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

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Infection Prevention and Control in Pediatric Ambulatory Settings

Mobeen H. Rathore, MD, FAAP,[a] Mary Anne Jackson, MD, FAAP,[b] COMMITTEE ON INFECTIOUS DISEASES

Since the American Academy of Pediatrics published its statement titled "Infection Prevention and Control in Pediatric Ambulatory Settings" in 2007, 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 the transmission of infectious agents. Policies for infection prevention and control should be written, readily available, updated every 2 years, and enforced. Many of the recommendations for infection control and prevention from the Centers for Disease Control and Prevention for hospitalized patients are also applicable in the ambulatory setting. These recommendations include requirements for pediatricians to take precautions to identify and protect employees likely to be exposed to blood or other potentially infectious materials while on the job. In addition to emphasizing the key principles of infection prevention and control in this policy, we update those that are relevant to the ambulatory care patient. These guidelines emphasize the role of hand hygiene and the implementation of diagnosis- and syndrome-specific isolation precautions, with the exemption of the use of gloves for routine diaper changes and wiping a well child's nose or tears for most patient encounters. Additional topics include respiratory hygiene and cough etiquette strategies for patients with a respiratory tract infection, including those relevant for special populations like patients with cystic fibrosis or those in short-term residential facilities; separation of infected, contagious children from uninfected children when feasible; safe handling and disposal of needles and other sharp medical devices; appropriate use of personal protective equipment, such as gloves, gowns, masks, and eye protection; and appropriate use of sterilization, disinfection, and antisepsis. Lastly, in this policy, we emphasize the importance of public health interventions, including vaccination for patients and health care personnel, and outline the responsibilities of the health care provider related to prompt public health notification for specific reportable diseases and communication with colleagues who may be providing subsequent care of an infected patient to optimize the use of isolation precautions and limit the spread of contagions.

abstract

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[a]*University of Florida Center for HIV/AIDS Research, Education and Service (UF CARES) and Infectious Diseases and Immunology, Wolfson Children's Hospital, Jacksonville, Florida; and* [b]*Division of Infectious Diseases, Department of Pediatrics, University of Missouri–Kansas City School of Medicine and Children's Mercy Kansas City, Kansas City, Missouri*

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Address correspondence to Mobeen H. Rathore, MD, FAAP. E-mail: mobeen.rathore@jax.ufl.edu

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In the ambulatory setting, infection prevention and control (IPC) are essential practices to ensure patient safety by preventing the transmission of infectious agents to patients and accompanying people, health care personnel (HCP), and other employees. IPC should start at the time an ambulatory visit is scheduled and is important in every patient encounter. In general, standards for IPC are the same in all health care delivery settings, whether inpatient or outpatient and hospital or freestanding ambulatory facility. Recommendations for IPC practices in hospitals are well documented and are updated on a regular basis.[1–5] Because most patient encounters are in ambulatory settings, prevention of the transmission of infection in ambulatory settings is important.[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 the transmission of infectious agents among patients, accompanying people, and staff.[8] The transmission of measles,[9,10] tuberculosis (TB),[11,12] other airborne infections,[9–11] hepatitis B and C,[13–15] and other infectious diseases have been traced to ambulatory medical encounters.[6,16] Most disease outbreaks reported in ambulatory medical facilities were associated with nonadherence to recommended IPC procedures.[16]

In this statement, we provide practical information that updates the 2007 Policy Statement[17] regarding IPC procedures as applied to ambulatory medical settings. Major changes include the endorsement of mandatory influenza immunization for HCP, the inclusion of a section on patients with cystic fibrosis, guidance during outbreaks of infectious diseases, communication with other health care facilities, considerations for short-term residential facilities, and an update on the immunization of HCP. Additional IPC recommendations not covered in this statement may be necessary for other ambulatory medical settings, such as dialysis centers, chemotherapy centers, procedure suites (eg, for endoscopy), emergency centers, and outpatient surgery suites.[6,18–23]

MODES OF TRANSMISSION OF INFECTIOUS AGENTS

Knowledge about modes of transmission of infectious agents is critical to understanding IPC.[1,6,7,24] Overall, contaminated hands are the predominant mode of transmission of infectious agents, underscoring 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.

IPC strategies are based on the following 4 routes of transmission of pathogens: (a) the airborne route, (b) by direct contact with body fluids, (c) by indirect contact through fomites or hands of HCP (both contact), or (d) by droplets. The Centers for Disease Control and Prevention (CDC) provides guidance for each type of transmission-based precaution.[19] Respiratory tract secretions can become airborne in small-particle aerosols (airborne transmission) and carry some viruses (eg, rubeola [measles virus], varicella virus) and bacteria (*Mycobacterium tuberculosis*) over longer distances and remain suspended in the air for a long period of time. In general, the particles that are ≤5 μm can travel in the air as far as 3 to 6 feet and spread by airborne transmission. Respiratory tract secretions can also transmit some pathogens over a shorter distance (usually <3 feet) through the air via droplets that are >5 μm (droplet transmission), including some viruses (eg, influenza virus, adenovirus) and bacteria (eg, *Bordetella pertussis*). Body fluids precautions intend to prevent the transmission of potential pathogens in blood and other body fluids and discharges. Bloodborne pathogens (eg, hepatitis B and C viruses and HIV) can be spread via contaminated needles and other sharp instruments if the recommended procedures to prevent exposure to blood or blood-containing body fluids are not implemented and followed. Transmission via direct contact (direct contact transmission) occurs with body fluids (including blood, urine, stool, discharge from infected wounds, 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), or 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 *Clostridium difficile* and norovirus, and respiratory tract pathogens, such as influenza and respiratory syncytial virus. Fomites, such as toys and ambulatory facility equipment, have been implicated in the transmission of some pathogens.[25–27] For some emerging infections for which modes of transmission have not been clearly defined, more than one type of isolation precaution may be necessary, such as for Middle East respiratory syndrome coronavirus (MERS-CoV), which requires both contact and airborne isolation.

GUIDELINES FOR PREVENTION OF THE TRANSMISSION OF INFECTIOUS AGENTS

As with hospitalized patients, HCP should observe the "Standard Precautions"[1] with every patient encounter in the ambulatory setting. "Standard Precautions" refers to a

TABLE 1 Standard Precautions

Use standard precautions, as recommended by the CDC for hospitalized patients and modified by the AAP for all children in the ambulatory setting. Major features are as follows:
Hand hygiene
● Hands should be disinfected with an alcohol-based hand rub or washed with 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 and water if visibly soiled or contaminated with blood or other body fluids or if exposure to spores (eg, *C difficile*) or certain viruses (eg, norovirus) is likely to have occurred.
● Hands should be disinfected with an alcohol-based hand rub or washed with soap and water before donning and 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 the routine care of well children, including changing diapers and wiping the nose or eyes of children, except when required as part of contact precautions.[17,28]
● 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 or risk of splashes.
● Fluid-impermeable gowns or aprons should be worn during procedures that are likely to generate splashes of blood or other body fluids.
Respiratory hygiene and cough etiquette (see Table 2 and text)[29,30]
Handling of sharp instruments to minimize risk of injury (see text "Prevention of Exposure to Bloodborne Pathogens, Blood, and Body Fluids and Management of Injuries by Needles and Other Sharp Instruments")
Resuscitation equipment
● Equipment should be available for use in areas in which the need for resuscitation is predictable.
● Mouth-to-mouth resuscitation should be avoided.

Adapted from Siegel JD, Rhinehart E, Jackson M, Chiarello L; Healthcare Infection Control Practices Advisory Committee. 2007 guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings. Available at: https://www.cdc.gov/infectioncontrol/pdf/guidelines/isolation-guidelines.pdf. Accessed March 6, 2017

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). The Standard Precautions are supplemented with "Transmission-Based Precautions"[1] when additional measures are needed to reduce the risk of airborne, contact, and droplet transmission. Transmission-based precautions may require additional equipment or special areas in the health care facility; few ambulatory care settings will have the latter. Special equipment may include masks (procedure or surgical masks), respirators (special masks that require individual-fit testing and education for safe and effective use), gowns, gloves, and protective eyewear such as face shields or goggles.

Hand Hygiene

Hand hygiene (using alcohol-based hand rubs or washing with soap and water) is the single most important method of preventing the transmission of infectious agents (Table 1).[1,3,31–33] The World Health Organization's recommendation of 5 moments when hand hygiene should be performed include the following: before touching a patient, before cleaning and aseptic procedures, after body fluid exposure and/or risk, after touching a patient, and after touching patient surroundings.

The use of alcohol-based hand rubs 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 applying the amount of product recommended by the manufacturer to the palm of one hand and rubbing the hands together, covering all of the surfaces of the hands and fingers, until the hands are dry.[3,4] Alcohol-based hand rubs 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; before donning and after removing gloves; and before and after performing invasive procedures. Repetitive use of alcohol-based hand rubs can be less drying to the skin than repetitive use of soap and water. Hands should be washed with soap and water instead of using an alcohol-based hand rub whenever they are visibly soiled or contaminated with blood or other body fluids, if exposure to spores (eg, *C difficile*) and certain viruses (eg, norovirus) is likely to have occurred,[34] before eating, and after using the toilet.

Hand washing should consist of the following steps: (1) wet hands with warm (not hot) water; (2) apply soap to hands; (3) vigorously rub the hands together for at least 15 seconds, covering all of the surfaces of the hands and fingers; (4) rinse the hands with warm water; (5) dry the hands with a disposable towel; and (6) use the towel to turn off the faucet.[3,4,35]

Disposable towels are preferred for hand drying and always should be available and within easy reach by HCP. Recently, the role of antimicrobial soap versus plain soap in promoting antimicrobial resistance has been raised.[2,36,37] The Society for Healthcare Epidemiology of America (SHEA) recommends using plain soap for hand hygiene when soap and water are indicated.[31] If used, hand lotions should be available in containers that are not refilled but are replaced frequently to avoid extrinsic contamination.[31] Hand lotions should not be petroleum based because petroleum can cause deterioration of latex material and reduce the effectiveness of latex gloves.

Hand hygiene before performing procedures (such as incision and drainage, joint aspirations, tympanocentesis, etc) should consist of prewashing with soap and water and thorough drying followed by the use of an alcohol-based surgical scrub with persistent activity or washing with an antimicrobial surgical scrub agent (such as chlorhexidine or povidone-iodine) for the length of time specified by the manufacturer, usually 2 to 6 minutes.[3] Additionally, nails need to be kept trimmed and cleaned with soap and water, paying special attention to the undersides of nails.[28] Employees who perform direct patient care activities in ambulatory surgery settings or practices that include patients at high risk of infection or those who are immunocompromised should keep fingernails short and avoid wearing jewelry, artificial nails, and extenders because these have been shown to harbor microorganisms that are not easily removed by hand hygiene.[3]

Information Specific to the Pediatric Ambulatory Setting

Although standard precautions should be used for patient encounters in the ambulatory setting and include the performance of hand hygiene before and after patient contact and the use of gloves for blood, body fluid, secretion, excretion, and contact with items contaminated by such fluids (Table 1), for well-child care, the American Academy of Pediatrics (AAP) modifies "Standard Precautions" 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 the "Contact Precautions."[17,38,39] 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.[40,41] When gloves are used, hand hygiene should be performed before donning the gloves and after the gloves are removed because contamination can occur during removal or from microscopic breaks in the glove.[29,31] Alcohol is preferred for skin antisepsis before immunization and routine venipuncture. In cases in which skin may be incised or sutured or a blood culture is collected, skin preparation should include either 2% chlorhexidine gluconate (CHG) in 70% isopropyl alcohol–based solutions (for children older than 2 months) or iodine (1% or 2% tincture of iodine, 2% povidone-iodine).

Respiratory hygiene and cough etiquette[30,42] are integral parts of the Standard Precautions to prevent the transmission of influenza and potentially other pathogens causing respiratory tract infection in reception areas, common waiting areas, and examination rooms in ambulatory care facilities (Table 2).[1,30,42] The full implementation of this strategy requires the education of patients and accompanying people at the time they enter the facility and the provision of necessary resources to contain respiratory secretions. Visual alerts should be posted that emphasize the importance of (1) covering the nose and mouth when coughing or sneezing, (2) coughing and sneezing into the elbow rather than hand, (3) the appropriate use and disposal of tissues, (4) performing hand hygiene whenever hands have been in contact with respiratory secretions, and (5) maintaining a separation of at least 3 feet in most cases (for patients with cystic fibrosis, the recommended separation is 6 feet) between symptomatic patients and others in common waiting areas, as recommended by the CDC and SHEA. Resources to enable patients and families to adhere to respiratory hygiene and cough etiquette principles must also be provided. These include resources to perform hand hygiene, masks for use by coughing patients and family members, and tissues and trash receptacles for disposing of used tissues. The effectiveness of cough etiquette 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 air.[43–46] Although respiratory hygiene and cough etiquette were designed primarily to reduce transmission of influenza (including pandemic influenza strains), they may also reduce the transmission of additional respiratory pathogens. Some features of respiratory hygiene and 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. Respiratory hygiene and cough

TABLE 2 Respiratory Hygiene and Cough Etiquette to Minimize Transmission of Influenza and Other Respiratory Tract Pathogens

In reception and common waiting areas of ambulatory medical facilities, the implementation of some or all components of respiratory hygiene and cough etiquette should be implemented 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 a fever.

Components:

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 and cough etiquette.
2. Respiratory hygiene and cough etiquette for patients and accompanying individuals with suspected respiratory virus infection
   - Cover the nose and mouth when coughing or sneezing. Cough or sneeze into the elbow rather than a 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 and 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.
3. Components of respiratory hygiene and cough etiquette for staff
   - Educate patients and accompanying people on the need for and components of respiratory hygiene and cough etiquette.
   - In reception area, have tissues and no-touch receptacles for used tissue disposal available.
   - If feasible, provide conveniently located 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 people 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.

Adapted from Siegel JD, Rhinehart E, Jackson M, Chiarello L; Healthcare Infection Control Practices Advisory Committee. 2007 guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings. Available at: https://www.cdc.gov/infectioncontrol/pdf/guidelines/isolation-guidelines.pdf. Accessed March 6, 2017; Quade D. Cough Etiquette. 2009. Available at: https://www.youtube.com/watch?v=UNEp5U_TCOM. Accessed March 6, 2017; and Centers for Disease Control and Prevention. Respiratory hygiene/cough etiquette in healthcare settings. Available at: www.cdc.gov/flu/professionals/infectioncontrol/resphygiene.htm. Accessed March 6, 2017

etiquette should be stressed year round. However, during periods of increased prevalence of respiratory infections in the community, the availability of and use of masks to enhance respiratory etiquette should be considered.

HCP should observe the "Droplet Precautions" that include the use of masks for HCP and patients with symptoms of influenza or other respiratory tract infection symptoms before being placed in an examination room. Masks (a surgical-grade mask as either a procedure mask with elastic loops to secure the mask over the ears or a surgical mask with 2 sets of ties to secure the mask) and face shields 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.

For the health care provider, a mask is indicated and is adequate for protection from respiratory tract pathogens transmitted by respiratory droplets, such as influenza virus or *Bordetella pertussis*. However, guidelines from the Occupational Safety and Health Administration (OSHA) require the use of special particulate respirators (eg, National Institute for Occupational Safety and Health [NIOSH]–approved N95 or higher respirators) when caring for patients with infections such as pulmonary TB, which is transmitted via the airborne route in small-particle aerosols[47]; the 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 the use of such respirators in pediatric ambulatory facilities is uncommon. It is, therefore, not expected that these respirators would be available to staff in an ambulatory setting, especially because almost all children younger than 12 years with TB are not contagious. However, an adult with contagious TB may be in a child's household and may be accompanying the child for his or her health care visit.[48] It is, therefore, acceptable to use a regular mask if respirators are not available. Ideally, anyone suspected to have contagious TB should not be permitted in the ambulatory facility because they pose a hazard to patients, accompanying people in the ambulatory facility, and staff. However, if an accompanying adult or adolescent suspected of having pulmonary TB is present in an ambulatory facility, a surgical mask should be provided to and worn by that individual and those adults accompanying the patient, and a referral should be made to a facility capable of appropriately isolating, evaluating, and treating TB. Reasonable attempts should be made that such an individual not stay in a common waiting area and be moved to a room immediately while awaiting and determining disposition. The facility to which the patient is being referred should be alerted of the potential risk (see "Communication With Other Health Care Facilities").

Considerations for Patients With Cystic Fibrosis

Patients with cystic fibrosis constitute a special group who are at risk for increased morbidity and mortality if infected with several types of respiratory pathogens, including often multidrug-resistant *Pseudomonas aeruginosa* and *Burkholderia cepacia* complex. Patients with cystic fibrosis can also be a source of resistant pathogens that could spread to other patients with cystic fibrosis. The Cystic Fibrosis Foundation commissioned a group of experts to update the 2003 guidelines for IPC[49] specifically for patients with cystic fibrosis, and the updated guideline was published in 2014.[50] Although most patients with cystic fibrosis are followed by experts in cystic fibrosis centers, these patients also receive care in other ambulatory medical facilities. In general, in ambulatory medical settings, standard IPC guidelines should be followed. In addition, when caring for patients with cystic fibrosis, HCP should follow the "Contact Precautions," and all patients with cystic fibrosis should wear a mask throughout their visit except when in an examination room, as outlined in the 2014 guideline.[50] The guideline specifically outlines measures to reduce the risk of people with cystic fibrosis from either spreading or acquiring pathogens from one another at gatherings, such as cystic fibrosis events, or in public places, such as waiting rooms. Therefore, patients with cystic fibrosis should not share space in the waiting area and instead should be placed directly in an examination room.[51–54]

Basic patient-related IPC measures include informing and educating patients and families regarding cough etiquette and meticulous hand hygiene before and after the use of a spirometer or any other handheld device. Pulmonary function studies, airway clearance procedures, and sputum collections should be performed in well-ventilated rooms, away from other patients. HCP should follow the "Contact Precautions" and pay extra attention to avoid contamination of the hands and clothing. Clinic equipment, surfaces, and apparatuses should be cleaned between patients per standard IPC policy for the ambulatory facility. Cross contamination could occur from toys, books, and computers, among other fomites in the waiting room or in the clinic examination rooms. It is therefore recommended that practices have policies in place addressing the method and frequency of cleaning toys. Furry and plush toys such as stuffed animals are difficult to clean and can harbor germs and should generally be avoided in clinic waiting areas and game rooms. Parents can also be encouraged to bring their child's own toy for the office visit.

General Health Considerations for Staff

As employers, pediatricians are required by 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 TB while on the job. Although most ambulatory practices caring for children may not have a trained IPC professional on staff, access to such an individual at a referral hospital would be an option. OSHA has published guidelines called the "Bloodborne Pathogens Standard" for the protection of HCP from bloodborne agents.[55,56] Guidance on compliance with OSHA regulations, including education of personnel, writing a bloodborne pathogen exposure control plan, sharp injuries and prevention, TB exposure, emergency procedures, emergency preparedness, hazardous chemical safety, and general facility safety, can be found the OSHA Web site, and a checklist is available on the CDC Web site.[57,58]

Prevention of Exposure to Bloodborne Pathogens, Blood, and Body Fluids and Management of Injuries by Needles and Other Sharp Instruments

There are 9 measures to minimize risk of injuries by needles and other sharp instruments and of transmission of bloodborne pathogens to HCP or other patients.

1. Educate personnel. Establish policies for annual training for education on bloodborne pathogens and safe disposal of infectious materials. At the time of orientation, all employees should receive and review information regarding IPC policies and procedures, including precautions to minimize the risk of transmission of bloodborne pathogens. Annual education regarding the OSHA Bloodborne Pathogens Standard is required.[48] Furthermore, regularly scheduled educational sessions for all staff members are important to ensure that the levels of hand hygiene and IPC awareness remain high.[59,60] Policies for IPC should be written and easily accessible to all staff. All staff members should be aware of and motivated to follow these policies;[61];
2. Prepare a written policy for the prevention of needlestick injuries;
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 needlestick injuries with the input of staff members who use needles, and implement the use of devices likely to improve safety. Evaluation (with input from staff members) and implementation of needle safety devices is a requirement of the US Department of Labor (OSHA)[57] as well a number of states[62];
5. Provide impermeable and puncture-proof disposal

containers in areas where needles or other disposable sharps are used. Such containers should be out of the reach of children, replaced when filled to three-quarters of their capacity, and stored and disposed of according to local policies;

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. Use single-dose medication vials and prefilled syringes if available. 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% CHG in 70% isopropyl alcohol–based solutions (for children older than 2 months) or iodine (1% or 2% tincture of iodine, 2% povidone-iodine); and
9. Develop a bloodborne pathogens exposure control plan for management of contaminated sharp object injuries and other potential exposures to blood or body fluid–borne pathogens that includes written policies, is readily available to all staff, and is reviewed regularly. A workbook is available through the CDC[63] for designing, implementing, and evaluating a sharps injury–prevention program.

Policies for management of needlestick injuries, as described in Table 3, should address potential exposures to hepatitis B, hepatitis C, and HIV[64,65] 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, including the use of postexposure chemoprophylaxis for high-risk encounters (eg, needlestick exposure from an HIV-infected patient or chronic carrier of hepatitis B in a nonimmune health care provider). Skin surfaces that are contaminated with blood or other body fluids should be washed immediately and thoroughly with soap and water. HCP with direct contact with patients should receive hepatitis B immunization if they have not been immunized previously.

Personnel Illness

In recent studies, researchers confirm that HCP often work while ill, posing a risk of infection transmission to patients and other personnel if they have a communicable disease.[66] Written policies, therefore, should exist regarding the exclusion of staff members with contagious illnesses, and communication should occur with occupational health providers or ICP leadership within the practice if a health care worker is absent from work because of a communicable infection.[67] Such policies should not be punitive, and practices should be supportive and understanding of staff members who do not come to work when they are ill. Recommended work restrictions for HCP with selected infections are listed in Table 4. Respiratory tract infections without fever (eg, common cold) may not be a reason to exclude personnel, but precautions should be taken with an emphasis on hand hygiene before every patient contact, and the use of a mask should be considered when having direct patient contact. The inability to contain secretions and to control coughing and sneezing is an indication to exclude personnel from patient contact. Additionally, symptomatic HCP should avoid contact with immunosuppressed patients.

Immunizations and Screening for TB for Health Care Providers in Ambulatory Settings

Policies should be established regarding immunization of all individuals performing any duties in an ambulatory care setting (including employees, volunteers, students, and resident physicians) against vaccine-preventable infections (Table 5).[29,68–70] Immunization records should be maintained for all employees. The immunization recommendations for HCP are as follows:

1. A 3-dose series of hepatitis B vaccine (at no cost to the employee) is mandated by OSHA and must be offered to all people whose job category, specified in the bloodborne pathogen exposure control plan for the facility, indicates likely exposure to bloodborne pathogens. One to 2 months after the third dose in the series, antibody testing should be performed, and if an inadequate response to vaccine is noted (<10 mIU/mL), an additional 3-dose series should be given. If there is an inadequate response to the second series, the HCP should be regarded as nonimmune and advice from an infectious disease expert should be obtained if the HCP is subsequently exposed;[55,56];
2. Employees should be immunized against measles, mumps, rubella, and varicella unless immunity is documented by serologic testing or there is documentation of immunization (Table 5);
3. All employees should be immunized once using tetanus and diphtheria toxoids and pertussis vaccine designed for adolescents and adults and every 10 years thereafter with a tetanus and diphtheria toxoids vaccine[69,70]; and
4. Health care facilities should provide an influenza vaccine annually to all HCP at no cost.[71] The AAP and other professional organizations

TABLE 3 Management of Potential Occupational Exposure to Bloodborne Pathogens

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

The definition of exposure that might place HCP at risk for hepatitis B, hepatitis C, or HIV infection is as follows: a percutaneous injury (eg, needlestick 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.

The exposed employee should immediately follow these steps:

- Wash needlestick 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 do the following:

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. Determine if the source patient's HIV, hepatitis B, and hepatitis C infection status is documented in the patient's medical records.
4. Have an established policy for the management of an exposure such as described below or an arrangement for immediate referral to a person or location with expertise in the management of such exposures, such as the emergency department of a specific hospital or the occupational health department of a large health care organization.
5. Ensure follow-up for the potentially exposed employee.
6. Ensure that all employees know how to access this policy.

Management includes the following steps:

Step 1: Determine the infection 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.

Step 2: Determine the immunity of the employee. Was a hepatitis B vaccine received? Was the employee tested for antibody to HBsAg (anti-HBs)? If response to immunization is unknown, obtain blood to test for anti-HBs. 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 B:
- 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 necessary

C. If exposed person immunized but did not adequately respond (anti-HBs <10 mIU/mL)
- 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 4–6 mo later

Step 4: Consider prophylaxis against HIV.[64,65] Antiretroviral prophylaxis should be initiated as soon as possible within hours and not days after exposure. Thus, clinicians in ambulatory settings should be prepared to arrange for urgent consultation with a specialist in the management of HIV infection who will prescribe antiretrovirals and 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.[56] Updated information can be found at AIDSinfo (http://aidsinfo.nih.gov/) or the National HIV/AIDS Clinician's Postexposure Prophylaxis Hotline at 1-888-448-4911. The PEPline provides consultation 24 h a day, 7 d a 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: If the initial serologic test results for hepatitis C and HIV are negative, repeat these 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.

Adapted from Occupational Safety and Health Administration. Bloodborne pathogens and needlestick prevention: overview. Available at: www.osha.gov/SLTC/bloodbornepathogens/index.html. Accessed March 6, 2017. anti-HB, hepatitis B surface antibody; HBIG, hepatitis B immune globulin.

recommend mandatory influenza immunization for all HCP.[71,72] The choice of influenza vaccine used is guided by age and underlying host factors of the individual HCP as well as the availability of the product from the manufacturer and the health care facility. In more recent studies, researchers confirm that the immunization of an individual with an egg allergy, including anaphylaxis, can be performed safely with any of the available influenza vaccines, although a recombinant vaccine is

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 4 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 of the isolate
Streptococcal group A pharyngitis	Restrict from direct patient care	Until treated for 24 h
TB, 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 covered, may have contact with patients (other than immunocompromised patients and newborn infants); if lesions cannot be covered, restrict from patient care	Until lesions crusted

—, not applicable.

[a] HCP with these infections should avoid performing procedures considered to be at risk for transmission of blood from HCP to patient.

TABLE 5 Immunizations for Ambulatory Care Staff

All staff members should receive the following immunizations:

- Meningococcal vaccines
  - Generally not indicated for HCP.
  - Standard recommendation for all who are asplenic (functional or anatomic) or have complement deficiency.
- MMR vaccine
  - All HCP born after 1956 should have documentation of 2 doses of an MMR vaccine. Because birth before 1957 is only presumptive evidence of immunity to measles, mumps, and rubella, 1 dose of MMR vaccine for unimmunized workers born before 1957 who do not have laboratory evidence of immunity to these viruses is recommended. 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. OSHA requires that a hepatitis B vaccine must be offered to all employees who may be at risk for bloodborne exposures on the basis of the 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
  - Proof of varicella immunity is recommended. This may include either verified history of varicella or herpes zoster, laboratory confirmation of immunity, or documentation of 2 doses of varicella vaccine.
  - 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 mandated and offered free of charge yearly to all employees.
- Adolescent-adult Tdap
  - This vaccine is recommended by the CDC to be given once to all HCP with direct patient contact.

Adapted from American Academy of Pediatrics Committee on Infectious Diseases. Prevention of pertussis among adolescents: recommendations for use of tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) vaccine. *Pediatrics*. 2006;117(3):965–978; Centers for Disease Control and Prevention. Updated recommendations for use of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis (Tdap) vaccine from the Advisory Committee on Immunization Practices, 2010. *MMWR Morb Mortal Wkly Rep*. 2011;60(1):13–15; American Academy of Pediatrics, Committee on Infectious Diseases. Influenza immunization for all health care personnel: keep it mandatory. *Pediatrics*. 2015;136(4):809–819; Infectious Diseases Society of America; Society for Healthcare Epidemiology of America; Pediatric Infectious Diseases Society. Joint policy statement on mandatory immunization of health care personnel according to the ACIP-recommended vaccine schedule. 2013. Available at: https://www.idsociety.org/uploadedFiles/IDSA/Policy_and_Advocacy/Current_Topics_and_Issues/Immunizations_and_Vaccines/Health_Care_Worker_Immunization/Statements/IDSA_SHEA_PIDS%20Policy%20on%20Mandatory%20Immunization%20of%20HCP.pdf. Accessed March 6, 2017; and Dheda K, Udwadia ZF, Huggett JF, Johnson MA, Rook GA. Utility of the antigen-specific interferon-gamma assay for the management of tuberculosis. *Curr Opin Pulm Med*. 2005;11(3):195–202. MMR, measles-mumps-rubella; Tdap, tetanus, diphtheria toxoid, and acellular pertussis vaccine.

an option. One egg-free influenza vaccine that uses recombinant technology is approved by the US Food and Drug Administration and available in the United States (Flublok; Protein Sciences Corporation, Meriden, CT).

In HCP, screening for TB should be performed before employment to ensure that people with a tuberculous infection are detected early and, if necessary, treated. Screening may have to be repeated in certain situations in which the HCP has been exposed to TB. This testing should be performed by using an interferon-γ release assay (IGRA) for *Mycobacterium tuberculosis* (eg, QuantiFERON-TB Gold In-Tube assay [Cellestis Limited, Carnegie, Australia], T-SPOT.TB [Oxford Immunotec, Abingdon, United Kingdom]) or the tuberculin skin test (TST).[73,74] If a TST is used, the result is considered positive in a 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 who do not have a previously documented positive TST result, who have not had a TST performed within the past year, or who do not have a history of previously treated latent TB infection (LTBI) or TB disease, a 2-step TST (ie, placement of a second TST 1–3 weeks after the initial skin test) is recommended. The second TST will boost the size of the induration in an individual with remote LTBI whose initial reading was <10 mm.[75] For employees with an immunocompromising condition (such as HIV infection or therapy with immunosuppressive medications) or those who were in close contact with a person with active TB, an induration of 5 mm or more is considered a positive result.[76] An IGRA for *M tuberculosis* measures γ-interferon release by T cells after incubation of whole blood with 2 *M tuberculosis*–specific antigens. The advantages of an IGRA include that it only requires 1 visit, it eliminates the need for 2-step testing, and it has increased specificity compared with the TST (it does not cross-react with the BCG vaccine or with the most common nontuberculous mycobacteria). In contrast to a TST, there is no need for a second IGRA test if the initial result is negative. An IGRA is the preferred test in adults who have received bacille Calmette-Guérin for vaccination or cancer treatment.[77] The limitations of IGRAs include insufficient data for the interpretation of conversions and reversions when used for serial testing and issues related to low-level positive results.[77–79] For ambulatory settings classified as having a low risk of TB transmission, additional screening of employees is not necessary unless an exposure to *M tuberculosis* occurs.[75] If the TST or IGRA result is positive, the employee should be referred for evaluation and appropriate management. The risk of developing TB disease is greatest during the 2 years after TB infection. In some individuals, treatment of LTBI is recommended after an evaluation. The treatment of LTBI should be encouraged among HCP; however, it is not mandatory. Such individuals will continue to have a positive test result after treatment, and repeated regular TB testing is not indicated. Repeat chest radiographs are only indicated if the person develops any symptoms and signs suggestive of TB, followed by appropriate investigation, as indicated. Employees with active pulmonary or laryngeal TB should be excluded from work until they are effectively treated and are no longer contagious.[16,77] HCP who have documentation that they have been adequately treated for active TB will require evidence of ongoing monitoring by a physician.

Communication With Other Health Care Facilities

Patients seen in ambulatory care settings may require a referral to other health care facilities for additional inpatient or outpatient services, including admission to the hospital, referral to the emergency department, and referral to radiologic, laboratory, or other services. When transporting a patient with a contagious infection, communication with health care providers at other facilities should include the appropriate information related to the diagnosis and isolation needs to avoid transmission of a contagion at points of access for services and to ensure that appropriate personal protective equipment is provided to and used by the patient and, when appropriate, accompanying people (eg, TB). The most common case scenario would be using a mask for prevention of possible respiratory transmission of pathogens such as *M tuberculosis* and *B pertussis* and providing the appropriate alert to the referral facility regarding isolation needs (eg, airborne precautions for measles). When appropriate, the patient should be asked to wear a regular surgical mask during a visit and until evaluation and a plan is implemented.[44,45] An exposure to a patient subsequently identified as contagious can result in a labor-intensive and expensive search for contacts who may be at an increased risk. Educating parents and caregivers to inform health care providers that their child is colonized with a resistant organism that may require additional precaution is also important.

Communication With Patients, Families, and Visitors During Seasonal Increases, Outbreaks, High-Risk Situations, or Emergencies of Contagious Diseases

Risk assessment for possible contagious diseases should be conducted year round and started at the time of scheduling a patient appointment and continued through the signing in and triage process to the assessment within the

examination room.[80] Ambulatory care practices might consider the use of informational alert notices prominently placed at the entrances and reception area for patients, families, and visitors to inform the staff immediately on arrival if the criteria on the alert are met. Practices using online scheduling or digital communications with their patients and families may also have such alerts on digital media.[81]

During the regular winter season or annual influenza season in the community and on the basis of recommendations from local public health departments and the CDC, travel- or symptom-based questions should be asked of patients and/or parents at the time of scheduling the appointment and on arrival.[82] Also on the basis of current recommendations from local public health departments and the CDC, practices may also consider questioning patients about recent travel (eg, to countries with active cases of emerging infections, such as Ebola or Zika viruses, or to countries with endemic infections, such as measles)[83–85] that might signify the patient or an accompanying person has a contagious infection (Table 2).

During an infectious disease outbreak, special procedures may be necessary in ambulatory settings to prevent the transmission of pandemic or epidemic pathogens. These procedures may include the following:

1. Staff education, including instruction on the appropriate personal protective equipment use, is essential;
2. Posting special signs where they are most likely to be more easily visible to anyone entering the ambulatory practice, such as the entrance points, reception area, waiting areas, and examination rooms. These signs inform patients and families regarding the concern about the possible infectious disease as well as the history and signs and symptoms that may suggest the infection. Patients and families should be advised to inform staff if there is a consistent history or signs and symptoms;
3. Staff receiving calls from patients and families should also be trained to ask appropriate questions and perform triage when scheduling appointments. This will facilitate patient placement on arrival such that patients with a contagious disease are promptly and appropriately placed. In rare cases, patients may be initially evaluated and triaged in alternative locations outside of the facility. If possible, a separate temporary triage area may also need to be designated within the ambulatory space. In such cases, provisions should be made to ensure that patients evaluated in the alternative site are stable and those who warrant immediate care are promptly evaluated in an emergency department setting. Provisions should allow for examination, testing, and disposition of the patient and for the same infection control precautions that would be used in the primary emergency department to be implemented;
4. A room in the facility should be identified to directly move any potentially contagious patient without waiting in the common areas. Appropriate cleaning and disinfection of such a room and appropriate disposal of waste should also be planned;
5. A plan for transfer of potentially contagious patients to hospital or other health care facilities should be in place;
6. Adequate supply of appropriate personal protective equipment should be assured;
7. A plan to communicate with local public health authorities should be in place, including easy access to contact information of appropriate public health authorities;
8. A restricted policy for clinic visits may be implemented by the ambulatory clinic IPC leadership in the event of certain outbreak scenarios, such as restricting children not immunized against measles (by choice or because of younger age) in the midst of a measles outbreak;
9. In a disaster, IPC procedures may be interrupted. Advance preparedness planning can mitigate risk. The AAP offers comprehensive guidance to pediatricians to prepare for disasters (http://pediatrics.aappublications.org/content/early/2015/10/13/peds.2015-3112);

Medicolegal Considerations Related to IPC to 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 a third party 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. An example is a needlestick injury sustained when a child has access to a sharps container. Third-party liability can occur not only from failing to warn or protect 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 that they often bear responsibilities to third parties and should enact and document appropriate measures to minimize risks. These responsibilities include the following: (1) informing the patient and other facilities about the potential contagious nature related

to the exposure; (2) informing the patient about postexposure prevention or treatments, potential risk to third parties, and advice about preventing the spread of the infection; (3) reporting communicable diseases on the basis of state statutes (while recognizing that reporting alone may not be sufficient to satisfy the physician's duty to protect the third party); and (4) informing the patient of any action the physician intends to take to protect third parties at risk for contact with the patient.[86]

Communication With Local and State Health Authorities

State and local health authorities determine which diseases should be reported. Physicians and staff in ambulatory care facilities must be aware of the rules and regulations in their municipalities and develop a process that allows for timely and appropriate public health notification. Policies and procedures for communication with local and state health authorities regarding reportable diseases and in times of outbreak should be established while adhering to current regulations of the Health Insurance Portability and Accountability Act (HIPAA). The Privacy Rule permits covered entities to disclose protected health information, without authorization, to public health authorities who are legally authorized to receive such reports for the purpose of preventing or controlling disease, injury, or disability.[87]

Infection Control Issues Related to Residential Facilities

Short-term residential facilities (such as the Ronald McDonald House) that accommodate patients and their families are becoming more commonplace and meet an important need for patients and families. Although not health care or long-term care facilities, they are potential sources of contagious exposures to other patients and staff in ambulatory settings. Recently, SHEA developed guidance for such short-term residential facilities.[88] Recommendations include screening of all guests (including patients), visitors, and staff members for any exposures or potential for contagiousness and informing the ambulatory care facility of any such situation. Patients residing in these short-term residential facilities are often at high risk for infection because of their underlying conditions, and staff should inquire about specific restrictions outlined by their primary provider. Special populations for which restrictions may be appropriate include neonates, those with immunodeficiency conditions, those receiving immunosuppressive medications, those with cystic fibrosis, and any pregnant woman. If therapy animals or pets are brought to the residential facility, policies governing such visits should be available to guide staff taking into consideration the health and temperament of such animals.[89,90]

The SHEA guidance encourages that guests have access to an influenza vaccine if not already immunized and that all staff receive appropriate vaccines, including varicella and influenza vaccines. Immunizations in these settings are especially important because many of the patients in these facilities may not be able to receive an influenza vaccine, or if they receive it, they may not be able to mount an adequate immune response because of their underlying medical condition. Close communication with the local hospital IPC department should be encouraged for disease-specific exposures.

Ambulatory Facility Design, Procedures, and Patient Flow

Waiting and Reception Areas

Measures to prevent the transmission of contagious infectious agents in ambulatory facilities begin at the time the visit is scheduled. For example, during a telephone call request for an urgent visit for an ill child, the staff person may inquire, among other things, whether the child has a fever and/or 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 or triaged and evaluated in the patient's vehicle in the parking area.

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 similar to 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 the transmission of infectious agents by specifically designing waiting areas, avoiding crowding, shortening wait times, and minimizing the sharing of toys. To the extent feasible, respiratory hygiene and cough etiquette guidelines (Table 2), including the use of tissues and hand hygiene products (which should be supplied by the ambulatory medical 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 research documents the need for or benefit of separate waiting areas for well and ill children.[8] Accompanying adults, if sick, should be encouraged not to come to the office with the child if possible. If such adults do come with the child, they may need to wear a mask. Sick adults should be discouraged from spending time in waiting areas.

Pathogenic bacteria have been recovered from toys in ambulatory waiting areas,[26,91] and contaminated

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% 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 sodium hypochlorite (1000 ppm 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 sodium hypochlorite (100 ppm chlorine)

Adapted from Wendt C, Frei R, Widmer AF. Decontamination, disinfection and sterilization. In: Jorgensen JH, Pfaller MA, Carroll KC, et al, eds. *Manual of Clinical Microbiology*. 11th ed. Washington, DC: American Society of Microbiology; 2015:183–216; Rutala WA. APIC guideline for selection and use of disinfectants. 1994, 1995, and 1996 APIC Guidelines Committee. Association for Professionals in Infection Control and Epidemiology, Inc. *Am J Infect Control*. 1996;24(4):313–342; and Rutala WA, Weber DJ; Healthcare Infection Control Practices Advisory Committee, Centers for Disease Control and Prevention. Guideline for disinfection and sterilization in healthcare facilities, 2008. Available at: https://www.cdc.gov/infectioncontrol/pdf/guidelines/disinfection-guidelines.pdf. Accessed March 6, 2017. OPA, ortho-phthalaldehyde.

toys used for water play have been implicated in an outbreak of *P aeruginosa* infection in a hospital.[92] 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 medical facilities and waiting areas should be disposable or washable and of appropriate sizes and shapes to avoid aspiration or other injuries. Furry and plush toys are less desirable because of the inability to clean them effectively. The value of antibacterial agents incorporated within toys is unproven. Ideally, toys should be cleaned between uses to avoid transfer of infectious agents.[93] However, cleaning toys at the end of the day is acceptable. Toys contaminated with body fluids should be removed until cleaned. Toys should be cleaned by washing with soap and water and then disinfecting (by 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 designed to sanitize dishes.

GENERAL HOUSEKEEPING RECOMMENDATIONS FOR AN AMBULATORY MEDICAL FACILITY

Sterilization and Disinfection of Patient Care Equipment

Sterilization 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).[94–96]

Sterilization

The appropriate availability and proper utilization of sterilization is critically important for ambulatory facilities that perform invasive procedures and should be accomplished by exposure to high-temperature steam or dry heat or chemical sterilizing agents.[94–96] 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 indicators are useful in showing that the wrapped package has been through the sterilization process. However, the procedure recommended by the manufacturer to document that sterility has been achieved should be performed at least weekly, and the 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, researchers have shown that the 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 ensure that policies are followed.

Disinfection

For this statement, the terms for disinfection are taken from standards for sterilization, disinfection, and antisepsis used in hospitals.[94–96]

High-level disinfection is used for instruments having 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's instructions and applied for the specified contact time, which varies with the chemical and the concentration. Activated glutaraldehyde solutions are most commonly used; 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 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, CHG, 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 containing 2% CHG in 70% isopropyl alcohol is the preferred skin preparation agent for invasive procedures, including the placement of central venous catheters.[97–99] Although CHG use is becoming more common even in infants <2 months, the Food and Drug Administration labeling recommends for CHG to be used with care in preterm infants or those younger than 2 months.[97–99] 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. The contamination of antiseptics has been associated with outbreaks of infections and pseudoepidemics attributable to false-positive blood culture results.[100] 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, CHG, and iodine products prepared in single-use packaging are preferred and eliminate the need for multiple-use bottles of these antiseptics. Attention should also be paid to antiseptic wipes in multidispense containers. The lids on these containers should be kept closed at all times to prevent drying, and expiration dates should be noted for replacement.

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 and are preferred over carpeting 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

Gloves should be worn during cleaning of contaminated environmental surfaces. Surfaces should be cleaned with a detergent, 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 list E (registered antimicrobial products effective

against *Mycobacterium tuberculosis*, HIV-1, and hepatitis B virus).[101] 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 of bleach is required if the surface is not cleaned before disinfection.

Examination Rooms

Provision of alcohol-based hand rub easily accessible inside each examination room is important. A properly functioning sink with an adjacent liquid soap dispenser and disposable towels should be accessible to examination rooms in a pediatric ambulatory care setting. Installation of solid-surface sinks with continuous countertops and backsplashes may offer fewer opportunities for water trapping in seams. Empty soap containers should be replaced and not refilled to avoid any chance of 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 the drainage and drying of the soap should be used. Faucet aerators should not be used because they often become contaminated by *Pseudomonas* species and other waterborne organisms.

Equipment that makes physical contact with the patient is preferably cleaned after each use. Although furniture in the room generally is not a major concern for transfer of infectious agents, examination tables should be covered with disposable paper or linen that is changed between patients to decrease 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 an 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 and gowns are used, their careful handling in a manner that minimizes the contamination of the environment is important. A new class of "active barrier" fabrics that have been designed with fluid-repellent qualities on the outside and embedded with antimicrobial agents are now available.[102–104] The benefit of these fabrics in ambulatory settings has not been evaluated. Soiled linens should be contained or placed in a soiled linen bag at the point of use.[2] Provisions should be made for the laundering of soiled linen.

Restrooms

Restrooms 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 linens, diapers, and paper should be provided.

Airflow

Certain infectious agents, including varicella-zoster and measles virus and *M tuberculosis*, are transmitted by the airborne route. Unfortunately, the number of air exchanges in buildings that house ambulatory medical facilities often is low, and the air is recirculated frequently.

Physicians should be aware of airflow patterns to limit transmission of airborne pathogens. Special arrangements are recommended for patients considered to be contagious with an airborne pathogen, including the following: (1) making efforts to see these patients at the end of the day, (2) placing a mask on the patient (and when appropriate, on accompanying people) 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," evaluating the patient in the family vehicle in the parking area of the ambulatory facility. The duration of time 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.[105] These guidelines are adopted in whole or in part as regulations in nearly all states and enforced by The Joint Commission. Another nonregulatory resource is the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). 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, researchers have shown stethoscopes can be contaminated with viral and bacterial agents, including bacteria that are resistant to multiple antimicrobial agents.[106–108] 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, use an EPA-approved disinfectant wipe labeled effective against hepatitis B or a 70% isopropyl alcohol wipe. Disposable ear curettes may be preferred. If not disposable, ear curettes should be cleaned with 70% isopropyl alcohol after each use and, if grossly contaminated by blood and/or body substances, should be cleaned and then disinfected by using a sodium hypochlorite (bleach) solution.

In most cases, blood pressure cuffs are placed on intact skin; therefore, the risk of transmission of infectious agents 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 type of body secretions, and equipment should be cleaned according to manufacturer recommendations after each use. Other equipment, such as electrocardiography machines and kits used for developmental testing (which generally contain toys and other reusable testing material), should be cleaned and disinfected with an intermediate-level disinfectant whenever they become soiled or contaminated by patient secretions.

Ballpoint pens, patient charts, computer mouse and keyboard, and personal mobile handheld devices (eg, smart phones, tablets) can be contaminated with infectious agents that can be transmitted by hands to other environmental sources.[109] 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 using an EPA-approved low-level disinfectant is recommended for such items as computer mouse and keyboard, computer screens, blood pressure cuffs, and other commonly touched items in the patient's environment.

Disposal of Medical Wastes

The federal OSHA standard as well as local and state regulations dictate the proper disposal of medical wastes, including dressings, needles, sharps, and body fluid samples.[2,110] 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 Emergence of Antimicrobial-Resistant Bacteria

The diagnosis of infection and institution of antimicrobial therapy, when indicated, complements good IPC practices. Inappropriate use of antimicrobial agents in hospitals and in ambulatory settings has contributed to the emergence of antimicrobial-resistant microorganisms and confers an increased risk of adverse events for patients unnecessarily treated with antibiotics. The CDC and the AAP have provided guidelines for the judicious use of antimicrobial agents that emphasize 4 key strategies:

1. Eliminating antibiotic prescribing for those with viral upper respiratory infection;
2. Using stringent clinical diagnostic criteria for acute otitis media and acute bacterial sinusitis and consideration of patients who may be appropriate candidates for watchful waiting;
3. Appropriate testing for group A β-hemolytic *Streptococcus* (rapid diagnostic testing for those 3 years and older with a sore throat without viral symptoms) and the use of antibiotics only for those with positive test results;
4. Collecting and testing appropriate urine specimens for all patients with a suspected urinary tract infection, with urine culture for all patients with abnormal urinalysis results; and
5. Using narrow-spectrum antimicrobial agents that are most effective for the major pathogens causing acute otitis media or acute bacterial sinusitis (high-dose amoxicillin), streptococcal pharyngitis (once-daily amoxicillin), and urinary tract infection (eg, cephalexin, cefdinir). In patients with treatment failure or other risk for antibiotic resistant pathogens, alternative therapy is indicated.[111–118]

Guidelines have been published for the isolation and precautions for hospitalized children and adults who acquire resistant flora.[119–121] 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 (ESBL)–producing organisms, carbapenem-resistant *Enterobacteriaceae*, and other multidrug-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, except for patients with cystic fibrosis (see "Consideration for Patients With Cystic Fibrosis"). However, these resistant bacteria could contaminate the environment; thus, if a patient is known to have been infected or colonized with multidrug-resistant bacteria, has a draining wound, or is in diapers, contact precautions should be undertaken, hand hygiene should be performed by using an alcohol-based hand gel or washing with antimicrobial soap and water, and surfaces in the examination room with which the patient had contact should undergo appropriate disinfection, depending on the pathogen involved. Parents should also be advised to inform the HCP if their child has been identified to have antibiotic-resistant bacteria.

SUMMARY OF IPC POLICIES

1. Written policies and procedures concerning IPC should be developed, incorporated into the ambulatory practice safety program, available at all times to office staff, and reviewed at least every 2 years;
2. Educational programs for staff concerning IPC should be implemented, reinforced, and evaluated on a regular basis. All staff should be required to review the policies at the time of employment;
3. Annual influenza immunization should be mandatory for staff as well as immunization or documentation of immunity against other vaccine-preventable infections (including pertussis, measles, mumps, rubella, varicella, and hepatitis B) that can be transmitted in an ambulatory care setting;
4. All HCP should perform hand hygiene using an alcohol-based hand rub or hand washing with soap and water before and after patient contact or contact with the patient's immediate environment;
5. Standard Precautions (Table 1) should be used in every interaction with a patient.
6. In waiting rooms of ambulatory care facilities, the use of respiratory hygiene and cough etiquette should be encouraged for patients and accompanying people, especially those with suspected respiratory infection;
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, mumps, and TB) should be devised and implemented; travel, immunization, and exposure history is key to identify patients who may be at increased risk for such infections;
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% CHG in 70% isopropyl alcohol–based solutions (for children older than 2 months) or iodine (1% or 2% tincture of iodine, 2% povidone-iodine). Most skin preparation agents must be allowed to dry before surface bacteria are killed;
9. Physicians should be aware of requirements of government agencies, such as OSHA, as they relate to the operation of ambulatory facilities;
10. Needles and sharps should be handled with great care. Safer needle-disposal units that are impermeable and puncture-proof should be available next to the areas used for injection or venipuncture. The containers should be used only until filled to three quarters of capacity and should be kept out of reach of young children. Procedures should be established for the 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 the use of devices that are likely to improve safety should be implemented;
11. A written bloodborne pathogens exposure control plan that includes written policies for the management of contaminated sharp object injuries should be developed, readily available to all staff, and reviewed annually;
12. Standard guidelines for sterilization, disinfection, and antisepsis should be followed;
13. Policies and procedures should be developed for communication with local and state health authorities regarding reportable diseases and suspected outbreaks;
14. A policy for communicating with other health care facilities when referring potentially contagious patients should be established;

15. Policies should be established for communicating with patients and families in case of infectious disease outbreaks, emergencies, and seasonal increases of infections (such as influenza or respiratory syncytial virus); and
16. Antimicrobial agents should be used appropriately, and Standard Precautions (Table 1) should be observed to limit the emergence and spread of antimicrobial-resistant bacteria.

LEAD AUTHORS

Mobeen H. Rathore, MD, FAAP
Mary Anne Jackson, MD, FAAP

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Jeffrey R. Starke, MD, FAAP – *American Thoracic Society*

STAFF

Jennifer M. Frantz, MPH

ABBREVIATIONS

AAP: American Academy of Pediatrics
CDC: Centers for Disease Control and Prevention
CHG: chlorhexidine gluconate
EPA: Environmental Protection Agency
HCP: health care personnel
IGRA: interferon-γ release assay
IPC: infection prevention and control
LTBI: latent TB infection
OSHA: Occupational Safety and Health Administration
SHEA: Society for Healthcare Epidemiology of America
TB: tuberculosis
TST: tuberculin skin test

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