



Infection Prevention and Control in Pediatric Ambulatory Settings

Committee on Infectious Diseases

Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of All Children

ABSTRACT

Since the American Academy of Pediatrics published a statement titled “Infection Control in Physicians’ Offices” (*Pediatrics*. 2000;105[6]:1361–1369), there have been significant changes that prompted this updated statement. Infection prevention and control is an integral part of pediatric practice in ambulatory medical settings as well as in hospitals. Infection prevention and control practices should begin at the time the ambulatory visit is scheduled. All health care personnel should be educated regarding the routes of transmission and techniques used to prevent transmission of infectious agents. Policies for infection prevention and control should be written, readily available, updated annually, and enforced. The standard precautions for hospitalized patients from the Centers for Disease Control and Prevention, with a modification from the American Academy of Pediatrics exempting the use of gloves for routine diaper changes and wiping a well child’s nose or tears, are appropriate for most patient encounters. As employers, pediatricians are required by the Occupational Safety and Health Administration to take precautions to identify and protect employees who are likely to be exposed to blood or other potentially infectious materials while on the job. Key principles of standard precautions include hand hygiene (ie, use of alcohol-based hand rub or hand-washing with soap [plain or antimicrobial] and water) before and after every patient contact; implementation of respiratory hygiene and cough-etiquette strategies for patients with suspected influenza or infection with another respiratory tract pathogen to the extent feasible; separation of infected, contagious children from uninfected children when feasible; safe handling and disposal of needles and other sharp medical devices and evaluation and implementation of needle-safety devices; appropriate use of personal protective equipment such as gloves, gowns, masks, and eye protection; and appropriate sterilization, disinfection, and antisepsis.

INTRODUCTION

Infection-prevention and -control practices have long been recognized as an important means of preventing transmission of infectious agents. In the ambulatory setting, the goal is to prevent transmission of infectious agents to patients and visitors, health care personnel, and other employees. Infection prevention and control should start at the time an ambulatory visit is scheduled and is important in every patient encounter. In general, the standards for infection prevention and control are the same in all health care delivery settings, whether inpatient or outpatient, hospital or freestanding ambulatory facility. Recommendations for infection-prevention and -control practices in hospitals are well documented and

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Key Words

infection control, infection prevention, respiratory hygiene/cough etiquette, isolation precautions, staff immunization

Abbreviations

AAP—American Academy of Pediatrics
SARS—severe acute respiratory syndrome
CDC—Centers for Disease Control and Prevention
OSHA—Occupational Safety and Health Administration
TST—tuberculin skin test
Tdap—adolescent-adult tetanus, diphtheria, and acellular pertussis
EPA—Environmental Protection Agency
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updated on a regular basis.¹⁻⁵ Because most patient encounters are with outpatients, the prevention of transmission of infection in ambulatory settings is critical.^{2,6,7} In addition to the risk of health care–associated infection during medical evaluation and treatment, the reception and waiting areas of ambulatory facilities present opportunities for transmission of infectious agents among patients and accompanying persons.⁸ Outbreaks of measles,^{9,10} tuberculosis,¹¹ hepatitis B and C,¹² airborne infections,⁹⁻¹¹ and other infectious diseases have been traced to ambulatory visits.^{6,13} Most disease outbreaks reported in ambulatory facilities were associated with nonadherence to recommended infection-prevention and -control procedures.¹³

This statement provides practical information that updates the 2000 American Academy of Pediatrics (AAP) policy statement¹⁴ regarding infection-prevention and -control procedures as applied to ambulatory medical settings. Major changes include the endorsement of routine use of alcohol-based hand rub for hand hygiene and, where feasible, the addition of respiratory hygiene/cough etiquette to standard precautions to decrease transmission of influenza and other respiratory tract pathogens; evaluation and implementation of safer medical devices designed to reduce the risk of needle sticks; use of 2% chlorhexidine gluconate/70% isopropyl alcohol-based solutions for skin antisepsis under certain circumstances; and immunization of health care personnel with appropriate vaccines, including influenza vaccine and a vaccine to protect adults against pertussis. Additional prevention and control recommendations not covered in this statement may be necessary for other ambulatory settings such as dialysis centers, chemotherapy centers, procedure suites (eg, for endoscopy), emergency centers, and outpatient surgery suites.⁶

MODES OF TRANSMISSION OF INFECTIOUS AGENTS

To understand infection-prevention and -control issues, modes of transmission of infectious agents should be considered.^{2,6,7,15} Transmission can result via direct contact (direct “contact transmission,” contact with body substances including blood, urine, stool, and respiratory tract secretions), when the infectious agent is transferred directly from an infected person to a susceptible person, or, more commonly, via indirect contact transmission, when the infectious agent is transferred through a contaminated intermediate object such as a stethoscope, a countertop, a door handle, or a person’s contaminated hands. Examples of pathogens transmitted via the contact route include gastrointestinal tract pathogens such as rotavirus and respiratory tract pathogens such as respiratory syncytial virus. Fomites such as toys and ambulatory facility equipment have been implicated in the transmission of some pathogens. Bloodborne pathogens can be spread via contaminated needles and other sharp instruments if recommended procedures to prevent ex-

posure to blood or blood-containing body fluids are not implemented and followed. Pathogens in respiratory tract secretions can be transmitted a few feet through the air via droplets (“droplet transmission”; eg, influenza virus, *Bordetella pertussis*, adenovirus, and severe acute respiratory syndrome [SARS]–related coronavirus) or become airborne in small-particle aerosols (“airborne transmission”; eg, rubeola [measles virus], varicella virus, and *Mycobacterium tuberculosis*) and be transmitted over longer distances and remain suspended in the air for a long period of time. Overall, contaminated hands are the predominant mode of transmission of infectious agents, which underscores the importance of appropriate hand hygiene (ie, use of alcohol-based hand rub or hand-washing with soap and water) before and after contact with each patient or his or her immediate environment.

GUIDELINES FOR PREVENTION OF TRANSMISSION OF INFECTIOUS AGENTS

As with hospitalized patients, health care personnel should observe standard precautions¹ with every patient encounter in the ambulatory setting. “Standard precautions” refers to a single set of precautions that should be followed for all patients regardless of their diagnosis or presumed infection status and is predicated on the principle that every patient may harbor an unrecognized infectious agent that can be transmitted by blood or body fluids or via their skin or mucous membranes (Table 1). Standard precautions are supplemented with transmission-based precautions² when additional measures are needed to reduce the risk of contact, droplet, or airborne transmission and may include the use of a mask (a procedure mask or surgical mask), a respirator (a special mask that requires individual-fit testing and education for safe and effective usage), gowns, gloves, and/or protective eyewear such as a face shield or goggles.

Hand Hygiene

Hand hygiene (ie, using an alcohol-based hand rub or washing with soap and water) is the single most important method of preventing transmission of infectious agents (Table 1).^{1,2,4,16-18} Use of an alcohol-based hand rub product in gel, rinse, or foam form is the preferred method of hand hygiene in most situations, because this method is convenient, acts rapidly, and is highly effective in inactivating microbes. Hands are decontaminated by using an alcohol-based hand rub and applying the product (using an amount recommended by the manufacturer) to the palm of one hand and rubbing the hands together, covering all surfaces of the hands and fingers, until the hands are dry.⁴ Alcohol-based hand rub should be used (or hands should be washed with soap and water) before and after each contact with patients; between dirty and clean procedures on the same patient; after removing gloves; and before and after performing

TABLE 1 Standard Precautions, as Recommended by the CDC for Hospitalized Patients and Modified by the AAP for Children, Should Be Used With All Patients

<p>Hand hygiene</p> <ul style="list-style-type: none"> ● Hands should be disinfected with an alcohol-based hand rub (or washed with plain or antimicrobial soap and water) before and after each patient encounter or an encounter with the patient's immediate environment. ● Hands and other body surfaces should be washed with soap (antimicrobial preferred, but plain is acceptable) and water if visibly soiled or contaminated with blood or other body fluids or if exposure to spores (eg, <i>C. difficile</i>) is likely to have occurred. ● Hands should be disinfected with an alcohol-based hand rub or washed with soap and water after removal of gloves. ● Barrier precautions to prevent skin and mucous membrane exposure ● Gloves should be worn for contact with blood, all body fluids, secretions and excretions, mucous membranes, nonintact skin, and items or surfaces contaminated with body fluids. Gloves need not be used for routine care of well children, including changing diapers and wiping the nose or eyes of children, except when required as part of contact precautions.^{14,19} ● Gloves should be worn when performing venipuncture and other vascular-access procedures. ● Gloves are not routinely required when administering injections, including immunizations, unless the person administering the injection is likely to come into contact with body substances or has open lesions on his or her hands. ● Appropriate masks and protective eyewear or face shields should be used during procedures that are likely to generate droplets of blood or body fluids. ● Fluid-impermeable gowns or aprons should be worn during procedures that are likely to generate splashes of blood or other body fluids. <p>Respiratory hygiene/cough etiquette: see Table 2 and text^{2,22}</p> <p>Handling of sharp instruments to minimize risk of injury: see "Prevention of Exposure to Bloodborne Pathogens by Needles and Other Sharp Instruments"</p> <p>Resuscitation equipment</p> <ul style="list-style-type: none"> ● Equipment should be available for use in areas in which the need for resuscitation is predictable. ● Mouth-to-mouth resuscitation should be avoided.

Source: Garner JS; Hospital Infection Control Practices Advisory Committee. *Infect Control Hosp Epidemiol.* 1996;17:53–80.

invasive procedures. Repetitive use of alcohol-based hand rubs can be less drying to skin than repetitive use of soap and water. Hands should be washed with soap and water instead of alcohol-based hand rub whenever they are visibly soiled or contaminated with blood or other body fluids, if exposure to spores (eg, *Clostridium difficile*) is likely to have occurred, before eating, and after using the toilet. For hand-washing, antimicrobial soap may be preferable to plain soap, because plain soap may fail to remove pathogens from the hands, and use of an antimicrobial soap results in a significantly lower bacterial count on the skin.⁴ Routine hand-washing should consist of the following steps: (1) wet hands with warm (not hot) water; (2) apply soap (plain or antimicrobial) to hands; (3) vigorously rub the hands together for at least 15 seconds, covering all surfaces of the hands and fingers; (4) rinse hands with warm water; (5) dry hands with a disposable towel; and (6) use the towel to turn off the faucet.⁴ Disposable towels are preferred for hand-drying and always should be available and within

easy reach by health care personnel. If used, hand lotions should be available in containers that are replaced frequently to avoid extrinsic contamination.¹⁶ Hand lotions should not be petroleum based, because petroleum can cause deterioration of latex material and thereby reduce the effectiveness of latex gloves.

Hand hygiene before performing invasive procedures should consist of prewashing with soap and water and thorough drying followed by use of an alcohol-based surgical scrub with persistent activity or washing with an antimicrobial soap, such as chlorhexidine or povidone iodine, for the length of time specified by the manufacturer (usually 2 to 6 minutes).⁴ In addition, fingernails need to be cleaned with disposable manicure sticks. Employees who perform direct patient care activities in practices that include immunocompromised patients at high risk of infection should keep their fingernails short and avoid wearing artificial fingernails and extenders, because these have been shown to harbor microorganisms that are not easily removed by hand hygiene.

Standard Precautions

Standard precautions include performing hand hygiene before and after every patient contact (Table 1).¹ Standard precautions require that gloves be available for use by all health care personnel and should be worn when contact with blood, body fluids, secretions, excretions, and items contaminated with these fluids is reasonably anticipated. However, the AAP modified standard precautions for well-child care by indicating that although hand hygiene should be performed, gloves do not need to be worn for routine procedures such as changing a diaper or wiping the nose or eyes of a well child except when required as part of contact precautions.^{14,19,20} Gloves are not required when administering vaccines unless the health care professional has open hand lesions or will come into contact with potentially infectious body fluids.^{21,22} When gloves are used, hand hygiene should be performed after gloves are removed, because contamination can occur during removal or from microscopic breaks in the glove.²³ A surgical-grade mask and face shield or protective eyewear, such as goggles, should be worn if splashing of body fluids is anticipated. Skin surfaces contaminated with blood or other body fluids should be washed immediately and thoroughly with soap and water.

The Centers for Disease Control and Prevention (CDC) added "respiratory hygiene/cough etiquette" to standard precautions to prevent transmission of influenza and potentially other pathogens that cause respiratory infection in reception areas, common waiting areas, and examination rooms in ambulatory facilities (Table 2).^{2,24} Full implementation of this strategy requires education of patients and accompanying persons, including visual alerts on covering the nose and mouth when coughing or sneezing and coughing and sneezing into

TABLE 2 Respiratory Hygiene/Cough Etiquette to Minimize Transmission of Influenza and Other Respiratory Tract Pathogens^{2,24}

1. Visual alerts for patients at the entrance to ambulatory facilities instructing patients and accompanying persons to inform staff of symptoms of a respiratory tract infection when they first register for care and to practice respiratory hygiene/cough etiquette
2. Components of respiratory hygiene/cough etiquette for patients and accompanying individuals with suspected respiratory virus infection
 - Cover the nose/mouth when coughing or sneezing; cough or sneeze into elbow rather than hand
 - Use tissues to contain respiratory tract secretions and dispose of them in the nearest waste receptacle after use
 - Perform hand hygiene (ie, use of alcohol-based hand rub, hand-washing with soap and water, or use of an antiseptic handwash) after having contact with respiratory tract secretions and contaminated objects/materials
 - If tolerated and feasible, consider providing a size-appropriate mask for the patient to wear to prevent respiratory droplet dispersal while in common reception and waiting areas^a
3. Components of respiratory hygiene/cough etiquette for staff
 - Educate patients and accompanying persons on the need for and components of respiratory hygiene/cough etiquette
 - In reception area, have tissues and no-touch receptacles for used tissue disposal available
 - If feasible, provide conveniently located, but out of reach of young children, dispensers of alcohol-based hand rub with instructions for use (or have a sink available with consistently available soap and disposable towels)
 - When space and chair availability permit, cluster chairs for a coughing patient and accompanying persons at least 3 feet away from other patients
 - Consider having masks available for distribution to symptomatic patients by staff
 - In addition to hand hygiene before and after patient contact, health care personnel should consider wearing a mask when examining an ambulatory patient with suspected influenza^a

In reception and common waiting areas of ambulatory facilities, implementation of some or all components of respiratory hygiene/cough etiquette should be considered for patients with suspected influenza or other respiratory tract pathogens. Influenza or another respiratory tract pathogen is suspected in patients with a new onset of cough or increased respiratory tract secretions, especially in the presence of fever.

^a The use of masks and eyewear protection is strongly recommended if human cases of avian influenza or SARS have been diagnosed in the community.

the elbow rather than hand, maintaining a separation of at least 3 feet between symptomatic patients and others in common waiting areas, availability of materials and facilities for performing hand hygiene, and the use of masks by patients with symptoms of influenza or other respiratory tract infection before being placed in an examination room. Health care personnel who examine such patients should observe droplet precautions that include the use of masks. The effectiveness of these strategies for reducing transmission of influenza or other respiratory pathogens in the ambulatory setting has not been evaluated, but both covering a cough or sneeze and wearing a mask have been shown to prevent dispersion of respiratory droplets into the air²⁵ and decrease transmission of *Streptococcus pyogenes*.²⁶ The use of these measures evolved from the experience during SARS outbreaks in which individuals in emergency departments who were not suspected of having SARS were the source of continued transmission. Although respiratory hygiene/cough etiquette was designed primarily to reduce transmission of influenza including pandemic influenza strains, it may also reduce transmission of other agents that cause respiratory infection. Some features of respiratory hygiene/cough etiquette may be difficult to implement. For example, in many ambulatory settings, supplying masks for patients with suspected respiratory tract infection may not be feasible, and ensuring effective use of these masks in young children may not be possible. However, implementation of some of the fea-

tures of respiratory hygiene/cough etiquette is likely to be more effective than no implementation. The individual ambulatory practice can determine whether to implement respiratory hygiene/cough-etiquette practices only during periods of increased prevalence of respiratory infections in the community or year-round.

Prevention of Exposure to Bloodborne Pathogens by Needles and Other Sharp Instruments

The following measures should be implemented to minimize risk of injuries by needles and other sharp instruments and of transmission of bloodborne pathogens to health care personnel or other patients:

1. Prepare a written policy for prevention of needle-stick injuries.
2. Educate personnel.
3. Implement a practice not to recap, bend, or break needles or remove needles from a syringe by hand.
4. Evaluate safer medical devices designed to reduce the risk of needle sticks with the input of staff members who use needles, and implement use of devices that are likely to improve safety. Evaluation (with input from staff members) and implementation of needle safety devices is a requirement of the Occupational Safety and Health Administration (OSHA) of the US Department of Labor²⁷ and a number of states.²⁸

5. Dispose needles into impermeable and puncture-proof needle-disposal containers that are available in areas where needles or other disposable sharps are used. Such containers should not be overfilled and should be out of reach of young children.
6. Prepare and follow policies consistent with state and local regulations for removal and incineration or sterilization.
7. Place reusable sharp instruments in puncture-resistant containers for transport to reprocessing areas.
8. Use a sterile, single-use, disposable needle and syringe for each injection given.
9. Preferentially use single-dose medication vials when medications are administered to more than 1 patient.
10. Develop a bloodborne pathogens exposure-control plan for management of contaminated-sharp-object injuries that includes written policies, is readily available to all staff, and is reviewed regularly. A workbook is available through the CDC²⁹ for designing, implementing, and evaluating a sharps injury-prevention program.

Transmission-Based Precautions

A mask is indicated and is adequate for protection of personnel from respiratory tract pathogens that are transmitted by respiratory droplets, such as influenza virus or *Bordetella pertussis*. However, OSHA guidelines require use of special particulate respirators (eg, National Institute for Occupational Safety and Health–approved N-95 or higher respirators) when caring for patients with infections such as pulmonary tuberculosis, which is transmitted via the airborne route in small-particle aerosols³⁰; use of these respirators requires medical screening, individual-fit testing, and education to ensure proper use. It is important not to confuse the use of a surgical or procedure mask with the use of a particulate respirator that may have a similar appearance to some masks. A need for use of such respirators in pediatric ambulatory facilities is uncommon, because almost all children with tuberculosis who are younger than 12 years are not contagious, although an adult with contagious tuberculosis may be in their household and may be accompanying them for their health care visit.³¹ Ideally, anyone suspected of having contagious tuberculosis should not be permitted in the ambulatory facility, because they pose a hazard to patients and staff. However, if an adult or adolescent suspected of having pulmonary tuberculosis is present in an ambulatory facility, a mask should be provided to and worn by that individual, and a referral should be made to a facility that is capable of appropriately isolating, evaluating, and treating tuberculosis.

General Health Considerations of Staff

As employers, pediatricians are required by the OSHA to institute procedures to protect staff from blood and other potentially infectious materials, including procedures to minimize the risk of sharp-instrument–related injuries and infections and to minimize exposure to tuberculosis while on the job. The OSHA has published bloodborne pathogen standards for protection of health care personnel from bloodborne agents.^{32,33} Guidance on compliance with OSHA regulations, including education of personnel, writing a bloodborne pathogen exposure-control plan, sharp injuries and prevention, tuberculosis exposure, emergency procedures, emergency preparedness, hazardous chemical safety, and general facility safety, can be found in the *OSHA Safety Program Manual* from the Medical Group Management Association³⁴ and a technical manual from the OSHA.³⁵

Management of Injuries by Needles and Other Sharp Instruments and Blood and Body-Fluid Contact

A written bloodborne pathogens exposure-control plan that includes written policies for management of contaminated-sharp-object injuries should be developed, readily available to all staff, and reviewed regularly. Policies for management of needle-stick injuries as described in Table 3 should address potential exposures to hepatitis B, hepatitis C, and HIV^{36,37} and should be understood by employees. OSHA requirements for management of sharps injuries and education of employees on the management of sharp-instrument–related injuries should be followed. Skin surfaces that are contaminated with blood or other body fluids should be washed immediately and thoroughly with soap and water. Health care personnel with direct contact with patients should receive hepatitis B immunization if they have not been immunized previously.

Personnel Illness

Health care personnel may pose a risk to patients and other personnel if they develop a communicable disease. Written policies, therefore, should exist regarding exclusion of staff members with contagious illnesses.³⁸ Recommended work restrictions for health care personnel with selected infections are listed in Table 4. Respiratory tract infections may not be a reason to exclude personnel, but precautions should be taken with an emphasis on hand hygiene before every patient contact, and use of a mask should be considered when having direct patient contact. The inability to contain secretions and control coughing and sneezing is an indication to exclude personnel from patient contact. In addition, symptomatic health care personnel should avoid contact with immunosuppressed patients.

TABLE 3 Management of Potential Occupational Exposure to Bloodborne Pathogens

A written policy should be developed, available, and followed.

Definition of exposure that might place health care personnel at risk of hepatitis B, hepatitis C, or HIV infection: A percutaneous injury (eg, needle stick or cut with a sharp object) or contact of mucous membrane or nonintact skin (eg, exposed skin that is chapped, abraded, or afflicted with dermatitis) with blood, tissue, or other body fluids that are potentially infectious. Body fluids that are potentially infectious include those contaminated with visible blood, semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, and amniotic fluid. Feces, nasal secretions, saliva, sputum, sweat, tears, urine, and vomitus are not considered potentially infectious for these pathogens unless they contain blood; the risk of transmission of these pathogens from these fluids and materials is extremely low.^{34,35}

The exposed employee should immediately follow these steps:

- Wash needle-stick site or cut with soap and water.
- If splashes to the nose, mouth, or skin occur, flush involved area with water.
- If splashes to the eye occur, irrigate eyes with clean water, saline, or sterile irrigants.
- Report the incident to your supervisor and immediately seek medical treatment.
- Document the type of injury including the involvement of blood, the source of the blood, and the extent of the injury (eg, deep injection, blood spill onto intact skin).

In all cases, the physician should:

1. Document the type of injury, including the involvement of blood.
2. Identify the source patient, if possible, and make a judgment of the likelihood that the source patient may have HIV, hepatitis B, or hepatitis C infection.
3. Have an established policy for management of an exposure such as that described below or an arrangement for immediate referral to a person or location with expertise in management of such exposures such as the emergency department of a specific hospital or the occupational health department of a large health care organization.
4. Ensure follow-up for the potentially exposed employee.
5. Ensure that all employees know how to access this policy.

Management includes the following steps:

Step 1: Determine the status of the source patient. If this is not possible, base actions on the likelihood of exposure considering source of needle and type of exposure.

If the source is known, obtain permission consistent with local statutes and determine the serologic status of the source for hepatitis B virus, hepatitis C virus, and HIV. FDA-approved methods for rapid testing for HIV antibody are available.

Step 2: Determine the immunity of the employee. Was hepatitis B vaccine received? Was the employee tested for HBsAg? If response to immunization is unknown, obtain blood to test for anti-HBsAg. Test for antibody to hepatitis C. Obtain consent and test for antibody to HIV.

Step 3: Hepatitis B—follow the steps outlined below for hepatitis B prophylaxis after percutaneous or permucosal exposure:

A. If exposed person is unimmunized against hepatitis

- Source HBsAg-positive: administer HBIG (0.06 mL/kg; maximum dose: 5 mL) intramuscularly and begin hepatitis B vaccine series.
- Source HBsAg-negative: begin hepatitis B vaccine series.
- Source not tested or unknown: begin hepatitis B vaccine series.

B. If exposed person was immunized and responded:

- No treatment is necessary.

C. If exposed person was immunized and did not respond:

- Source HBsAg-positive: HBIG immediately and in 1 mo or HBIG and initiate reimmunization.
- Source HBsAg-negative: no treatment.
- Source not tested or unknown: if high-risk source, consider HBIG or HBIG and HBV reimmunization as for HBsAg-positive source.

D. If exposed person was immunized and not tested for a response or response is unknown:

- Source HBsAg-positive: test exposed for anti-HBs; if positive, no treatment; if negative, 1 dose of HBIG and 1 dose of vaccine, retest exposed for anti-HBs 4 to 6 mo later.

Step 4: Consider prophylaxis against HIV.^{34,35} Antimicrobial prophylaxis should be initiated as soon as possible but within 24 h of exposure. Thus, clinicians in ambulatory settings should be prepared to prescribe and manage anti-HIV medications or arrange for urgent consultation with a specialist in the management of HIV infection who will also provide follow-up care of the employee. There are 2 postexposure HIV-prophylaxis regimens: the “basic regimen,” a 4-wk course of 1 of several regimens containing 2 anti-HIV drugs, and an “expanded regimen” containing 3 anti-HIV drugs for exposures with an increased risk of transmission.^{34,35}

Updated information can be found at AIDSinfo (<http://aidsinfo.nih.gov>) or the National HIV/AIDS Clinician’s Post Exposure Hotline (PEPline) at 1-888-448-4911. The PEPline provides consultation 24 h per day, 7 days per week for questions about managing occupational exposures to HIV, hepatitis B and C, and other bloodborne pathogens.

Step 5: Use this opportunity to educate the exposed person regarding risks of exposure, safe handling of sharps, immunization, standard precautions, and safe work habits.

Step 6: Repeat serologic testing for hepatitis C and HIV at 6 mo after potential exposure. Repeat serologic testing for hepatitis B (HBsAg and anti-HBs) at 6 mo if the exposed person was not previously documented to be anti-HBs-positive.

HBsAg indicates anti-hepatitis B surface antigen; HBIG, hepatitis B immunoglobulin.

Sources: Medical Group Management Association. *OSHA Safety Program Manual*. Englewood, CO: Medical Group Management Association; 2002; and Occupational Safety and Health Administration. Bloodborne Pathogens and needlestick prevention. Available at: www.osha.gov/SLTC/bloodbornepathogens/index.html.

Tuberculosis

In adults, screening for tuberculosis using a tuberculin skin test (TST) or a blood assay for *M tuberculosis* (eg, QuantiFERON-TB Gold test [Cellestis Limited, Carnegie, Victoria, Australia], which measures γ -interferon release by T cells after incubation of whole blood with 2 *M*

tuberculosis-specific antigens^{39,40}) should be performed before employment to ensure that persons with tuberculous infection are detected early and are treated. Employees with active pulmonary or laryngeal tuberculosis should be excluded from work until they are no longer contagious.^{13,41} A TST result is considered positive in a

TABLE 4 Work-Restriction Policies for Employees

Infection	Restriction	Length of Restriction
Conjunctivitis	Restrict from direct patient care	Until discharge resolves
Gastroenteritis	Restrict from direct patient care and food preparation	Until symptoms resolve or person is deemed noncontagious
Hepatitis A	Restrict from direct patient care	Until 1 wk after onset of jaundice
Hepatitis B	None ^a	
Hepatitis C	None ^a	
Herpes simplex		
Orofacial	None (cover lesion if feasible)	
Whitlow	Restrict from direct care of newborn infants	Until lesions are crusted
HIV	None ^a	
Measles	Exclude from ambulatory facility	Until 7 d after onset of rash
Mumps	Exclude from ambulatory facility	Until 5 d after onset of parotitis
Pertussis	Exclude from ambulatory facility	Until treated for 5 d with appropriate antimicrobial therapy
Rubella	Exclude from ambulatory facility	Until 5 d after onset of rash
Staphylococcal skin infection	Restrict from direct patient care	Until treated for 24 h with an agent active against the isolate
Streptococcal group A pharyngitis	Restrict from direct patient care	Until treated for 24 h
Tuberculosis, active	Exclude from ambulatory facility	Until proven noninfectious
Varicella	Exclude from ambulatory facility	Until lesions crusted (usually 6 d after the onset of rash)
Zoster	If lesions are covered, may have contact with patients (other than immunocompromised patients and newborns); if lesions cannot be covered, restrict from patient care	Until lesions crusted

^a Health care personnel with these infections should avoid performing procedures that are considered to be at risk for transmission of blood from health care personnel to a patient.

health care staff member who is otherwise healthy if the transverse diameter of the area of induration is at least 10 mm. For new employees with a negative TST and who have not had a TST within the past year, a 2-step TST (ie, use of a second TST 1–3 weeks after the initial skin test) is recommended, because it will boost the size of the induration in an individual with remote latent tuberculosis infection whose initial reading was less than 10 mm.⁴² For employees with an immunocompromising condition, such as HIV infection, or close contact with a person with active tuberculosis, induration of 5 mm is considered a positive result.⁴² If the TST result is positive, the employee is referred for evaluation and appropriate management. A blood assay for *M tuberculosis* is an acceptable alternative to a TST in adults, including health care personnel.^{39,40} In contrast to a TST, there is no need for a second test if the initial result is negative. For ambulatory settings classified as having low risk of tuberculosis transmission, additional screening of employees is not necessary unless an exposure to *M tuberculosis* occurs.⁴⁰

Staff Immunization

Policies should be established regarding immunization of employees, volunteers, students, and resident physicians against vaccine-preventable infections (Table 5).^{22,43} Immunization records should be maintained for all employees. Immunization with hepatitis B vaccine at no cost to the employee is mandated by the OSHA and must be offered to all persons whose job category, specified in the bloodborne pathogen exposure-control plan for the facility, indicates likely exposure to bloodborne pathogens.^{32,33} In 2005, a

trivalent vaccine for protection against tetanus, diphtheria, and pertussis designed for adolescents and adults (Tdap; Adacel, Sanofi Pasteur, Swiftwater, PA) was licensed for persons 11 to 65 years of age.⁴⁴ (A second Tdap vaccine, Boostrix [GlaxoSmithKline Biologicals, Rixensart, Belgium] has been licensed for use in persons 10–18 years of age.⁴⁴) Tdap is given instead of the tetanus-diphtheria booster to protect health care personnel and their patients from pertussis and provide protection against tetanus and diphtheria (Table 5). In 2006, the CDC recommended administering a single dose of Tdap to health care personnel with direct patient contact. This vaccine should be provided by the health care facility at no cost to the employee. Employees should be immunized against measles, mumps, rubella, and varicella unless immunity is documented by serologic testing or previous immunization or infection (Table 5). For the protection of health care personnel and their patients, the CDC also recommended that health care facilities provide influenza vaccine annually to all health care personnel at no cost to the employees.⁴⁵

Staff Education

At the time of orientation, all employees should receive and review information regarding infection-prevention and -control policies and procedures, including precautions for minimizing the risk of transmission of bloodborne pathogens. Annual education regarding the OSHA bloodborne pathogens standard is required.³³ Furthermore, regularly scheduled educational sessions for all staff members are important to ensure that the levels of hand hygiene and infection-prevention and -control

TABLE 5 Suggested Immunizations for Staff

All staff members should receive the following immunizations:

- MMR vaccine
 - All health care personnel born after 1956 should have received 2 doses of MMR vaccine. Ambulatory facility health care personnel often have contact with pregnant women; thus, it is optimal to ensure that all personnel are immune to rubella. Because birth before 1957 is only presumptive evidence of immunity to measles, mumps, and rubella, ambulatory facilities should consider recommending 1 dose of MMR vaccine for unimmunized workers born before 1957 who do not have a history of physician-diagnosed measles, mumps, and rubella or laboratory evidence of immunity to these viruses. Some experts recommend serologic screening for all employees to ensure immunity to measles, mumps, and rubella.
- Hepatitis B vaccine
 - Hepatitis B vaccine should be strongly recommended for any employee who may come in contact with blood. The OSHA requires that hepatitis B vaccine must be offered to all employees who may be at risk of bloodborne exposures on the basis of job categories determined by the organization's bloodborne pathogen exposure-control plan. If the employee refuses immunization, this should be documented in the employee's file; the OSHA declination form is useful for this purpose.
- Varicella vaccine
 - All employees should be questioned about a history of varicella. Employees with a negative or unknown history of disease who have not previously received 2 doses of varicella vaccine should be offered vaccine. Alternatively, employees with no history of disease or immunization can have a varicella antibody test performed, and vaccine can be offered to those who lack detectable varicella antibody. Adults require 2 doses of varicella vaccine separated by a minimum of 4 wk. If the employee has a medical contraindication to varicella vaccine or refuses immunization, this information should be placed in the employee's file.
- Influenza vaccine
 - Vaccine use should be strongly promoted and offered free of charge yearly to all employees. Employee education and the use of a declination form should be considered to enhance immunization rates.
- Adolescent-adult Tdap vaccine
 - This vaccine is recommended by the CDC for all health care personnel with direct patient contact. There should be a minimum of a 2-y interval between administration of Tdap and the most recent dose of Td vaccine.⁴³

MMR indicates measles-mumps-rubella; Td, tetanus-diphtheria.

Source: Centers for Disease Control and Prevention. *MMWR Recomm Rep*. 2004;43(RR-13):1–132.

awareness remain high.^{46,47} Policies for infection prevention and control should be written, available, read by staff, and enforced. All staff members should be aware of and motivated to follow these policies.⁴⁸

Communication With Local and State Health Authorities

State and local health authorities determine which diseases should be reported. Physicians and staff in ambulatory facilities must be aware of the rules and regulations in their municipalities. Policies and procedures for communication with local and state health authorities regarding reportable diseases and suspected outbreaks should be established while adhering to current regulations of the Health Insurance Portability and Accountability Act (HIPAA).⁴⁹

Minimize the Likelihood of Liability to Third Parties

A number of third-party liability cases involve infectious diseases (ie, cases alleging that a physician is liable for injury to others as a result of exposure to a contagious patient seen by the physician). A third party might include a family member or another close contact of a patient. Although some courts have concluded that there can be no liability without a physician-patient relationship, other courts have held that the physician has a duty to third parties if contact with the infected patient is "reasonably foreseeable." Third-party liability

can occur not only from failing to warn the third party but also from failing to diagnose the disease in the patient or negligently advising the third party that there was no danger of infection. Therefore, physicians should be aware of their potential responsibility to third parties and should enact and document appropriate measures to minimize such risks. These measures include (1) informing the patient about the contagious nature of the disease, including treatments, potential risk to third parties, and advice about preventing the spread of the infection, (2) learning the relevant communicable diseases—reporting statutes and complying with them (although reporting may not be sufficient to satisfy the physician's duty to protect the third party), and (3) informing the patient of any action the physician intends to take to protect third parties at risk of contact with the patient.⁵⁰

Ambulatory Facility Design, Procedures, and Patient Flow: Waiting and Reception Areas

Measures to prevent transmission of contagious infectious agents in ambulatory facilities that begin at the time the visit is scheduled should be developed and implemented. For example, during a telephone call request for an urgent visit for an ill child, the staff person should inquire whether the child has a skin rash. Parents of a child suspected of being contagious should register with the receptionist immediately on arrival; in some

cases, the child may be asked to use a separate entrance to avoid the waiting area and may be escorted directly into an examination room. Year-round (or during the winter season) and on the basis of recommendations from local public health departments and the CDC, travel- or symptom-based questions should be asked of patients/parents on arrival.⁵¹ Staff should question patients and parents to determine if the patient has a rash or symptoms of a respiratory infection or has been exposed to individuals with specific infections (eg, tuberculosis, pertussis, measles). On the basis of current recommendations from local public health departments and the CDC, patients should be questioned about recent travel (eg, to countries with avian influenza infection or SARS-related coronavirus infection)⁵¹ that might signify that the patient or an accompanying person has a contagious infection (Table 2). Signs should be displayed prominently at the entrance and reception areas with (1) instructions to patients and parents to notify staff immediately if the patient has a rash or symptoms of a respiratory infection or has been exposed to individuals with specific infections (eg, tuberculosis, pertussis, measles, varicella) and (2) instructions on implementing respiratory hygiene/cough etiquette (such as those prepared by the CDC^{52,53}).

Waiting rooms and reception areas offer the opportunity for child-to-child interaction with concomitant child-to-child transmission of infectious agents. Waiting rooms are comparable with child care settings, where contamination of the environment and transmission of infectious agents occur at an increased rate compared with the home setting. Efforts should be made to limit transmission of infectious agents by designing waiting areas as multiple smaller rooms if possible, avoiding crowding, shortening waiting times, and minimizing the sharing of toys. To the extent feasible, respiratory hygiene/cough-etiquette guidelines (Table 2), including the use of tissues and hand-hygiene products (which should be supplied by the ambulatory facility), should be followed by children and adults with respiratory tract symptoms. Infected children who are symptomatic should be segregated from well children as quickly as possible. However, no studies document the need for, or benefit of, separate waiting areas for well and ill children.⁸ Sick adults should be discouraged from spending time in waiting areas. Pathogenic bacteria have been recovered from toys in ambulatory waiting areas,⁵⁴ and contaminated bath toys have been implicated in an outbreak of *Pseudomonas aeruginosa* infection in a hospital.⁵⁵ A suggestion can be made to parents to bring along their child's personal book and toys for the office visit to minimize sharing of toys. Toys in ambulatory facility reception and waiting areas should be disposable or washable and of appropriate sizes and shapes to avoid aspiration or other injuries. Furry toys are less desirable because of the inability to clean them.⁵⁴ The value of

antibacterial agents incorporated within toys is unproven. Ideally, toys should be cleaned between uses to avoid transfer of infectious agents.⁵⁶ Toys contaminated with body fluids should be removed until cleaned. Toys should be cleaned by washing with soap and water and then disinfecting (using a freshly prepared 1:100 dilution of household bleach or a product that meets the standards of the Environmental Protection Agency [EPA] for "hospital-grade" germicide that is nontoxic for children), rinsing, and air drying or by cleaning in a dishwasher that is designed for sanitizing dishes. Although smooth surfaces that are able to be scrubbed have not been demonstrated to have an infection-control advantage over carpeting and cloth upholstery, it may be prudent to use such materials in waiting areas because of their ease of cleaning and maintenance.

Sterilization, Disinfection, and Antisepsis

Sterilization completely eliminates or destroys all forms of microbial life, including spores. Disinfection reduces, but does not eliminate, the microbial burden. The extent of disinfection depends on the type of disinfectant and its concentration, the resistance of the microbes, contact time, and amount of organic material. Cleaning with detergent to remove organic material from medical instruments and other devices is a prerequisite to sterilization and disinfection. Antisepsis refers to the process used to decontaminate the skin of a patient or health care professional.

All patient care equipment should be cleaned at least daily while in use or when visibly contaminated and should be stored where it will not become contaminated. Reusable equipment having contact with mucous membranes requires high-level disinfection, whereas instruments that penetrate skin or sterile body cavities must be sterile (Table 6).⁵⁷⁻⁵⁹

Sterilization

Sterilization is accomplished by exposure to high-temperature steam, dry heat, or chemical sterilizing agents.^{57,59} Items must be cleaned manually with soap and water to remove organic debris before autoclaving. Steam autoclaving uses distilled water that must reach a temperature of 121 to 132°C. The time for exposure of items and temperature depend on the type of sterilizer and what is being sterilized. Dry-heat sterilization in an oven is used only for items that cannot be sterilized by autoclaving. The oven temperature should be 170°C for an exposure time of 1 hour. For sterilizing specific instruments, the manufacturer's instructions must be followed. Unwrapped instruments should be used immediately or aseptically transferred to a sterile container.

A chemical indicator should be included with the equipment to be sterilized to ensure that sterilization has occurred. Instrument indicators ensure that a machine reaches the correct temperature and pressure. Chemical

TABLE 6 Sterilization, Disinfection, and Antisepsis

Instrument	Level of Disinfection	Methods (Examples)
Critical instrument or device: any instrument that enters tissue (eg, needles, surgical instruments, urinary catheters, some semicritical items)	Sterilization	Steam, low-temperature gas plasma, immersion in liquid chemical sterilants, ethylene oxide gas
Semicritical instrument or device: any instrument that contacts mucous membranes but does not enter tissue (eg, laryngoscope)	High-level disinfection	Wet pasteurization at 70°C for 30 min, chemical sterilants, liquid-chemical high-level disinfectants (eg, >2% glutaraldehyde, 0.55% ortho-phthalaldehyde [OPA], 7.5% hydrogen peroxide alone or in combination with peracetic acid)
Noncritical instruments or devices: instruments that touch only intact skin (eg, stethoscopes, blood pressure cuffs), including those with visible blood	Intermediate-level disinfection	1:50 dilution of sodium hypochlorite (1000 ppm of chlorine), 70%–90% isopropyl and ethyl alcohol, phenolic germicidal detergent solution, iodophor germicidal detergent solution
Environmental surfaces: knobs, handles, carts, or tabletops (with no visible blood)	Soap and water or low-level disinfection	EPA-approved disinfectants labeled for use against hepatitis B virus and/or tuberculocidal activity (eg, quaternary ammonium compounds), 1:500 dilution of sodium hypochlorite (100 ppm of chlorine)

Sources: Merriman E, Corwin R, Ikram R. *Br J Gen Pract.* 2002;52:138–140; Buttery JP, Alabaster SJ, Heine RG, et al. *Pediatr Infect Dis J.* 1998;17:509–513; and Geyer SA. *J Healthc Mater Manage.* 1986;4:52–53.

indicators are useful in showing that the wrapped package has been through the sterilization process. Biological indicators are necessary to ensure sterility. The procedure recommended by the manufacturer to document that sterility has been achieved should be performed at least weekly, and results should be recorded.

Packs that have been sterilized should be appropriately identified and stored in clean, dry areas to minimize recontamination. As long as the integrity of the sterile packaging is clean and intact, studies have shown that sterility of the product has no expiration date. Written policies and procedures for sterilization should be prepared, distributed to staff, and reviewed at regular intervals to be sure that policies are followed.

Disinfection

For this statement, the terms for disinfection are taken from the standards for sterilization, disinfection, and antisepsis used in hospitals.^{57,59} High-level disinfection is used for instruments that have had contact with mucous membranes or nonintact skin. High-level disinfection is most often achieved by using liquid chemicals. Chemical disinfection is accomplished with several chemicals or combination of chemicals, including glutaraldehyde, 0.55% ortho-phthalaldehyde, or stabilized hydrogen peroxide (a combination of hydrogen peroxide and peracetic acid). The solution should be prepared according to manufacturer instructions and applied for the specified contact time, which varies with the chemical and the concentration. Activated glutaraldehyde solutions are used most commonly; however, these products have potential toxicity if proper ventilation is not ensured. After disinfection, instruments are rinsed with sterile water, dried, and stored in a clean, dry place to avoid extrinsic contamination.

Intermediate-level disinfection is accomplished with

70% ethyl or isopropyl alcohol, iodine and iodophors, or a 1:50 dilution of sodium hypochlorite.

Low-level disinfection is appropriate for equipment that does not touch mucous membranes; examples include bedpans, blood pressure cuffs, crutches, stethoscopes, and tabletops. Low-level disinfectants include phenolic compounds, quaternary ammonium compounds, and a 1:500 dilution of sodium hypochlorite.

Written policies and procedures for disinfection should be prepared, distributed to staff, and reviewed at regular intervals to be sure that policies are being followed.

Antisepsis

Antiseptics are chemical agents intended for use on skin or tissue. Skin-preparation agents include isopropyl alcohol, chlorhexidine gluconate, iodine, and iodophors. The preferred skin-preparation agent for immunization and venipuncture for routine blood collection (except obtaining blood for culture) is 70% isopropyl alcohol. Most skin-preparation agents must be allowed to dry before surface bacteria are killed. For children 2 months and older, a preparation that contains 2% chlorhexidine gluconate/70% isopropyl alcohol is the preferred skin-preparation agent for invasive procedures, including placement of central venous catheters. Tincture of iodine and povidone iodine are acceptable alternatives, may be used for infants younger than 2 months, and are routinely used for obtaining blood for culture. Contamination of antiseptics has been associated with outbreaks of infections and pseudoepidemics attributable to false-positive blood cultures.⁶⁰ To prevent contamination, bottles of antiseptics should be dated, should not be refilled, and should be inspected and discarded if not used within 28 days after opening. Alcohol pads, chlorhexidine gluconate, and iodine products prepared in single-use pack-

aging are available and eliminate the need for multiple-use bottles of these antiseptics.

General Housekeeping

All areas in ambulatory facilities should be cleaned on a regular basis and kept visibly clean. Examination rooms and frequently used equipment should be cleaned daily. Surfaces in examination rooms and patient waiting areas should be cleaned with a detergent and low-level disinfectant such as a disinfectant-grade quaternary ammonium compound "registered" by the EPA (ie, EPA approved). Linoleum and sealed wood floors are optimal floor surfaces, because they can be cleaned without difficulty. Furniture made of nonporous materials offers a similar advantage compared with furniture with cloth upholstery.

Spills and Environmental Contamination

Contaminated environmental surfaces should be cleaned with a detergent and then treated with a freshly prepared (ie, within the past 24 hours) 1:100 dilution of household bleach with contact time of at least 1 minute or a proprietary germicidal product on the EPA's list E (registered antimicrobial products effective against *M tuberculosis*, human HIV-1, and hepatitis B virus; see www.epa.gov/oppad001/chemregindex.htm). For spills with blood or body fluids contaminated by blood, visible organic matter should be removed with absorbable material (eg, paper towels) and discarded into a leak-proof, properly labeled container before cleaning and decontaminating. Chlorine, the active agent in household bleach, can be inactivated by blood and other organic material, and full-strength solution or a 1:10 dilution is required if the surface is not cleaned before disinfection. Gloves should be worn during cleaning.³

Examination Rooms

Each examination room in a pediatric ambulatory care setting should have a sink and alcohol-based hand rub. Properly functioning sinks, ideally with faucets that operate in a "hands-free" manner, with adjacent soap dispensers (with plain or antimicrobial soap) and disposable towels or dispensers with alcohol-based hand rub, should be located conveniently in all patient care areas. Installation of solid-surface sinks with continuous countertops and backsplashes may offer fewer opportunities for water trapping in seams. Soap should generally be in liquid form in pump dispensers that are designed to minimize the risk of extrinsic contamination. Bar soaps are less desirable, because bars frequently are wet and easily contaminated with potential pathogens; if used, small bars of soap and soap racks that facilitate drainage and drying of the soap should be used. Faucet aerators should be avoided, because they often become contaminated by *Pseudomonas* species and other waterborne organisms.

Equipment that makes physical contact with the patient should be cleaned after each use. Although furniture in the room generally is not a major concern for transfer of infectious agents, contamination of the examining table can be a problem. Covering the table with disposable paper or linen, which is changed between patients, decreases the risk of transmission of microbes. More-thorough cleaning should be performed if contamination, such as soiling from a diaper change, is visible. In such cases, a detergent should be used to remove visible soil followed by application of a freshly diluted solution of household bleach (1:100) applied for 1 minute to disinfect the surface, rinsing with water, and allowing to dry or using an EPA-approved low-level disinfectant disposable wipe indicated to inactivate *M tuberculosis* and/or hepatitis B virus. If reusable patient linens/gowns are used, they should be handled in a manner that minimizes contamination of the environment. Soiled linens should be contained or placed in a soiled linen bag at the point of use.³ Provision should be made for the laundering of soiled linen.

Rest Rooms

Rest rooms for use by staff and patients should be cleaned daily and whenever visibly soiled. A diaper-changing area with disposable paper and a closed receptacle for soiled diapers and paper should be provided in at least 1 rest room.

Air Flow

Certain infections, including varicella, measles, and tuberculosis, are transmitted by the airborne route. Unfortunately, the number of air exchanges in buildings that house ambulatory facilities often is low, and the air is recirculated frequently.

Physicians should be aware of air-flow patterns to limit transmission of airborne pathogens. Special arrangements are recommended for patients who are considered to be contagious with an airborne pathogen, including (1) making efforts to see these patients at the end of the day, (2) placing a mask on the patient and quickly triaging these patients out of common waiting areas, and (3) closing the door of the examination room and limiting access to the patient by visitors and staff members who are not immune to the suspected disease. In some practices, it may be feasible for the clinician to perform a "car visit" by evaluating the patient in the family car in the parking area of the ambulatory facility. The duration of time that airborne pathogens remain in a room depends on air-exchange rates. For example, in hospitals where air-exchange rates are 6 to 8 per hour, several air exchanges occur within 30 minutes. Recommended air-exchange rates depend on the stated use of a room. Recommendations and guidelines for design and construction of hospitals and health care facilities are made by the American Institute of Architects and the

Facility Guidelines Institutes with guidance from the US Department of Health and Human Services.⁶¹ These guidelines have been adopted in whole or in part as regulations in nearly all states and enforced by the Joint Commission (formerly called the Joint Commission on Accreditation of Healthcare Organizations). Another nonregulatory resource is the American Society of Heating, Refrigerating and Air-Conditioning Engineers. The current recommended air-exchange rate for a medical examination room is 6 air changes per hour, with 2 outside air exchanges per hour.

Diagnostic and Personal Equipment

The role of stethoscopes and other examining devices in transmitting infectious agents is unclear; however, studies have shown that stethoscopes can be contaminated with viral and bacterial agents, including bacteria that are resistant to multiple antimicrobial agents. A reasonable means of decreasing contamination is to wipe the bell and diaphragm of the stethoscope as well as the handle and body of otoscopes or ophthalmoscopes regularly, and whenever they become soiled, by using an EPA-approved disinfectant wipe labeled to be effective against hepatitis B or a 70% isopropyl alcohol wipe. Ear curettes, if not disposable, should be cleaned with 70% isopropyl alcohol after each use and, if grossly contaminated by blood/body substances, should be cleaned and then disinfected by using a sodium hypochlorite solution.

In most cases, blood pressure cuffs are placed on intact skin; therefore, the risk of transmission of infectious agents with their use is minimal. These reusable cloth cuffs should not be placed in direct contact with damaged or nonintact skin.

Whenever economically and medically feasible, disposable supplies should be used. Electronic thermometers have single-use shields, but care must be taken to avoid contaminating the housing of the thermometer. The "box" and the probe handle should be wiped with a low-level EPA-approved disinfectant whenever soiled. Care should be taken to avoid contamination of pulse-oximetry and tympanometry equipment with any body secretions, and equipment should be cleaned according to manufacturer recommendations after each use. Other equipment, such as electrocardiography machines and Denver Developmental Testing kits (Denver Developmental Materials Incorporated, Denver, CO), should be cleaned and disinfected with an intermediate-level disinfectant whenever they become soiled or contaminated by patient secretions.

Ballpoint pens, patient charts, computer mice and keyboards, and personal digital assistant devices can be contaminated with infectious agents that can be transmitted by hands to other environmental sources. Because these items are not cleaned after each use, hand hygiene before and after contact with the patient or

immediate environment is necessary to minimize the potential transfer of bacteria and viruses from equipment to patients. A daily cleaning schedule that includes use of an EPA-approved low-level disinfectant is recommended for such items as computer mice and keyboards, blood pressure cuffs, and other commonly touched items in the patient's environment.

Disposal of Medical Wastes

The federal OSHA standards, as well as local and state regulations, dictate the proper disposal of medical wastes including dressings, needles, sharps, and body-fluid samples.^{3,62} All physicians should be aware of the policies in their state and municipality and ensure that regulated wastes are disposed of appropriately. Basic principles include defining which items constitute infectious waste and which do not; appropriately separating, labeling, storing, and transporting items in these 2 categories; instructing staff on how to handle infectious waste; and developing plans for managing spills and inadvertent exposures.

Judicious Use of Antimicrobial Agents and Antimicrobial-Resistant Bacteria

Another aspect of infection prevention and control is diagnosis of infection and institution of antimicrobial therapy when indicated. Inappropriate use of antimicrobial agents in hospitals and ambulatory settings has contributed to the emergence of antimicrobial-resistant microorganisms. The CDC and the AAP have provided guidelines for the judicious use of antimicrobial agents.⁶³⁻⁶⁹

Guidelines have been published for isolation and precautions for hospitalized children and adults who acquire resistant flora.⁷⁰⁻⁷² Patients may continue to harbor antimicrobial-resistant bacteria as part of their skin, respiratory tract, or gastrointestinal tract flora. These organisms include methicillin-resistant *Staphylococcus aureus*, vancomycin-intermediately susceptible *S aureus* (glycopeptide-intermediately susceptible *S aureus*), vancomycin-resistant *Enterococcus* species, and extended-spectrum β -lactamase-producing and other multiply resistant Gram-negative bacteria. Many patients harboring these bacteria will not be identified, because the bacteria may not cause symptoms. Hand hygiene before and after contact with colonized children with or without the use of gloves is appropriate; no guidelines for management of these patients in ambulatory settings have been published. However, these resistant bacteria could contaminate the environment; thus, if a patient is known to have been infected or colonized with multidrug-resistant bacteria and has a draining wound or is in diapers, contact precautions may be beneficial, hand hygiene should be performed with an alcohol-based hand rub or washing with antimicrobial soap and water, and surfaces

in the examination room with which the patient had contact should be disinfected.

SUMMARY OF INFECTION-PREVENTION AND -CONTROL POLICIES (SEE APPENDIX FOR DESCRIPTION OF EVIDENCE CATEGORIES)

1. Written policies and procedures concerning infection prevention and control should be developed, incorporated into the ambulatory practice safety program, available at all times to office staff, and reviewed at least every 2 years (categories IB and IC).
2. Educational programs for staff concerning infection prevention and control should be implemented, reinforced, and evaluated on a regular basis (category IB).
3. Staff should receive influenza immunization annually and be immunized against or show documentation of immunity to other vaccine-preventable infections, including pertussis, measles, mumps, rubella, varicella, and hepatitis B, that can be transmitted in an ambulatory setting (categories IB and IC).
4. All health care personnel should perform hand hygiene by using an alcohol-based hand rub or hand-washing with soap (plain or antimicrobial) and water before and after patient contact or contact with the patient's immediate environment (category IA).
5. Standard precautions (Table 1) should be used in every interaction with a patient (categories IB and IC).
6. In waiting rooms of ambulatory facilities, use of some or all components of respiratory hygiene/cough etiquette should be considered for patients and accompanying persons with suspected respiratory infection (category II).
7. Patients with potentially contagious diseases and immunocompromised children should be promptly triaged. Contact between contagious children and uninfected children should be minimized. Policies to deal with children who present with highly contagious infections, such as varicella, measles, pertussis, influenza, and mumps, should be devised and implemented (category IB).
8. Alcohol is preferred for skin antisepsis before immunization and routine venipuncture. Skin preparation for incision, suture, and collection of blood for culture requires either 2% chlorhexidine gluconate/70% isopropyl alcohol-based solutions (for children older than 2 months) or iodine (1% or 2% tincture of iodine, 2% povidone iodine) (category IB).
9. Physicians should be aware of requirements of government agencies, such as the OSHA, as they relate to the operation of ambulatory facilities (category IC).
10. Needles and sharps should be handled with great care. Needle-disposal units that are impermeable and puncture-proof should be available next to the areas used for injection or venipuncture. The containers should not be overfilled and should be kept out of reach of young children. Procedures should be established for removal and incineration or sterilization of contents. Needle devices with safety features should be evaluated periodically with input from staff members who use needles, and use of devices that are likely to improve safety should be implemented (categories IA and IC).
11. A written bloodborne pathogens exposure-control plan that includes written policies for management of contaminated-sharp-object injuries should be developed, readily available to all staff, and reviewed annually (category IC).
12. Standard guidelines for sterilization, disinfection, and antisepsis should be followed (category IC).
13. Policies and procedures should be developed for communication with local and state health authorities regarding reportable diseases and suspected outbreaks (category IC).
14. Antimicrobial agents should be used appropriately, and standard precautions (Table 1) should be observed to limit the emergence and spread of antimicrobial-resistant bacteria (category IB).

APPENDIX: EVIDENCE-BASED GUIDELINES CATEGORIES

CDC Healthcare Infection Control Practices Advisory Committee (HICPAC) guidelines^{2,4} were used for categorizing the evidence base for each recommendation. Each recommendation is categorized on the basis of existing scientific data, theoretical rationale, applicability, and economic impact. The CDC/HICPAC system for categorizing recommendations is as follows:

Category IA. Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiologic studies.

Category IB. Strongly recommended for implementation and supported by certain experimental, clinical, or epidemiologic studies and a strong theoretical rationale.

Category IC. Required for implementation, as mandated by federal or state regulation or standard.

Category II. Suggested for implementation and supported by suggestive clinical or epidemiologic studies or a theoretical rationale.

No recommendation. Unresolved issue; practices for

which insufficient evidence or no consensus regarding efficacy exist.

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