

TEACHING IMMUNIZATION

→ *for Medical Education*

REVISED BY

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March 2005

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SPONSORED BY

Association of Teachers of Preventive Medicine
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CHILDHOOD VACCINATION

Small-Group Booklet



DEPARTMENT OF FAMILY MEDICINE
UNIVERSITY OF PITTSBURGH

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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.

MCTS was developed at Harvard University to teach radiology.¹¹ Viewboxes were displayed around a room and small groups of students rotated between viewboxes. At each viewbox, a clinical history was given along with questions (e.g., What is the differential diagnosis?). W. Scott Schroth, MD, modified this approach to teach medical students during a primary care clerkship at George Washington University.¹² Students rotated between stations that consisted of microscopes (e.g., Gram stain and urine specimens), x-rays, and brief histories. After all cases were completed, the facilitator led a discussion of the relevant teaching points. This approach was adapted by the authors for use with vaccine-preventable diseases.

Students and residents are assigned to small groups of 3 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 Childhood Vaccination *Small-Group Booklet* to each group along with a copy of the learning aids listed for the scenarios to be discussed.
3. Review the objectives briefly, focusing on the primary objectives.
4. Instruct the students or residents 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. Instruct them to stay on the same page so everyone is working on the same scenario. To answer the questions, the learners should use their previous knowledge and experience, the resource materials, and the abstracts included in selected scenarios. Instruct them to divide the resource materials since each individual may not have time to read all of the materials.
5. 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 their answers and discuss the teaching points for 5 to 7 minutes.
6. Repeat steps 4 and 5 for the remaining scenarios that you have selected.

**OBJECTIVES****Primary Objectives**

- **At the end of this session, every learner should be able to accomplish the following core set of objectives:**
 1. Given a child, recommend vaccination appropriately, according to the recommended childhood immunization schedule, and state the administration routes and injection sites for these vaccinations.
 2. Given a child who is behind schedule, explain the principles of accelerated and catch-up vaccination, and determine needed vaccinations for current and subsequent visits.
 3. Explain the rationale for simultaneous vaccine administration and the potential consequences of nonsimultaneous administration.
 4. Given a patient scenario, identify valid contraindications and precautions to vaccination without missing vaccination opportunities that are appropriate.
 5. Explain general vaccine safety and adverse event information, including the Vaccine Injury Compensation Program (VICP), the Vaccine Adverse Event Reporting System (VAERS), and use of the Vaccine Information Statements (VISs).
 6. Suggest three procedures that a physician can implement in a practice or clinic to improve childhood vaccination rates.

Secondary Objectives

1. Given a patient scenario, recommend vaccination, if indicated, during both acute-care and well-child care visits to providers, thereby reducing missed opportunities.
2. State sources of current information on childhood vaccinations, including information about the schedule, minimal interval between doses, procedures for undocumented vaccination histories, and vaccine contraindications.
3. Explain that severely immunocompromised persons should not receive live viral vaccines, except that HIV-infected persons who are not severely immunosuppressed can receive MMR when indicated.

SCENARIO ONE

Joan is a healthy 2-month-old in Dr. Stevenson's office for her first well-child visit. She is breast-fed. Immunization history: She received the first dose of hepatitis B vaccine at 24 hours of age, just prior to being discharged from the hospital. Family history: Her mother's hepatitis B surface antigen status was negative. Her father has allergic rhinitis and skin tests show that he is allergic to ragweed, cat dander, and chicken dander; otherwise, her parents are healthy. Parent questions: Her parents wonder if so many shots are really needed.

• Learning Aids

1. *Recommended Childhood and Adolescent Immunization Schedule—United States* (use latest version) <http://www.cdc.gov/nip/recs/child-schedule.htm>
2. Abstract 1
3. Vaccine Information Statement on DTaP. <http://www.cdc.gov/nip/publications/vis/> and to get the DTaP VIS: <http://www.cdc.gov/nip/publications/VIS/vis-dtp.pdf>
4. Table 1 and Abstract 2
5. Shots PDA software (optional www.immunizationed.org)

• Questions for Learners

1. What vaccination(s) are indicated?
2. How would you answer the parents' question, "Are they really needed?"
3. Why is pneumococcal conjugate vaccine recommended for all infants?
4. Does Joan have any contraindications to vaccination?
5. When should Vaccine Information Statements be used?

• Abstract 1

Vaccine Information Statements (VIS).

As required under the National Childhood Vaccine Injury Act, all health care providers in the United States who administer any vaccine containing diphtheria, tetanus, pertussis, measles, mumps, rubella, polio, hepatitis B, *Haemophilus influenzae* type b (Hib), varicella (chickenpox), influenza, or pneumococcal conjugate vaccine shall **prior to administration of each dose of the vaccine**, provide a copy to keep of the relevant current edition vaccine information materials that have been produced by the Centers for Disease Control and Prevention (CDC):

- to the parent or legal representative of any child to whom the provider intends to administer such vaccine, or
- to any adult to whom the provider intends to administer such vaccine.

The materials shall be supplemented with visual presentations or oral explanations, as appropriate. If there is not a single VIS for a combination vaccine (e.g., hepatitis A/hepatitis B), use the VISs for both component vaccines.

Adapted from Centers for Disease Control and Prevention (CDC): Instructions for the Use of Vaccine Information Statements. <http://www.cdc.gov/nip/publications/vis/vis-Instructions.pdf>

DIPHTHERIA TETANUS & PERTUSSIS VACCINES

WHAT YOU NEED TO KNOW

1 Why get vaccinated?

Diphtheria, tetanus, and pertussis are serious diseases caused by bacteria. Diphtheria and pertussis are spread from person to person. Tetanus enters the body through cuts or wounds.

DIPHTHERIA causes a thick covering in the back of the throat.

- It can lead to breathing problems, paralysis, heart failure, and even death.

TETANUS (Lockjaw) causes painful tightening of the muscles, usually all over the body.

- It can lead to “locking” of the jaw so the victim cannot open his mouth or swallow. Tetanus leads to death in about 1 out of 10 cases.

PERTUSSIS (Whooping Cough) causes coughing spells so bad that it is hard for infants to eat, drink, or breathe. These spells can last for weeks.

- It can lead to pneumonia, seizures (jerking and staring spells), brain damage, and death.

Diphtheria, tetanus, and pertussis vaccine (DTaP) can help prevent these diseases. Most children who are vaccinated with DTaP will be protected throughout childhood. Many more children would get these diseases if we stopped vaccinating.

DTaP is a safer version of an older vaccine called DTP. DTP is no longer used in the United States.

2 Who should get DTaP vaccine and when?

Children should get 5 doses of DTaP vaccine, one dose at each of the following ages:

- ✓ 2 months
- ✓ 4 months
- ✓ 6 months
- ✓ 15-18 months
- ✓ 4-6 years

DTaP may be given at the same time as other vaccines.

3

Some children should not get DTaP vaccine or should wait

- Children with minor illnesses, such as a cold, may be vaccinated. But children who are moderately or severely ill should usually wait until they recover before getting DTaP vaccine.
- Any child who had a life-threatening allergic reaction after a dose of DTaP should not get another dose.
- Any child who suffered a brain or nervous system disease within 7 days after a dose of DTaP should not get another dose.
- Talk with your doctor if your child:
 - had a seizure or collapsed after a dose of DTaP,
 - cried non-stop for 3 hours or more after a dose of DTaP,
 - had a fever over 105°F after a dose of DTaP.

Ask your health care provider for more information. Some of these children should not get another dose of pertussis vaccine, but may get a vaccine without pertussis, called **DT**.

4

Older children and adults

DTaP should not be given to anyone 7 years of age or older because pertussis vaccine is only licensed for children under 7.

But older children, adolescents, and adults still need protection from tetanus and diphtheria. A booster shot called **Td** is recommended at 11-12 years of age, and then every 10 years. There is a separate Vaccine Information Statement for Td vaccine.

Diphtheria/Tetanus/Pertussis

7/30/2001

5 What are the risks from DTaP vaccine?

Getting diphtheria, tetanus, or pertussis disease is much riskier than getting DTaP vaccine.

However, a vaccine, like any medicine, is capable of causing serious problems, such as severe allergic reactions. The risk of DTaP vaccine causing serious harm, or death, is extremely small.

Mild Problems (Common)

- Fever (up to about 1 child in 4)
- Redness or swelling where the shot was given (up to about 1 child in 4)
- Soreness or tenderness where the shot was given (up to about 1 child in 4)

These problems occur more often after the 4th and 5th doses of the DTaP series than after earlier doses.

Sometimes the 4th or 5th dose of DTaP vaccine is followed by swelling of the entire arm or leg in which the shot was given, lasting 1-7 days (up to about 1 child in 30).

Other mild problems include:

- Fussiness (up to about 1 child in 3)
- Tiredness or poor appetite (up to about 1 child in 10)
- Vomiting (up to about 1 child in 50)

These problems generally occur 1-3 days after the shot.

Moderate Problems (Uncommon)

- Seizure (jerking or staring) (about 1 child out of 14,000)
- Non-stop crying, for 3 hours or more (up to about 1 child out of 1,000)
- High fever, over 105°F (about 1 child out of 16,000)

Severe Problems (Very Rare)

- Serious allergic reaction (less than 1 out of a million doses)
- Several other severe problems have been reported after DTaP vaccine. These include:
 - Long-term seizures, coma, or lowered consciousness
 - Permanent brain damage.

These are so rare it is hard to tell if they are caused by the vaccine.

Controlling fever is especially important for children who have had seizures, for any reason. It is also important if another family member has had seizures. You can reduce fever and pain by giving your child an *aspirin-free* pain reliever when the shot is given, and for the next 24 hours, following the package instructions.

6 What if there is a moderate or severe reaction?

What should I look for?

Any unusual conditions, such as a serious allergic reaction, high fever or unusual behavior. Serious allergic reactions are extremely rare with any vaccine. If one were to occur, it would most likely be within a few minutes to a few hours after the shot. Signs can include difficulty breathing, hoarseness or wheezing, hives, paleness, weakness, a fast heart beat or dizziness. If a high fever or seizure were to occur, it would usually be within a week after the shot.

What should I do?

- **Call** a doctor, or get the person to a doctor right away.
- **Tell** your doctor what happened, the date and time it happened, and when the vaccination was given.
- **Ask** your doctor, nurse, or health department to report the reaction by filing a Vaccine Adverse Event Reporting System (VAERS) form.

Or you can file this report through the VAERS web site at www.vaers.org, or by calling 1-800-822-7967.

VAERS does not provide medical advice

7 The National Vaccine Injury Compensation Program

In the rare event that you or your child has a serious reaction to a vaccine, a federal program has been created to help pay for the care of those who have been harmed.

For details about the National Vaccine Injury Compensation Program, call **1-800-338-2382** or visit the program's website at www.hrsa.gov/osp/vicp

8 How can I learn more?

- Ask your health care provider. They can give you the vaccine package insert or suggest other sources of information.
- Call your local or state health department's immunization program.
- Contact the Centers for Disease Control and Prevention (CDC):
 - Call **1-800-232-4636 (1-800-CDC-INFO)**
 - Visit the National Immunization Program's website at www.cdc.gov/nip



U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES
Centers for Disease Control and Prevention
National Immunization Program



DTaP (7/30/01)

Vaccine Information Statement

42 U.S.C. § 300aa-26

Table I

Impact of Vaccines in the 20th Century

Disease	20th Century Annual Morbidity	2003 Total	% Decrease
Smallpox	448,164	0	100
Diphtheria	175,885	1	>99.9
Pertussis	147,271	11,647	92.1
Tetanus	1,314	20	98.5
Polio (paralytic)	16,316	0	100
Measles	503,282	56	>99.9
Mumps	152,209	231	99.9
Rubella	47,745	7	>99.9
Congenital rubella	823	1	99.8
<i>Haemophilus influenzae</i> (<5yrs)	20,000 (est.)	259 (serotype B or unknown serotype)	98.8

http://www.cdc.gov/nip/publications/pink/appendices/A/impact_vaccs.pdf

Sources:

1. CDC. Impact of vaccines universally recommended for children—United States, 1900 - 1998. MMWR 1999;48 (12):243 - 8.
2. CDC. Notice to Readers: Final 2003 Reports of Notifiable Diseases. MMWR 2004;53(30):687.


- **Abstract 3**

Pneumococcal Conjugate Vaccine for Young Children

Before the introduction of pneumococcal conjugate vaccine, *Streptococcus pneumoniae* caused approximately 6000 cases of meningitis, 61,000 cases of bacteremia, 100,000-135,000 cases of pneumonia requiring hospitalization, and 7 million cases of otitis media annually.

Risk factors for invasive pneumococcal disease include age, race, attendance at daycare, and chronic medical conditions. The incidence rates are highest in infancy, decline with age, and then increase in the elderly. African Americans have rates about two- to three-fold higher than whites and Alaska Natives and Native Americans have rates about three- to seven-fold higher than whites. Children with sickle cell disease have quite high rates of disease, penicillin prophylaxis reduces the risk for pneumococcal disease in sickle cell disease, but the rates are still elevated. Other predisposing risk factors include other asplenia, infection with HIV, recent antibiotic treatment, and passive smoking. Out-of-home day care increases the risk for invasive pneumococcal disease by two-to three-fold.

A 7-valent pneumococcal conjugate vaccine, (PCV), was licensed in 2000. PCV was designed to cover the seven serotypes most common in children; in fact, these serotypes account for



about 80% of invasive infections in children less than 6 years of age. Obviously, PCV covers fewer serotypes than the 23-valent polysaccharide vaccine. However, among the serotypes in PCV, it is more immunogenic than the polysaccharide vaccine. PCV elicits a T-dependent immune response that leads to anamnestic response on challenge and is effective in infants. The efficacy was 100% against invasive pneumococcal disease in the primary analyses of a large randomized, double-blind controlled trial conducted in California. In the follow-up analysis done 8 months later, the efficacy against invasive disease was 94 percent for serotypes included. No serious adverse reactions associated with PCV were reported. When given with DTaP but at another site, fever $\geq 38^{\circ}\text{C}$ occurred in 15% to 24% of those vaccinated with PCV compared to 9% to 17% of those receiving the control vaccine.

PCV is recommended for routine infant immunization.

For infants, the routine vaccine schedule is 2, 4, 6 and 12-15 months. The catch-up schedule varies by age and by presence of high risk medical conditions.



SCENARIO TWO

Rose, a 10-month-old who is new to your practice, is in your office for the first time in November for a cold. She is afebrile and you diagnose an upper respiratory tract infection. Her last visit to her previous physician was at 5 months of age for a cold.

Immunization history: Her parents are not sure which vaccines she received previously, but they know that she has received some vaccines. A vaccination record was faxed to your office showing receipt of the first dose of hepatitis B vaccine at 1 day of age; at 3 months of age she received the first dose of diphtheria and tetanus toxoid and acellular pertussis vaccine (DTaP), the first dose of *Haemophilus influenzae* type b (Hib) conjugate vaccine, a dose of inactivated poliovirus vaccine (IPV), and a dose of pneumococcal conjugate vaccine.

Rose's mother is pregnant with her second child.

- **Learning Aids**

1. *General Recommendations on Immunization: Recommendations of the Advisory Committee on Immunization Practices (ACIP)*; sections: Table 1, Recommended and Minimum Ages and Intervals Between Vaccine Doses (p. 3), Simultaneous Administration (pp. 4-5), Lapsed Vaccination Schedule (p. 8), and Table 5: Guide to contraindications and precautions to commonly used vaccinations (pp. 9-10). <http://www.cdc.gov/mmwr/PDF/rr/rr5102.pdf>
2. *Recommended Childhood and Adolescent Immunization Schedule – United States* (current year, including footnotes and catch-up schedule) <http://www.cdc.gov/nip/recs/child-schedule.htm> or shots software for PDA.
3. Table 2, Recommended Injection Routes, Needle Gauge and Needle Length, Based on Patient Characteristics on following pages.

- **Questions for Learners**

1. Which vaccinations are due today?
2. Are any of these vaccines contraindicated today? If so, why and which ones? If not, why not?
3. Rose had a 10-month lapse since her first hepatitis B vaccination. How many doses does she need now? Does Rose need to restart this or any of the vaccination series?
4. By what route and site should the vaccines be given?
5. When should her next (second) appointment be scheduled? What vaccines should be administered at that visit? What is the minimal interval between doses of these vaccines?
6. If she comes for the second visit at the recommended time and is appropriately vaccinated, when should she next return, and for which vaccines?

Table 2

Recommended Injection Routes, Needle Gauge and Needle Length, Based on Patient Characteristics

Vaccines	Injection Route	Needle Size	Patient Characteristics (Age)	Needle Length (inches)	Administration Site
DTaP DT Hepatitis A Hepatitis B Hib Influenza inactivated Pneumococcal conjugate vaccine Pneumococcal polysaccharide vaccine* Td Rabies vaccine	Intramuscular	22 to 25 gauge	Infants	7/8 to 1	Anterolateral thigh
			Toddlers (≥12 months) and adolescents	1	Anterolateral thigh (if deltoid muscle mass inadequate)
				7/8 to 1.25	Deltoid (if adequate muscle mass)
			Adults	1 to 1.5	Deltoid
IPV* MMR Varicella vaccine Pneumococcal polysaccharide vaccine*	Subcutaneous	23 to 25 gauge	Infants	5/8	Fat of anterolateral thigh or upper arm (triceps)
			Toddlers and adults	5/8	Fat of upper arm (triceps region)

Modified from Middleton DB, Zimmerman RK, Mitchell KB: Vaccine Schedules and Procedures, 2001. *J Fam Pract* 2001; 50:S44. Copyright STFM, used with permission.

*pneumococcal polysaccharide vaccine and IPV can be given either IM or SQ; most authorities recommend the SQ route for IPV.



SCENARIO THREE

Rhonda is a 25-month-old who comes into the Health Center in November for a routine follow-up visit for reactive airways disease. She receives cromolyn three times per day; albuterol is added when she has symptoms. She has a history of four hospitalizations for reactive airways disease and bronchopulmonary dysplasia. She received a 16-day course of daily oral corticosteroids 5 months ago during an exacerbation of her lung disease. Her vaccination record reveals that the third dose of DTaP, the second dose of IPV, and the third dose of hepatitis B vaccine were given at 11 months of age; Measles-mumps-rubella vaccine (MMR) and the last dose of Hib were given at 15 months of age. She does not have a history of varicella. She currently is on Day 8 of a 10-day course of antibiotics for otitis media and is no longer symptomatic. She lives with her mother and a brother who has hemophilia and developed HIV infection from a transfusion.

- **Learning Aids**

1. *General Recommendations on Immunization: Recommendations of the Advisory Committee on Immunization Practices (ACIP)*; sections: Table 1: Recommended and minimum ages and intervals between vaccine doses (p.3), Table 5: Guide to contraindications and precautions to vaccinations (pp. 9-10) Altered Immunocompetence (p. 22), and Corticosteroids (p. 23). <http://www.cdc.gov/mmwr/PDF/rr/rr5102.pdf>
2. *Recommended Childhood and Adolescent Immunization Schedule – United States* (current year). <http://www.cdc.gov/nip/recs/child-schedule.htm>
3. Abstract 4

- **Questions for Learners**

1. What vaccinations does Rhonda need?
2. Rhonda's mother refuses to let her have more than three injections at one time. Which vaccination(s) would you defer until the next visit? When should she return for that visit and for which vaccines?
3. Are any vaccines contraindicated? What is the impact of the history of oral steroids?
4. What dosage of influenza vaccine should be given?



- **Abstract 4**

Influenza and pneumococcal vaccines.**Zimmerman, RK.**

Inactivated influenza and pneumococcal vaccines are recommended for persons who are at risk for complications from these diseases. Both vaccines are recommended for persons with chronic pulmonary or cardiovascular diseases. Inactivated influenza vaccine is recommended for persons with asthma. Both are also recommended for persons with chronic metabolic disease (including diabetes mellitus), renal dysfunction, or immunosuppressive diseases (including HIV). Pneumococcal vaccines are recommended for persons with anatomic or functional (e.g., sickle cell disease) asplenia. Inactivated influenza vaccine is recommended for persons with hemoglobinopathies and children <19 years of age who are on long-term aspirin therapy (due to the possibility of Reye syndrome should they contract influenza). Persons who are household contacts of chronically ill persons should receive influenza vaccine yearly to reduce the likelihood that they will transmit influenza to the ill person.

The dose of inactivated influenza vaccine is 0.5 mL IM except for children 6 months through 35 months old who should receive 0.25 mL IM. Previously unvaccinated children <9 years of age should receive two doses, at least 1 month apart, in the first year that they receive influenza vaccine.

Pneumococcal conjugate vaccine is recommended for all infants and for catch-up of high risk children who were not previously vaccinated. In addition, children with a high risk condition may also need pneumococcal polysaccharide vaccine at age ≥ 2 years (see Table to right).

↓
Schedule for follow-up vaccination using 23-valent polysaccharide vaccine (PPV) for children ≥ 2 -years-old who previously received the 7-valent conjugate vaccine (PCV).

Population	Schedule for follow-up with PPV for children ≥ 2 years of age	Revaccinate with PPV?
<ul style="list-style-type: none"> • Healthy Children 	None§	No
<ul style="list-style-type: none"> • Children with sickle cell disease or anatomic or functional asplenia • Immunocompromised (e.g. renal failure or leukemia) • HIV-infected 	1 dose of PPV at age > 2 years and ≥ 2 months after last dose of PCV	Yes‡
<ul style="list-style-type: none"> • Chronic illness (e.g., diabetes mellitus, cerebrospinal fluid leaks, chronic bronchopulmonary dysplasia, or cyanotic congenital heart disease) 	1 dose PPV at age ≥ 2 years and ≥ 2 months after last dose of PCV	Not Recommended

Adapted from: Preventing Pneumococcal Disease Among Infants and Young Children: Recommendations of the Advisory Committee on Immunization Practices (ACIP), MMWR 2000;49(No. RR-9):25.

§ Health care providers of Alaska Natives and American Indians may wish to consider whether Native American children would benefit by the additional coverage provided by the expanded serotypes in 23-valent PPV.

‡ Regardless of when administered, a second dose of PPV should not be given earlier than 3 years following the previous PPV dose. If patient is aged > 10 years: single revaccination ≥ 5 years after previous dose. If patient is age ≤ 10 years: one revaccination 3-5 years after previous dose should be considered.

SCENARIO FOUR

Okmulgee Medical Center is a primary care office of a health maintenance organization. Dr. Kent, the medical center director, received a disturbing report indicating that the Center's vaccination rates are low: 62% overall for the 4:3:1:3:3 series. Physician-specific rates are 70% for Dr. Kent, 60% for Dr. Diamond, and 57% for Dr. Bloom. Furthermore, because the rates are lower than the HMO's average, the physicians in the Center will lose the \$5,000 quality bonus that they received last year. To clarify the problem, Dr. Kent conducted 75 chart audits, 25 from each physician. Infants were seen in the Center an average of five times in the first year of life. Two of these were for well-child care and three were for acute-care visits.

- **Learning Aids**

1. Figure 1
2. Abstract 5

- **Questions for Learners**

1. What are possible causes for low vaccination rates?
2. What can be done to raise the vaccination rates, i.e., what can be done to encourage parents to bring their children to the office according to schedule, and once children are at the office, what can be done to ensure that they receive the needed vaccinations?

Figure 1. Okmulgee Medical Center Chart Audit

Barrier	Number of Charts			
	Dr. Kent	Dr. Diamond	Dr. Bloom	Overall
Lack of simultaneous vaccination	2	3	3	8
Failure of vaccine during mild illnesses such as upper respiratory tract infections	13	17	16	46
Invalid contraindications such as family history of seizures	10	7	8	25
Number of charts with one or more of the previous barriers	17	18	18	53
Missed appointments for well-child care	15	17	18	50
Parental refusals	1	0	4	5

• **Abstract 5**

Office procedures to improve vaccination compliance.

Zimmerman, RK.

The procedures that are most important to improving vaccination rates are (1) evaluation of the practice's current vaccination rates, (2) problem solving, (3) goal setting, and (4) monitoring vaccination rates and provision of ongoing feedback to providers about vaccination rates.

The first step in developing a plan is evaluation of the practice's current vaccination rates. An evaluation is important since providers may overestimate vaccination rates and it may suggest particular barriers within the clinic. In one clinic audit, the vaccination barriers, in descending order, were gaps in patient attendance due to missed appointments, missed opportunities by physicians to immunize, and overly cautious interpretation of contraindications (*J Am Board Fam Pract* 1994;7:100-104).

The second step is problem solving. Physicians and staff can choose from the following strategies to custom design interventions that are suited for them and their patients: (a) during office visits, ask the office staff to routinely evaluate the vaccination status of patients prior to the physician's encounter with the patient. This can be done at the time of registration (perhaps with the aid of a computer) or by nursing personnel while obtaining vital signs. Colored stickers, checklists, or inked rubber stamps are practical ways to communicate the need for vaccinations. (b) Send reminder postcards to inform parents about needed vaccinations. Reminders have been shown to increase vaccination rates in a number of studies. (c) Write standing orders to allow nurses to administer routine vaccines without needing to get a new order for each patient. (d) Post updated copies of the schedules, vaccinations for high-risk persons, and checklists of valid contraindications in places readily accessible to office and medical staff. The Task Force on Community Preventive Services published a systematic review on ways to increase immunization rates. See their website at www.thecommunityguide.org.

The third step is setting a numerical goal. For instance, a goal could be that at least 90% of 2-year-olds would be fully vaccinated.

The final step is monitoring vaccination rates and giving feedback to providers. For instance, the percentage of 2-year-olds that are fully vaccinated can be graphed and displayed, allowing providers to compare their records with others. The physician/team that has the highest immunization rate can be awarded a prize. The impact of evaluation, competition, and feedback should not be underestimated—they are among the most important changes a practice can make to improve vaccination rates.

**SCENARIO FIVE**

Shasta, a 4-month-old infant, came to Dr. Johnson's office today at 11:30 am for a complete physical examination and vaccinations. The examination was entirely normal. The second doses of DTaP, Hib, PCV, and IPV were given. His mother called at 2:30 pm saying he had a temperature of 101.7°F (38.7°C) and was not eating well. She was instructed to administer acetaminophen and observe him. She called back at 4:45 pm indicating that he was limp and inactive. He was referred to the emergency department and found to be pale and listless. Physical examination showed a pale, inactive 4-month-old with a temperature of 102.6°F (39.2°C), decreased reaction to painful stimuli, and hypotonicity. Laboratory studies were normal. After 2 hours in the emergency department, he began to improve and started drinking from his bottle. He was sent home. The next day, the office nurse called his mother and found that he was active and playing.

- **Learning Aids**

1. *General Recommendations on Immunization: Recommendations of the Advisory Committee on Immunization Practices (ACIP)* sections: Contraindications and Precautions (pp. 8-11), Reporting of Adverse Events After Vaccination (p. 24), and Vaccine Injury Compensation Program (p. 25) <http://www.cdc.gov/mmwr/PDF/rr/rr5102.pdf>
2. Abstracts 6 and 7

- **Questions for Learners**

1. Which vaccine is most likely to have been responsible for the adverse events?
2. Should Shasta receive another dose of DTaP?
3. Do these adverse events need to be reported?
4. If Shasta's parents allege that vaccination caused a permanent injury, what could be done?

• **Abstract 6**

Hypotonic, hyporesponsive episodes.

Institute of Medicine (IOM) and the Centers for Disease Control and Prevention (CDC).

Shock or shock-like state, collapse, and hypotonic, hyporesponsive episodes (HHE) are terms that are used interchangeably in the literature to refer to an unusual reaction consisting of an acute diminution in sensory awareness or loss of consciousness accompanied by pallor and muscle hypotonicity. As described, the syndrome has its onset between 1 and 12 hours after immunization. Most children are initially irritable and febrile. They then become pale, limp, and unresponsive or hyporesponsive. Respirations are shallow and cyanosis is frequently noted. The duration can be as short as a few minutes and as long as 36 hours.

Incidence rates of HHE vary widely, from 3.5 to 291 per 100,000 whole-cell pertussis vaccinations. Two of the three controlled studies comparing children immunized with DTP or DT found no association between HHE and DTP compared with that between HHE and DT vaccine, and the other study found a significantly increased risk that the authors ascribed to the voluntary reporting system. A clinical presentation that could be classified as HHE has been widely observed and reported. Thus, the evidence for causality rests here on the typical clinical presentation that occurs within a few hours after administration of the vaccine.

The ACIP reports that HHE appears to be without sequelae. HHE has been reported following DTaP but appears to occur less frequently than after whole-cell DTP.

Modified from Howson CP, Howe CJ, Fineberg HV, eds. *Adverse Effects of Pertussis and Rubella Vaccines*. Washington, DC; National Academy Press; 1991: 171-177, and Update: vaccine side effects, adverse reactions, contraindications, and precautions—recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 1996;45(RR-12):1-35.



- **Abstract 7**

Adverse events from Hib, PCV and IPV.**Centers for Disease Control and Prevention (CDC). National Immunization Program.**

Adverse events to each of the four Hib conjugate vaccines are uncommon. Swelling, redness, and/or pain have been reported in 5% to 30% of recipients and usually resolve within 12 to 24 hours. Systemic reactions such as fever and irritability are infrequent.

Local reactions following PCV7 occur in 10%-20% of recipients. Fewer than 3% of local reactions are considered to be severe (e.g, tenderness that interferes with limb movement). Local reactions are more common with the fourth dose than with the first 3 doses. In one study, acellular pertussis vaccine (DTaP) was given at the same visit as the booster dose of PCV7. In this study, 11% of recipients had a temperature < 39°C. No serious adverse reactions attributable to PCV have been reported.

Minor local reactions (injection site pain and redness) may occur after IPV. No serious adverse reactions to IPV have been documented.

Modified from Centers for Disease Control and Prevention, National Immunization Program. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. 8th ed. 2nd printing. Atlanta, GA; Centers for Disease Control and Prevention; 2005. <http://www.cdc.gov/nip/publications/pink/default.htm>