Teaching Immunization for Medical Education (TIME)

MULTISTATION CLINICAL TEACHING SCENARIOS

Measles Prevention:
Small Group Booklet

DEVELOPED AND REVISED BY

Richard K. Zimmerman, MD, MPH

Department of Family Medicine

University of Pittsburgh School of Medicine

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FOR MORE INFORMATION

Association for Prevention Teaching and Research (APTR) can be contacted at

202-463-0550

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APTR
ASSOCIATION FOR PREVENTION TEACHING AND RESEARCH

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Contents

BACKGROUND ON THE MULTISTATION CLINICAL TEACHING SCENARIOS (MCTS) METHOD

The multistation clinical teaching scenarios were developed to encourage active small-group learning in a clinically relevant context with a modest amount of faculty time. The time commitment of both the facilitator and the student is typically 50 to 90 minutes, depending on the setting and goals. The MCTS teaching method may be readily used in medical pre-clinical and clinical years when students' or residents' time is limited. MCTS is well-suited to objective-driven curricula. In the MCTS session, one facilitator can interact with groups ranging from 10 to 30 residents or students. The facilitator needs basic knowledge about the disease and immunization covered but does not need to be a content expert.

Students and residents are assigned to small groups of 2 to 5 for an MCTS session. All of the small groups simultaneously address the first scenario. Each small group spends approximately 5 to 10 minutes attempting to solve the problem addressed in the scenario. The scenario is then discussed in a large group. The facilitator calls on one of the small groups to present their answers, then the facilitator and the large group discuss each small group's response to the scenario and summarize the teaching points. The facilitator should correct wrong answers and discuss the teaching points. Generally, the large-group discussion should not last more than 7 minutes per scenario. After the first scenario is discussed, each small group works on the second scenario.

A large-group discussion follows. The process is repeated until all scenarios are completed or the allotted time expires.

Suggested Schedule for MCTS Session

1. Arrange chairs in groups of 3 to 5, and separate students or residents into small groups.
2. Distribute one copy of the Measles Prevention MCTS *Small-Group Booklet* to each group along with a copy of the learning aids listed for the scenarios to be discussed. A major learning aid is needed: Recommended Adult Immunization Schedule -- United States, from www.cdc.gov/vaccines/recs/schedules/default.htm#adult, SHOTS software from www.immunizationed.org, internet access to CDC's website www.cdc.gov/vaccines, and/or the Pink Book in hard copy or internet access from http://www.cdc.gov/vaccines/pubs/pinkbook/default.htm. Review the objectives briefly, focusing on the primary objectives.
3. The students or residents are to start the first scenario by having one member of each small group read the scenario aloud. Subsequently, each small group should work on answering the questions for that scenario. To answer the questions, the learners should use their previous knowledge and experience, the resource materials/internet, and the abstracts included in selected scenarios. They should divide the resource materials since each individual may not have time to read all of the materials.
4. Convene as a large group after 5 to 10 minutes, depending upon the complexity of the scenario. Select one group to present their answers to the questions. Critique answers and discuss the teaching points for 5 to 7 minutes.
5. Repeat steps 3 and 4 for the remaining scenarios that have been selected.

OBJECTIVES

At the end of this session, every learner should be able to accomplish the following core set of objectives.

Primary Objectives:

1. Evaluate a patient with a rash and identify probable diagnoses.
2. Discuss the high degree of infectivity of measles.
3. Explain the general epidemiology of measles outbreaks.
4. Given a patient scenario, recommend measles, mumps, and rubella (MMR) vaccination appropriately, according to indications.
5. Given an office setting, describe office procedures to improve vaccination rates.

Secondary Objectives:

1. Identify serious complications of measles, e.g., pneumonia and encephalitis.
2. Appraise the risk for the patients' contacts, based on airborne and direct transmission.
3. Discuss patient information on MMR safety.

SCENARIO ONE

Jim, a 17-month-old child, was seen 3 days ago for cough, fever, conjunctivitis, and decreased appetite. On physical examination, bulging, erythematous tympanic membranes were noted. Jim was diagnosed with bilateral acute otitis media and treated with amoxicillin. Yesterday, a rash began on his face and trunk (see photographs). Physical exam reveals a temperature of 38.6°C (101.5°F) rectally and blue-white spots on the buccal mucosa.

Learning Aids

1. Photos
2. Differential Diagnosis of Typical Measles, page 8

Questions for Learners

1. What are the several most likely differential diagnoses for Jim's illness?
2. What are the blue-white spots on the buccal mucosa?
3. How can Jim's disease be differentiated from the other classic exanthems of childhood? List the differences.

Jim

Koplic spots on buccal musosa
CDC, Public Health Image Library

Enterovirus Rash: Hand, Foot & Mouth Disease

Dengue Petechiae and tourniquet test pictures- *Photo Courtesy of Centers for Disease Control & Prevention*

Mucocutanious Lymph Node Syndrome
(Kawaski Disease)

Rash from taking Amoxicillin During Infectious Mononucleosis – Epstein Barr Virus Infection

Rocky Mountain Spotted Fever

Parvovirus Rash

Roseola Rash

Scarlet

Rubella
- Photo Courtesy of Centers for Disease Control & Prevention

Blueberry Muffin Rash from Congenital Rubella Syndrome
- Photo Courtesy of Centers for Disease Control & Prevention

All photos used with permission of American Academy of Pediatrics unless otherwise noted.

Differential Diagnosis of Typical Measles

Disease	Agent	Typical Season	Typical Age	Prodrome	Fever	Duration of Rash (days)	Rash	Other Signs & Symptoms
Measles	Paramyxovirus Measles virus	Winter, Spring	1 to 20 years	2-4 days of cough, conjunctivitis, and coryza	High	5-6	Erythematous, irregular size, maculopapular; starts on temples & behind ears; progresses down from face; fades to brownish	Koplik's spots C blue-white papules (salt grains) on bright red mucosa opposite premolar teeth
Mucocutaneous lymph node syndrome (Kawasaki disease)	Unknown	Winter, Spring	< 5 years	3 days of abrupt fever	High; fever of 5 days is key sign	5-7; varies	Morbilliform, scarlatiniform, central distribution; erythematous, indurated palms and soles	Acute: dry, fissured & injected lips, strawberry tongue; irritability; cervical lymphadenopathy; conjunctival injection; peripheral edema Subacute: finger-tip desquamation; Complications: arthritis, carditis
Roseola Infantum (exanthema subitum)	Human herpes virus type 6	Any	6 mos. to 2 years	None	High	1-2; it follows deferve scence	Discrete erythematous macules, rarely involves face, begins as fever ends	Lymphadenopathy, irritability
Rubella	Togavirus	Spring, (late winter)	7 mos. to 29 years	0-4 days; mild malaise, fever; absent in children	Low-grade	1-3	Discrete, rose-pink, diffuse, maculopapular; progresses downward from face, may change quickly	Arthralgia (usually in adults), tender posterior cervical & suboccipital lymphadenopathy, malaise, petechiae on soft palate
Scarlet Fever	β – hemolytic strepto-cocci	Winter	> 2 years	0-1 day, marked	Low-High	2-7	Scarlet "sunburn" with puncate papules "sand-paper", circumoral pallor, increased intensity in skin folds, blanches, starts face/head/upper trunk and progresses downward	Sore throat, exudative tonsillitis, vomiting, abdominal pain, lymphadenopathy, white then red strawberry tongue
Erythema Infectiosum (Fifth Disease)	Human parvovirus type B19	Spring	5-10 years	None usually in children, may occur in adults	None to Low-grade	2-4	Starts as "slapped cheek", maculopapular; progresses to reticular (lacy) pattern; can recur with environmental changes such as sunlight exposure	Arthralgia/ arthritis in adults, adenopathy
Enterovirus	Echovirus Coxsackie virus	Summer (Fall)	Mainly childhood	0-1 day fever and myalgias	Low-High	1-5	Fine, pink, always affects face; variant in Boston exanthema (large ~ 1cm, discrete maculopapules)	Sore throat, headache, malaies, no lymphadenopathy, gastroenteritis

Disease	Agent	Typical Season	Typical Age	Prodrome	Fever	Duration of Rash (days)	Rash	Other Signs & Symptoms
Dengue Fever	Dengue virus types 1-4 (Flavivirus)			None	High	1-5	Generalized maculopapular rash after defervescence; spares palms and soles	Headache, myalgia, abdominal pain, pharyngitis, vomiting
Drug Rash	Penicillins, sulfonamide etc.	Any	Any	Possible due to underlying illness	Possible	Varies	Typically diffuse but may be concentrated in diaper area, typically no progression, erythema multiform rash can progress over a few days	Possible due to underlying illness or complications
Infectious Mononucleosis	Epstein – Barr Virus	None	10-30 years	2-5 days of malaise and fatigue	Low-High	2-7	Trunk and proximal extremities. Rash com-mon if Ampicillin given	Pharyngitis, lymphadenopathy, splenomegaly, malaise
Pharyno-conjunctival Fever	Adenovirus types 2, 3, 4, 7, 7a	Winter, Spring	< 5 years		Low-High	3-5	Starts on face and spreads down to trunk and extremities	Sore throat, conjunctivitis, headache, anorexia

Adapted from Centers for Disease Control and Prevention. Epidemiology, Prevention, and Control of Vaccine-Preventable Diseases. Atlanta, GA: Centers for Disease Control and Prevention; 1992; Chap 9.

SCENARIO TWO

Sheree, an 18-month-old child, was seen by her primary care physician for an upper respiratory tract infection (URI) 2 weeks ago. She was afebrile but had rhinorrhea. She was sent home with symptomatic treatment for her URI, which resolved. Another child, Mike, was in the office at the same time as Sheree — but never in the same room. Mike was seen for a rash which was diagnosed as measles. Sheree began coughing 4 days ago and her rhinorrhea recurred. Today, a maculopapular rash started on her face. Her vaccination record includes DTaP at 2, 6, 9, and 17 months, among other vaccines, but no MMR or varicella vaccine.

Learning Aids

1. Abstracts, pages 11-12.
2. Centers for Disease Control and Prevention. Recommended childhood and adolescent immunization schedule —United States. Use latest version. http://www.cdc.gov/vaccines/recs/schedules/child-schedule.htm, or *Shots* immunization software http://www.immunizationed.org/AnyPage.aspx?pgid=2 .

Questions for Learners

1. Was Sheree's case preventable? How?
2. Did Sheree contract measles from the child in the medical office?
3. What steps can a physician take to prevent the transmission of measles in the office setting?

Measles Outbreak Among Unvaccinated Preschool-Aged Children: Opportunities Missed by Health Care Providers to Administer Measles Vaccine.

Hutchins SS, Escolan J, Markowitz LE, Hawkins C, Kimbler A, Morgan RA, Preblud SR, Orenstein WA.

A measles outbreak in an inner-city area primarily involved preschool-aged children younger than 5 years of age. The authors investigated 31 unvaccinated preschool children with measles disease who had not been vaccinated. Health care providers missed opportunities to vaccinate some eligible patients against measles. Ten of the 26 (38%) patients whose full immunization status was known were vaccinated with diphtheria and tetanus toxoids and pertussis vaccine and/or poliovirus vaccine at a time when they could have received measles vaccine simultaneously (according to recommendations of the ACIP and the AAP). In addition, 5 of 10 health care providers missed at least one opportunity to administer measles vaccine because of a minor illness that was not a contraindication to vaccination.

Abstracted from *Pediatrics* 1989;83:369-374.

Measles Outbreak in a Pediatric Practice: Airborne Transmission in an Office Setting

Bloch AB, Orenstein WA, Ewing WM, Spain WH, Mallison GF, Herrmann KL, Hinman AR.

A measles outbreak occurred in a pediatric practice. The source patient was in the office for one hour on the second day of his rash, primarily in a single examining room. He was coughing vigorously when examined. Seven secondary cases of measles occurred due to exposure in the office. Four children had transient contact with the source patient as he entered or exited through the waiting room; only one of the four had face-to-face contact within 1 m of the source patient. The three other children who contracted measles were never in the same room with the source patient; one of the three arrived at the office one hour after the source patient had left. The risk of measles for unvaccinated infants (attack rate 80%, 4/5) was 10.8 times the risk for vaccinated children (attack rate 7%, 2/27) (p = .022). Airflow studies demonstrated that droplet nuclei generated in the examining room used by the source patient were dispersed throughout the entire office suite. The outbreak supports the fact that measles virus can survive at least one hour when it becomes airborne.
Abstracted in modified form from *Pediatrics* 1985;75:676-683.

Infection Control for Measles Case

Once a suspected measles case has been identified, prompt isolation of the potentially infectious patient and implementation of appropriate infection-control measures can help to decrease risk for transmission. Patients with suspected measles should be placed in an examination room, preferably an airborne-infection isolation room, as soon as possible and should not be permitted in patient waiting areas. Until placed in an airborne-infection isolation room, the patient should wear a surgical mask. If a surgical mask cannot be tolerated, other practical means to contain respiratory aerosols should be implemented. The door to the examination room should be kept closed, and all health-care personnel in contact with the patient should be documented as immune to measles. Health-care personnel and visitors without evidence of immunity (i.e., documentation of adequate vaccination, laboratory evidence of immunity, born before 1957, or documentation of physician-diagnosed measles) should be restricted from entering the rooms of patients known or suspected to have measles.
Abstracted from *MMWR. 2008;57:203-206*

SCENARIO THREE

Poneyville, a city with a population of 1,200,000, experienced a measles epidemic involving 55 cases. The number hospitalized due to complications of measles was 16. One unimmunized child died of complications of measles. Most of the cases were in unvaccinated school-aged children who were not vaccinated due to philosophic objection. Parents reported concerns about measles vaccine causing autism.

Learning Aids

1. Chart, page 14
2. MMR Vaccine Safety Research – CDC, page 15
3. Measles, mumps, and rubella – vaccine use and strategies for elimination of measles, rubella, and congenital rubella syndrome and control of mumps: recommendations of the Advisory Committee on Immunization Practices (ACIP); MMWR 1998; 47 (RR-8): 1-57. http://www.cdc.gov/mmwr/PDF/RR/RR4708.pdf
4. And/or *Shots* immunization software or *Shots* On-line http://www.immunizationed.org/ShotsOnline.aspx

Questions for Learners

1. What groups were responsible for most of the cases of measles?
2. Does measles vaccine cause autism?
3. Whom would you target for intervention? What should be done?

Age Group (years)	Vaccination Status of Measles Patients				Total Cases
	Received 2 doses of MMR	Received 1 dose of MMR	No MMR but MMR due	No MMR but not due	
<1	0	0	0	2	2
1-5	0	5	12	0	17
6-18	0	2	28	0	30
≥19	0	5	1	0	6
Totals	0	12	41	2	55

Measles Outbreak Control

The local or state health department should be contacted immediately when suspected cases of measles occur in a community. Because of the potential for rapid spread of the disease, one confirmed case of measles in a community is an urgent public health situation. Persons who cannot readily provide acceptable evidence of measles immunity should be vaccinated or excluded from the setting of the outbreak (e.g., school, day care facility, hospital, clinic). Live measles vaccine provides permanent protection and may prevent disease if given within 72 hours of exposure. Almost all persons who are excluded from an outbreak area because they lack acceptable evidence of immunity should quickly comply with vaccination requirements. Persons exempted from measles vaccination for medical, religious, or other reasons should be excluded from involved institutions in the outbreak area until 21 days after the onset of rash in the last case of measles.

Modified from Measles, mumps, and rubella—vaccine use and strategies for elimination of measles, rubella, and congenital rubella syndrome and control of mumps: recommendations of the Advisory Committee on Immunization Practices (ACIP) MMWR 1998: 47(RR-8):1-57

MMR Vaccine Safety Research

Many carefully performed scientific studies have found no link between MMR vaccine and autism. These studies include:

- A September 2008 case-control study published in Public Library of Science (PLoS) was conducted in 2004-2008 to determine whether results from an earlier study that claimed to find measles virus RNA in the intestinal tissue of a specific group of autistic children could be confirmed. The results could not be confirmed, and no link between MMR and autism was found.
- An April 2006 study conducted by the National Institute of Child Health and Human Development (NICHD) of NIH and the CDC assessed data from 351 children with autism spectrum disorders and 31 typically-developing children. The study did not find a link between MMR vaccination and autism. The results were published in the *Journal of Autism and Developmental Disorders*.
- A 2002 study by CDC and the Danish Medical Research Council that followed more than 500,000 children over 7 years and found no association between MMR vaccination and autism. The results were published in the *New England Journal of Medicine.*

Modified from http://www.cdc.gov/vaccinesafety/concerns/mmr_vaccine.htm

Power of Box "a" versus Full 2*2 Table

- Power of box "a": When a child experiences an alleged reaction based on a temporal association, this constitutes box "a" data. But a full 2*2 table employs all four items.
- If one only looks at box a, or even boxes a and b, then a skewed picture emerges
- The actual relative risk is 0.92 for measles containing vaccine and autism, with a confidence interval overlapping one, showing no association!

2*2 Table

		Outcome: Yes	Outcome: No
Exposure	Yes	a	b
	No	c	d

Danish Data from 2002 *NEJM***

Outcome: Yes	Outcome: No*	Adjusted relative risk per year
263	440392	1.00
53	96595	0.92 (.68 – 1.24)

* Total children within group – autistic children

** Madsen KM, Hviid A, Vestergaard M, et al. A population-based study of measles, mumps, and rubella vaccination and autism. N Engl J Med 2002;347(19):1477-1482

SCENARIO FOUR

Two days ago, Tom, an 18-month-old child, developed cough, coryza, conjunctivitis and a temperature of 39.7°C (103.4°F) rectally. He developed a maculopapular rash today. Tom's playmate was diagnosed recently with measles. Tom's father, who was born in 1974, received live measles vaccine at 9 months of age. His mother received one dose of measles vaccine at 15 months of age. Clinical records indicate that Tom has received three doses of poliomyelitis vaccine, four doses of diphtheria and tetanus toxoids and acellular pertussis vaccine (DTaP), four doses of *Haemophilus influenzae* type b (Hib) vaccine, three doses of rotavirus vaccine, two doses of influenza vaccine, and four doses of pneumoccocal conjugate vaccine. Tom has two well siblings: Bill, a 13-year-old who was given MMR at 12 months of age and Margaret, a 3-month- old with no MMR. Tom's father is a respiratory therapist at a local hospital.

Learning Aid

1. Childhood and Adolescent Immunization Schedule
   http://www.cdc.gov/vaccines/recs/schedules/child-schedule.htm#printable
2. Adult Immunization Schedule (include footnotes)
   http://www.cdc.gov/vaccines/recs/schedules/adult-schedule.htm
   and/or *Shots* immunization software for PDAs or Shots On-line
   http://www.immunizationed.org/AnyPage.aspx?pgid=2
3. Abstracts, page 18

Questions for Learners

1. Is Bill up-to-date on measles vaccination? What should be done for Bill?
2. What should be done for Margaret?
3. Are the parents up-to-date on measles vaccination? What should be done for them?
4. Tom's father is a respiratory therapist in a hospital. Should he continue to work?

Post-Exposure Prophylaxis

Live measles vaccine provides permanent protection and may prevent disease if given within 72 hours of exposure. Immune globulin (IG) may prevent or modify disease and provide temporary protection if given within 6 days of exposure. The dose is 0.25 mL/kg of body weight, with a maximum of 15 mL intramuscularly. The recommended dose of IG for immunocompromised persons is 0.5mL/kg of body weight (maximum 15 mL) intramuscularly. IG may be especially indicated for susceptible household contacts of measles patients, particularly contacts younger than 1 year of age (for whom the risk of complications is highest). If the child is 12 months of age or older, live measles vaccine should be given about 5 months later when the passive measles antibodies have waned. IG should not be used to control measles outbreaks.

Measles chapter in: Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine Preventable Diseases*. 11th ed. Washington DC: Public Health Foundation, 2009. http://www.cdc.gov/vaccines/pubs/pinkbook/downloads/meas-508.pdf

Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007

Measles

For exposed susceptibles, post-exposure measles vaccine within 72 hours may prevent disease and provides permanent protection. Or, immune globulin within 6 days, when available, may modify or prevent disease and provide temporary protection. Place exposed susceptible patients on Airborne Precautions and exclude susceptible healthcare personnel from duty from day 5 after first exposure to day 21 after last exposure, regardless of post-exposure vaccine.

Modified from CDC, Siegel JD, Rhinehart E, Jackson M, Chiarello L, and the HICPAC, 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings, June 2007.

SCENARIO FIVE

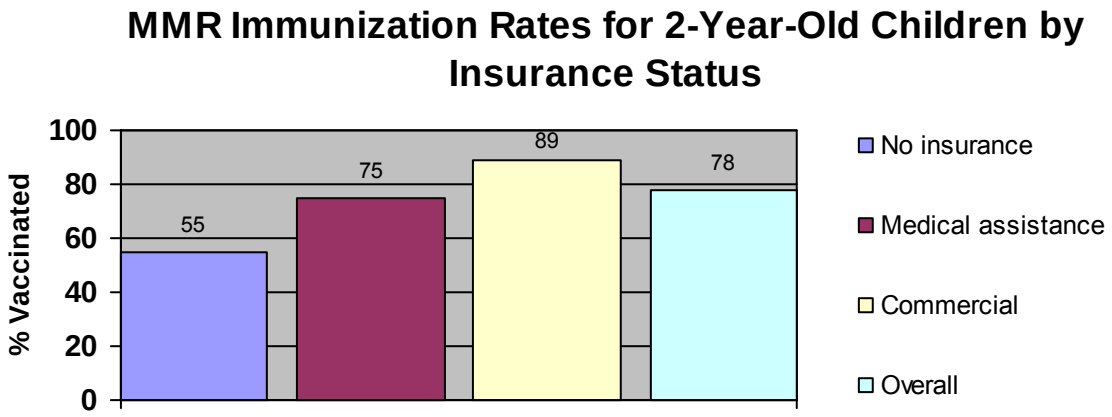
Dr. Jones is disturbed that eight of the children in O'Hara Street Medical Center, an inner-city clinic that is staffed by three physicians, have developed measles and that three have had significant complications (dehydration or pneumonia). Audits of the clinic's records indicate that none of the eight had received measles, mumps, and rubella vaccine (MMR), although six were old enough. Dr. Jones had the office manager program the office computer to generate a graph of MMR vaccination dates by insurance coverage. The center participates in the Vaccines for Children Program, which provides free vaccines for several groups of children, including uninsured and Medicaid-insured children.

Learning Aids

1. Graph of MMR Vaccination Rates for 2-Year-Old Children by Insurance Status, page 20
2. Standards for Pediatric Immunization Practices, pages 20-21

Questions for Learners

1. What are possible explanations for the low vaccination rates? List reasons. Why is there a difference in vaccination rates based on insurance status if the Vaccines for Children Program covers vaccinations?
2. How can Dr. Jones and the clinic staff encourage parents to bring their children to the clinic for vaccinations?
3. Once a child has arrived at the clinic, what can Dr. Jones and the clinic staff do to improve vaccination rates, i.e., decrease missed opportunities?



STANDARDS FOR CHILDHOOD AND ADOLESCENT IMMUNIZATION PRACTICES

Availability of Vaccines

1. Vaccination services are readily available.
2. Vaccinations are coordinated with other healthcare services and provided in a medical home when possible.
3. Barriers to vaccination are identified and minimized.
4. Patient costs are minimized.

Assessment of Vaccination Status

1. Healthcare professionals review the vaccination and health status of patients at every encounter to determine which vaccines are indicated.
2. Healthcare professionals assess for and follow only medically indicated contraindications.

Effective Communication about Vaccine Benefits and Risks

1. Parents/guardians and patients are educated about the benefits and risks of vaccination in a culturally appropriate manner and in easy-to-understand language.

Proper Storage and Administration of Vaccines and Documentation of Vaccinations

1. Healthcare professionals follow appropriate procedures for vaccine storage and handling.
2. Up-to-date, written vaccination protocols are accessible at all locations where vaccines are administered.
3. Persons who administer vaccines and staff who manage or support vaccine administration are knowledgeable and receive ongoing education.
4. Healthcare professionals simultaneously administer as many indicated vaccine doses as possible.
5. Vaccination records for patients are accurate, complete, and easily accessible.
6. Healthcare professionals report adverse events following vaccination promptly and accurately to the Vaccine Adverse Events Reporting System (VAERS) and are aware of a separate program, the National Vaccine Injury Compensation Program (NVICP).
7. All personnel who have contact with patients are appropriately vaccinated.

Implementation of Strategies to Improve Vaccination Coverage

1. Systems are used to remind parents/guardians, patients, and healthcare professionals when vaccinations are due and to recall those who are overdue.
2. Office- or clinic-based patient record reviews and vaccination coverage assessments are performed annually.
3. Healthcare professionals practice community-based approaches.

Adapted from The National Vaccine Advisory Committee. *Standards for Child and Adolescent Immunization Practices*. Pediatrics 2003; 112:958-963. http://www.cdc.gov/vaccines/recs/vac-admin/rev-immz-stds.htm#child

SCENARIO SIX

Mildred is in your office today (in May) for a routine checkup. She is a 24-year-old nurse at a local college. Her vaccination record includes five doses of DTaP, two doses of tetanus and diphtheria toxoids, adult type (Td), one dose of quadrivalent meningococcal conjugate vaccine (MCV4), four doses of inactivated poliomyelitis virus vaccine (IPV), one dose of MMR, three doses of human papillomavirus vaccine, three doses of hepatitis B vaccine, and influenza vaccine last season. She had varicella (chickenpox) as a child. She is not taking any medications, including oral contraceptives. Her only allergy is to duck feathers; following exposure to duck feathers, she develops urticaria. She is single, sexually active, and not planning to become pregnant. Her last menstrual period was 3 weeks ago. She shares an apartment with her sister who has a congenital immune disorder.

Learning Aids

Contraindications to Vaccines Chart
http://www.cdc.gov/vaccines/recs/vac-admin/contraindications-vacc.htm
Adult immunization Schedule – MMR footnote
http://www.cdc.gov/mmwr/PDF/wk/mm5753-Immunization.pdf
AND/OR
Shots software for PDAs or Shots On-line
http://www.immunizationed.org/AnyPage.aspx?pgid=2

Questions for Learners

1. Does Mildred need any vaccinations?
2. Are any vaccinations contraindicated in this case?
3. What can physicians do to ensure that their patients who have an occupational indication for MMR receive it?
4. By which route is MMR administered?

Guide to Contraindications* and Precautions** to Commonly Used Vaccines – Listed by Vaccine		
Vaccine	**True** contraindications and precautions#	**Untrue** (vaccines can be administered)
General for all vaccines, including DTaP, DT, Td, IPV, MMR, Hib, Hep A, Hep B, varicella, PCV, influenza, PPV.	**Contraindications** Serious allergic reaction (e.g., anaphylaxis) after a previous vaccine dose Serious allergic reaction (e.g., anaphylaxis) to a vaccine component **Precautions** Moderate or severe acute illness with or without fever	Mild acute illness with or without fever Mild to moderate local reaction (i.e., swelling, redness, soreness): low-grade or moderate fever after previous dose Lack of previous physical examination in well-appearing person Current antimicrobial therapy Convalescent phase of illness Premature birth (hepatitis B vaccine is an exception in certain circumstances + Recent exposure to an infectious disease History of penicillin allergy, other non-vaccine allergies, relative with allergies, receiving allergen extract immunotherapy
MMR@	**Contraindications** Severe allergic reaction to previous dose or vaccine component Pregnancy Known severe immunodeficiency (e.g., hematologic and solid tumors; congenital immunodeficiency; long-term immunosuppressive therapy ## or severely symptomatic human immunodeficiency virus [HIV] infection) **Precautions** Recent (≤ 11 months) receipt of antibody-containing blood product (specific interval depends on product)$$ History of thrombocytopenia or thrombocytopenic purpura Moderate or severe acute illness with or without fever	Positive tuberculin skin test Simultaneous TB skin testing ++ Breast-feeding Pregnancy of recipient's mother or other close or household contact Recipient is child-bearing-age female Immunodeficient family member of household contact Asymptomatic or mildly symptomatic HIV infection Allergy to eggs

* Contraindications – a vaccine should not be administered when a contraindication is present.
** Precautions – A precaution is a condition in a recipient that might increase the risk for a serious adverse reaction or that might compromise the ability of the vaccine to produce immunity.
# If the risk from the vaccine is believed to outweigh the benefit, the vaccine should not be administered. If the benefit of vaccination is believed to outweigh the risk, vaccine should be administered.
+ Hepatitis B vaccination should be deferred for infants weighing <2,000 grams if the mother is documented to be hepatitis B surface antigen (HbsAg)-negative at the time of infant's birth. Vaccination can commence at chronological

age 1 month. For infants born to HbsAg-positive women, hepatitis B immunoglobulin and hepatitis B vaccine should be administered at or soon after birth regardless of weight. See MMWR article, "General Recommendations on Immunizations" text for details.
@ MMR and varicella vaccines can be administered on the same day. If not, these vaccines should be separated by ≥ 28 days.
Immunosuppressive steroid dose is >2 weeks of daily receipt of 20 mg or 2 mg/kg body weight of prednisone.
++ Measles-containing vaccine can be administered on the same day as tuberculin skin testing; if not, should be postponed of >4 weeks after the vaccination.
$$ See text for details

Modified from CDC Vaccines and Immunizations. "Contraindications to Vaccines Chart." Web page last modified on February 9, 2005. http://www.cdc.gov/vaccines/recs/vac-admin/contraindications-vacc.htm