine whether the vaccine is eligible for catch-up. (Hint: Vaccines eligible for catch-up have green boxes under the respective age groups. A vaccine is also eligible for catch-up if it has a yellow box and has a green box to the left of it.)

Step 4. Use the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 2 (also known as the "catch-up immunization schedule"), to determine the minimum age for and interval to the next doses. Make sure to review the notes for catch-up dose information for each of the missed vaccines. Note that when catching up, the total number of doses to complete a vaccine series may be fewer compared with the routine schedule. You can also use the CDC vaccine catch-up guidance job aids for PCV13, Hib, DTaP, and Tdap to determine catch-up doses.

For the purpose of these case studies, a dose counts toward completion of the series if administered no earlier than the minimum age (see the General Guidelines, Table 3–1, third column) and no earlier than the minimum interval from a previous dose (see the General Guidelines, Table 3–1, fifth column). Also, assume that the patient has been screened for all vaccine contraindications and precautions.

Activities

1. What are the recommended vaccines by age 19 months? Refer to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger (review Table 1 and information included in the notes).

2. Review the patient's immunization history and determine which doses are valid (see example for HepB). Use the General Guidelines, Table 3–1.

Name: _____ Age: _____

Table 4a-1: Immunization history

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Age Dose 1 administered	Age Dose 2 administered	Age Dose 3 administered	Is Dose 1 valid?	Is Dose 2 valid?	Is Dose 3 valid?
Example: HepB	*Birth*	*2 mos*	*4 mos*	*Yes*	*Yes*	*No*
DTaP						
Hib (ActHIB®)						
IPV						

3. Complete the information in the table below (see example for HepB vaccine).

Step 1. Use the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 1, to determine whether the vaccine is eligible for catch-up. (Hint: Vaccines eligible for catch-up have green boxes under the respective age groups.) Then fill in columns 2 and 3 in Table 4a-3.

Step 2. For vaccines that are eligible for catch-up, identify the recent valid dose number and age when the most recent dose was administered (see Activity 1 answers). Fill in column 4.

Step 3. Use the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 2 (also known as the "catch-up immunization schedule"), to determine the minimum interval to the next dose. In theory, children who are behind have already passed the minimum age requirement. As a result, most catch-up scenarios (as shown below) are solely focused on meeting the minimum interval requirements between doses. Fill in column 5.

Step 4. Calculate the earliest age to receive the next dose to determine answers for columns 6 and 7.

Earliest age to administer vaccine = (age when most recent dose was administered) + (minimum interval)

= (column 4) + (column 5)

If earliest age to administer vaccine ≤ current age, administer dose today.

For example,

Earliest age to administer HepB = 4 mos + 8 wks

= 4 mos + 2 mos

= 6 mos

6 mos ≤ 19 mos, so administer dose today

Table 4a-3: Catch-up vaccination plan

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Eligible for catch- up? (Column 2)	Recent valid dose number (Column 3)	Age when recent dose was administered (Column 4)	Minimum interval (Column 5)	Dose number of vaccine dose due today (Column 6)	Administer dose today? (Column 7)
Example: HepB	*Yes*	*2*	*4 mos*	*8 wks*	*3*	*Yes*
RV						
DTaP						
Hib (ActHIB®)						
PCV13						
IPV						
MMR						
VAR						
HepA						
IIV						

4. Based on Activity 3 answers, what vaccines does Logan need today? Discuss the use of combination vaccines to decrease the number of injections Logan will need.

5. After receiving all the vaccines recommended in Activity 4, is Logan caught up?

4b. 2-year-old, Catch-Up Schedule (Advanced)

Overview

It is common to encounter children 4 months through 18 years of age whose immunizations are not up to date. The catch-up schedule will assist health care providers in bringing children's immunizations up to date so the recommended schedule can be resumed.

Objectives

Using this case study, nursing students will:

- Review appropriate timing and spacing of vaccine doses when the vaccination schedule is delayed.
- Practice using the catch-up schedule for children who are behind.
- Recognize how recommended vaccination schedules may change when a child is behind schedule.

Teaching Tools

Review the following to help complete the case study:

1. Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger
2. Catch-up immunization schedule for persons aged 4 months–18 years who start late or who are more than 1 month behind
3. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 3–1: Recommended and Minimum Ages and Intervals between Vaccine Doses

Glossary Word

Catch-up schedule: A schedule for persons whose vaccinations have been delayed. www.cdc.gov/vaccines/schedules/downloads/child/0-18yrs-child-combined-schedule.pdf#page=3

Background

Trisha is a 2-year-old toddler who has never been vaccinated because of parental objection to vaccines. Her brother recently contracted measles and was critically ill. Since then, her parents have decided to have their children vaccinated.

Instructions

Follow these steps to complete the corresponding activities on the next page.

Step 1. Determine recommended vaccines by age.

Step 2. Review the patient's immunization history and determine which doses are valid (use the General Guidelines, Table 3–1).

Step 3. Develop a vaccination catch-up plan for the patient to begin getting their vaccinations. The goal is to catch up the patient with doses needed at the current age. Then the provider should resume vaccinating according to the routine schedule. Refer to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 1, to determine whether the vaccine is eligible for catch-up. (Hint: Vaccines eligible for catch-up have green boxes under the respective age groups. A vaccine is also eligible for catch-up if it has a yellow box and has a green box to the left of it.)

Step 4. Use the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 2 (also known as the "catch-up immunization schedule"), to determine the minimum age for and interval to the next doses. Make sure to review the notes for catch-up dose information for each of the missed vaccines. Note that when catching up, the total number of doses to complete a vaccine series may be fewer compared with the routine schedule. You can also use the CDC vaccine catch-up guidance job aids for PCV13, Hib, DTaP, and Tdap to determine catch-up doses.

For the purpose of these case studies, a dose counts toward completion of the series if administered no earlier than the minimum age (see the General Guidelines, Table 3–1, third column) and no earlier than the minimum interval from a previous dose (see the General Guidelines, Table 3–1, fifth column). Also, assume that the patient has been screened for all vaccine contraindications and precautions.

Activity

1. Develop a vaccination catch-up plan for Trisha to begin getting her vaccinations. Complete the information in the table below (see example for HepB vaccine).

   Step 1. The goal is to catch up Trisha with doses needed by age 2–3 years so she can resume the routine schedule. Refer to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 1, to determine whether the vaccine is eligible for catch-up. (Hint: Vaccines eligible for catch-up have green boxes under the respective age groups.)

   Step 2. Use the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 2 (also known as the "catch-up immunization schedule"), to determine the minimum age for and interval to the next doses.

Table 4b-1: Catch-up vaccination plan

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Number of doses due to catch-up schedule	Age or intervals to schedule each dose	Comments
Example: HepB	*3*	*Dose 1 – now* *Dose 2 – 4 weeks from dose 1* *Dose 3 – 8 weeks from dose 2 and at least 16 weeks after dose 1*	*After dose 3, Trisha has completed the vaccine series*
RV			
DTaP			
Hib			
PCV13			
IPV			
MMR			
VAR			
HepA			
IIV			

4c. 5-year-old, Catch-Up Schedule (Advanced)

Overview

It is common to encounter children 4 months through 18 years of age whose immunizations are not up to date. The catch-up schedule will assist health care providers in bringing children's immunizations up to date so the recommended schedule can be resumed.

Objectives

Using this case study, nursing students will:

- Review appropriate timing and spacing of vaccine doses when the vaccination schedule is delayed.
- Practice using the catch-up schedule for children who are behind.
- Recognize how recommended vaccination schedules may change when a child is behind schedule.

Teaching Tools

Review the following to help complete the case study:

1. Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger
2. Catch-up immunization schedule for persons aged 4 months–18 years who start late or who are more than 1 month behind
3. General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices (referred to as "General Guidelines"), Table 3–1: Recommended and Minimum Ages and Intervals between Vaccine Doses

Glossary Word

Catch-up schedule: A schedule for persons whose vaccinations have been delayed. www.cdc.gov/vaccines/schedules/downloads/child/0-18yrs-child-combined-schedule.pdf#page=3

Background

Sedia is 5 years old and has no known medical problems. She is in the office in July for a well-child visit before school entry. She is behind schedule on several of the recommended childhood vaccines.

Immunization History

HepB – 2 doses (birth and 2 years of age)

DTaP – 2 doses (2 months and 2 years of age)

MMR – 1 dose (2 years of age)

VAR – 1 dose (2 years of age)

Instructions

Follow these steps to complete the corresponding activities on the next page.

Step 1. Determine recommended vaccines by age.

Step 2. Review the patient's immunization history and determine which doses are valid (use the General Guidelines, Table 3–1).

Step 3. Develop a vaccination catch-up plan for the patient to begin getting their vaccinations. The goal is to catch up the patient with doses needed at the current age. Then the provider should resume vaccinating according to the routine schedule. Refer to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 1, to determine whether the vaccine is eligible for catch-up. (Hint: Vaccines eligible for catch-up have green boxes under the respective age groups. A vaccine is also eligible for catch-up if it has a yellow box and has a green box to the left of it.)

Step 4. Use the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 2 (also known as the "catch-up immunization schedule"), to determine the minimum age for and interval to the next doses. Make sure to review the notes for catch-up dose information for each of the missed vaccines. Note that when catching up, the total number of doses to complete a vaccine series may be fewer compared with the routine schedule. You can also use the CDC vaccine catch-up guidance job aids for PCV13, Hib, DTaP, and Tdap to determine catch-up doses.

For the purpose of these case studies, a dose counts toward completion of the series if administered no earlier than the minimum age (see the General Guidelines, Table 3–1, third column) and no earlier than the minimum interval from a previous dose (see the General Guidelines, Table 3–1, fifth column). Also, assume that the patient has been screened for all vaccine contraindications and precautions.

Activities

1. What are the recommended vaccines by age 5 years? Refer to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger (review Table 1 and information included in the notes).

2. Review the patient's immunization history and determine which doses are valid (see example for HepB vaccine). Use the General Guidelines, Table 3–1.

Name: _____ Age: _____

Table 4c-2: Immunization history

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Age Dose 1 administered	Age Dose 2 administered	Is Dose 1 valid?	Is Dose 2 valid?
Example: HepB	*Birth*	*2 yrs*	*Yes*	*Yes*
DTaP				
MMR				
VAR				

3. Develop a vaccination catch-up plan for Sedia to begin getting her vaccinations. Complete the information in the table below (see example for HepB vaccine).

   Step 1. The goal is to catch up Sedia with doses needed by 4–6 years old. Then resume the routine schedule. Refer to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 1, to determine whether the vaccine is eligible for catch-up. (Hint: Vaccines eligible for catch-up have green boxes under the respective age groups. A vaccine is also eligible for catch-up if it's a yellow box and has a green box to the left of it.)

   Step 2. Use the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 2 (also known as the "catch-up immunization schedule"), to determine the minimum age for and interval to the next doses.

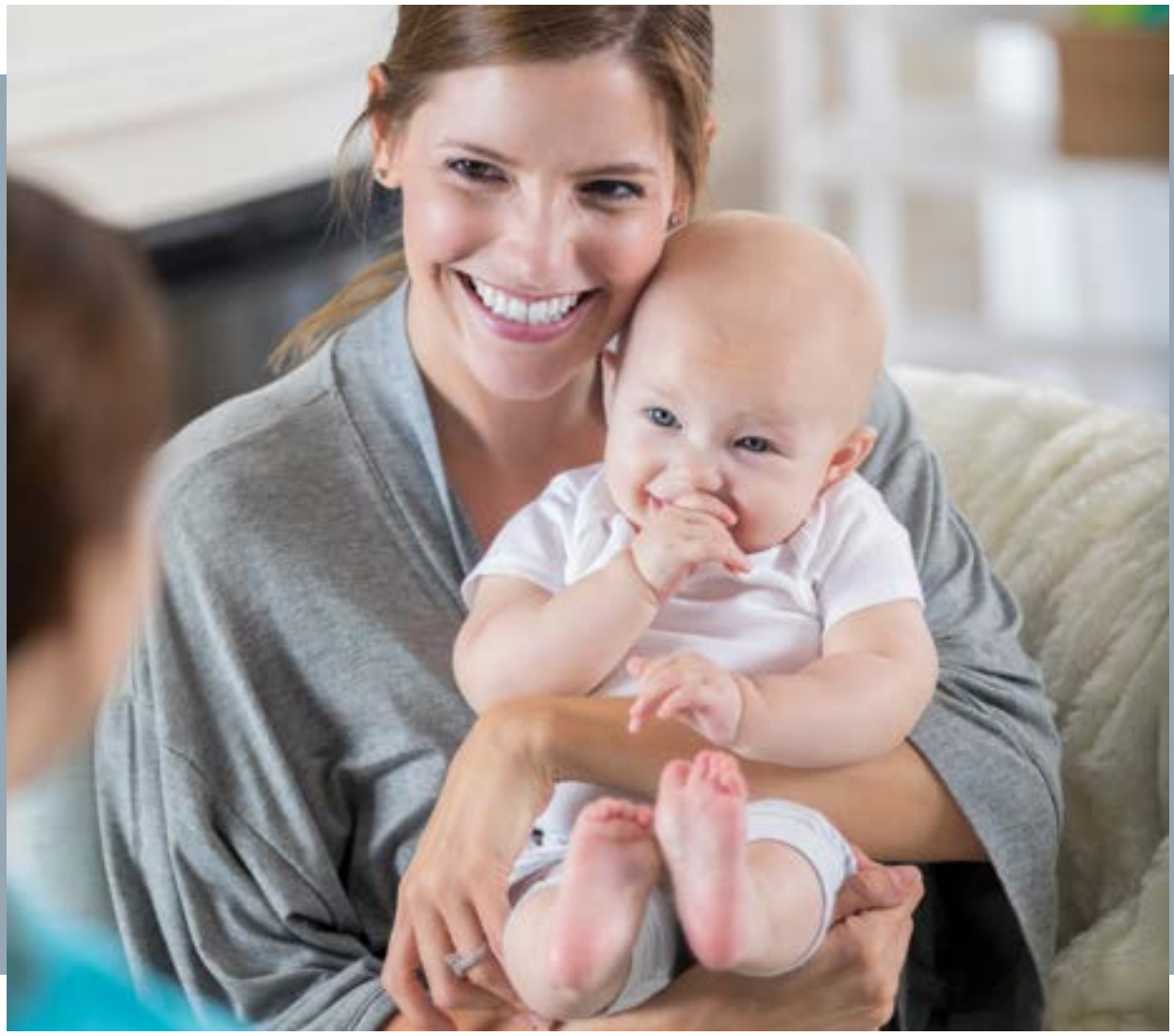
Table 4c-3: Catch-up vaccination plan

The 1st row has been completed for you as an example. The remaining cells are intentionally left blank and are to be completed.

Vaccine	Number of doses due to catch-up schedule	Age or dates to schedule each dose	Comments
Example: HepB	*1*	*Dose 3 – now (final)*	*She had 2 doses—dose 1 at birth and dose 2 at age 2 years. After dose 3, she has completed the series.*
RV			
DTaP			
Hib			
PCV13			
IPV			
MMR			
VAR			
HepA			
IIV			

ANSWER GUIDE

Part 4: Catch-Up Vaccination Schedule



A health care provider speaking with a mother who is holding an infant.

Part 4 Case Studies – Answer Guide

Case Study	Topics	Level of Difficulty
4a. 19-month-old, Logan	Catch-Up Schedule	Moderate
4b. 2-year-old, Trisha	Catch-Up Schedule	Advanced
4c. 5-year-old, Sedia	Catch-Up Schedule	Advanced

Answers to 4a. 19-month-old, Catch-Up Schedule (Moderate)

1. What are the recommended vaccines by age 19 months? Refer to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger (review Table 1 and information included in the notes).

   By 19 months, the recommended vaccines are HepB, RV, DTaP, Hib, PCV13, IPV, IIV, MMR, VAR, and HepA.

2. Review the patient's immunization history and determine which doses are valid (see example for HepB vaccine). Use the General Guidelines, Table 3–1.

   Name: Logan Age: 19 months

Table 4a-1: Immunization history: Answers
The 1st row indicates an example entry.

Vaccine	Age Dose 1 administered	Age Dose 2 administered	Age Dose 3 administered	Is Dose 1 valid?	Is Dose 2 valid?	Is Dose 3 valid?
Example: HepB	*Birth*	*2 mos*	*4 mos*	*Yes*	*Yes*	*No*
DTaP	2 mos	4 mos	12 mos	Yes	Yes	Yes
Hib (ActHIB®)	4 mos	N/A	N/A	Yes	N/A	N/A
IPV	2 mos	4 mos	N/A	Yes	Yes	N/A

Rationale:

- HepB: Although he had 3 doses of HepB, the third dose was invalid because it was administered too soon. The minimum age for the third HepB dose is 24 weeks. He will need 1 more dose of HepB vaccine.
- DTaP: He had 3 valid doses of DTaP. The fourth dose is recommended between ages 15–18 months when the vaccination schedule is followed on time.
- Hib: He had 1 valid dose at age 4 months. According to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, he should have had 2 or 3 Hib doses by now (depending upon which vaccine was administered).
- IPV: He had 2 valid doses at age 2 months and 4 months. CDC recommends that the third dose be administered at 6–18 months.

3. Complete the information in the table below (see example for HepB vaccine).

Step 1. Use the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 1, to determine whether the vaccine is eligible for catch-up. (Hint: Vaccines eligible for catch-up have green boxes under the respective age groups.) Then fill in columns 2 and 3 in Table 4a-3.

Step 2. For vaccines that are eligible for catch-up, identify the recent valid dose number and age when the most recent dose was administered (see Activity 1 answers). Fill in column 4.

Step 3. Use the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 2 (also known as the "catch-up immunization schedule"), to determine the minimum interval to the next dose. In theory, children who are behind have already passed the minimum age requirement. As a result, most catch-up scenarios (as shown below) are solely focused on meeting the minimum interval requirements between doses. Fill in column 5.

Step 4. Calculate the earliest age to receive the next dose to determine answers for columns 6 and 7.

Earliest age to administer vaccine = (age when most recent dose was administered) + (minimum interval)
= (column 4) + (column 5)

If earliest age to administer vaccine ≤ current age, administer dose today.

For example,
Earliest age to administer HepB = 4 mos + 8 wks
= 4 mos + 2 mos
= 6 mos
6 mos ≤ 19 mos, so administer dose today

Table 4a-3: Catch-up vaccination plan
The 1st row indicates an example entry.

Vaccine (Column 1)	Eligible for catch- up? (Column 2)	Recent valid dose number (Column 3)	Age when recent dose administered (Column 4)	Minimum interval (Column 5)	Dose number of vaccine dose due today (Column 6)	Administer dose today? (Column 7)
Example: HepB	*Yes*	*2*	*4 mos*	*8 weeks*	*3*	*Yes*
RV	No	N/A	N/A	N/A	N/A	N/A
DTaP	Yes	3	12 mos	6 mos	4	Yes
Hib (ActHIB®)	Yes	1	4 mos	4 weeks	2	Yes
PCV13	Yes	0	N/A	N/A	1	Yes
IPV	Yes	2	4 mos	4 weeks	3	Yes
MMR	Yes	0	N/A	N/A	1	Yes
VAR	Yes	0	N/A	N/A	1	Yes
HepA	Yes	0	N/A	N/A	1	Yes
IIV	Yes	0	N/A	N/A	1 of 2	Yes, when vaccine becomes available

Rationale:

- HepB: He has already received 2 valid doses of HepB and needs 1 more dose to complete the series. The minimum interval requirement to the next dose is 8 weeks. Note that the minimum interval is applied from the recent invalid dose (4 months is the age the recent dose was administered) rather than the dose received at 2 months of age.
- RV: He is past the age of eligibility for this vaccine. The maximum age for this vaccine is 8 months.
- DTaP: He received 3 valid doses of DTaP. He should receive the fourth dose at least 6 months after the third dose was administered, so he may receive the fourth dose now.
- Hib: He had 1 valid dose at age 4 months. His second and final dose should be administered after 5 months of age (i.e., now).
- PCV13: He did not receive any PCV13 doses. He is still eligible for catch-up and should receive his first dose now, with the second and final dose due in 8 weeks.
- IPV: He received 2 valid doses of IPV. He should receive the third dose after 5 months of age (i.e., now).
- MMR: He did not receive any MMR. He is still eligible for catch-up and should receive his first dose after 12 months of age (i.e., now).
- VAR: He did not receive any VAR. He is still eligible for catch-up and should receive his first dose after 12 months of age (i.e., now).
- HepA: He did not receive any HepA. He is still eligible for catch-up and should receive his first dose after 12 months of age (i.e., now).
- IIV: He did not receive any IIV in the past. Children 6 months to 8 years who did not receive at least 2 doses of influenza vaccine should receive 2 doses, separated by at least 4 weeks, during influenza season (see the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, influenza vaccination note).

4. **Based on Activity 2, what vaccines does Logan need today? Discuss the use of combination vaccines to decrease the number of injections Logan will need.**

   Logan should receive HepB, DTaP, Hib, PCV13, IPV, IIV, MMR, VAR, and HepA.

   Rationale:

   - You can administer IIV if the vaccine is available.
   - The health care provider can use the combination vaccine, DTaP-HepB-IPV (Pediarix®), to reduce the number of injections (see the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, page 1).
   - MMRV (ProQuad®) may be used if the parent/caregiver expresses a preference for MMRV. CDC recommends separate MMR and VAR vaccines be administered as the first doses at 12–47 months. MMRV is preferred over separate injections for the second doses of MMR and VAR at any age (15 months through 12 years) and for the first dose at 48 months of age or older.
   - DTaP-HepB-IPV (Pediarix®) is not approved for the fourth and fifth doses of DTaP and IPV.

5. After receiving all the vaccines recommended in Activity 4, is Logan caught up?

With the exception of PCV13 and IIV, Logan is caught up with all recommended vaccines by 19 months of age.

Rationale:

- Using the catch-up schedule, you will notice that Logan is caught up with all recommended vaccines by 19 months of age except PCV13 and IIV.
- Administer IIV if the vaccine is available. Otherwise, administer IIV when the influenza season begins.
- The catch-up schedule states that he needs 1 more dose of PCV13 8 weeks from today to complete the series. Note that in this scenario, he only needs 2 doses to complete the series, compared with 4 doses if the routine schedule had been followed. Note that when a vaccine is not administered according to the routine schedule, the child is not protected at ages when he is at most risk for the vaccine-preventable disease.
- After receiving PCV13 in 8 weeks, Logan will be caught up on all his vaccines and can resume the routine schedule at age 4–6 years.

A health care provider applying an adhesive bandage to an infant's injection site.

Answer to 4b. 2-year-old, Catch-Up Schedule (Advanced)

1. **Develop a vaccination catch-up plan for Trisha to begin getting her vaccinations.**

   Complete the information in the table below (see example for HepB vaccine).

   Step 1. The goal is to catch up Trisha with doses needed by age 2–3 years so she can resume the routine schedule. Refer to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 1, to determine whether the vaccine is eligible for catch-up. (Hint: Vaccines eligible for catch-up have green boxes under the respective age groups.)

   Step 2. Use the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 2 (also known as the "catch-up immunization schedule"), to determine the minimum age for and interval to the next doses.

Table 4b-1: Catch-up vaccination plan: Answers
The 1st row indicates an example entry.

Vaccine	Number of doses due to catch-up schedule	Age or intervals to schedule each dose	Comments
Example: HepB	*3*	*Dose 1 – now* *Dose 2 – 4 weeks from dose 1* *Dose 3 – 8 weeks from dose 2 and at least 16 weeks after dose 1*	*After dose 3, Trisha has completed the vaccine series*
RV	0	N/A	She is past the age of eligibility for this vaccine. Maximum age for this vaccine is 8 months.
DTaP	4	Dose 1 – now Dose 2 – 4 weeks from dose 1 Dose 3 – 4 weeks from dose 2 Dose 4 – 6 months from dose 3	After dose 4, resume the routine schedule at 4–6 years old.
Hib	1	Dose 1 – now (final)	No further doses are recommended if first dose administered after age 15 months or older.
PCV13	1	Dose 1 – now (final)	No further doses are recommended if first dose administered after age 24 months or older.
IPV	3	Dose 1 – now Dose 2 – 4 weeks from dose 1 Dose 3 – 4 weeks from dose 2	After dose 3, resume the routine schedule at 4–6 years old.
MMR	1	Dose 1 – now	After dose 1, resume the routine schedule at 4–6 years old.
VAR	1	Dose 1 – now	After dose 1, resume the routine schedule at 4–6 years old.
HepA	2	Dose 1 – now Dose 2 – 6 months from dose 1	After dose 2, the child has completed the vaccine series.
IIV	2	Dose 1 – during flu season Dose 2 – 4 weeks from dose 1	Children 6 months to 8 years who have not received at least 2 doses of influenza vaccine should receive 2 doses, separated by at least 4 weeks.

Answers to 4c. 5-year-old, Catch-Up Schedule (Advanced)

1. What are the recommended vaccines by age 5 years? Refer to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger (review Table 1 and information included in the notes).

   By 5 years, recommended vaccines are HepB, RV, DTaP, Hib, PCV13, IPV, IIV, MMR, VAR, and HepA.

2. Review the patient's immunization history and determine which doses are valid (see example for HepB vaccine). Use the General Guidelines, Table 3–1.

   Name: Sedia Age: 5 years

Table 4c-2: Immunization history: Answers
The 1st row indicates an example entry.

Vaccine	Age Dose 1 was administered	Age Dose 2 was administered	Is Dose 1 valid?	Is Dose 2 valid?
Example: HepB	*Birth*	*2 yrs*	*Yes*	*Yes*
DTaP	2 mos	2 yrs	Yes	Yes
MMR	2 yrs	N/A	Yes	No
VAR	2 yrs	N/A	Yes	No

All the vaccine doses Sedia received are valid.

Rationale:

- HepB: She had 2 valid doses of HepB.
- DTaP: She had 2 valid doses of DTaP.
- MMR: She had 1 valid dose of MMR.
- VAR: She had 1 valid dose of VAR.

3. Develop a vaccination catch-up plan for Sedia to begin getting her vaccinations. Complete the information in the table below (see example for HepB vaccine).

   Step 1. The goal is to catch up Sedia with doses needed by 4–6 years old. Then resume the routine schedule. Refer to the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 1, to determine whether the vaccine is eligible for catch-up. (Hint: Vaccines eligible for catch-up have green boxes under the respective age groups. A vaccine is also eligible for catch-up if it's a yellow box and has a green box to the left of it.)

   Step 2. Use the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, Table 2 (also known as the "catch-up immunization schedule"), to determine the minimum age for and interval to the next doses.

Table 4c-3: Catch-up vaccination plan: Answers
The 1st row indicates an example entry.

Vaccine	Number of doses due to catch-up schedule	Age or dates to schedule each dose	Comments
Example: HepB	*1*	*Dose 3 – now (final)*	*She had 2 doses—dose 1 at birth and dose 2 at age 2 years. After dose 3, she has completed the series.*
RV	0	N/A	She is past the age of eligibility for this vaccine. Maximum age for this vaccine is 8 months.
DTaP	2	Dose 3 – now Dose 4 – 6 months from dose 3 (final)	She had 2 doses (dose 1 at 2 months and dose 2 at 2 years of age). She needs 2 more doses. A fifth dose is not necessary if the fourth dose is administered at age 4 years or older.
Hib	0	N/A	Hib is not routinely recommended for healthy children over age 59 months.
PCV13	0	N/A	PCV13 is not routinely recommended for healthy children over age 5 years.
IPV	4	Dose 1 – now Dose 2 – 4 weeks after dose 1 Dose 3 – 6 months after dose 2 (final)	For children 4 years or older, dose 3 is the final dose, with an interval of 6 months from dose 2.
MMR	1	Dose 2 – now (final)	She had 1 dose of MMR at age 2. She is eligible for dose 2 now.
VAR	1	Dose 2 – now (final)	She had 1 dose of VAR at age 2. She is eligible for dose 2 today.
HepA	2	Dose 1 – during flu season Dose 2 – 4 weeks from dose 1	For children age 24 months or older who have not already received HepA vaccine, 2 doses, 6–18 months apart, should be administered if immunity to hepatitis A infection is desired.
IIV	2	Dose 1 – during flu season Dose 2 – 4 weeks from dose 1	Children 6 months to 8 years who have not received at least 2 doses of influenza vaccine should receive 2 doses, separated by at least 4 weeks.

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CS309631-C