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Infection control in the outpatient setting

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INTRODUCTION

Health care delivery in outpatient settings is increasing [1-4]. The layout of outpatient care areas can make implementation of isolation precautions difficult. Waiting rooms can be crowded, and patients with undiagnosed infection may serve as reservoirs for transmissible pathogens.

Outbreaks of transmissible infections have occurred in outpatient centers, including tuberculosis [5,6], measles [7,8], rubella [9,10], keratoconjunctivitis [11,12], viral gastroenteritis [13], respiratory infections, bloodborne pathogens [14-16], and community-acquired methicillin-resistant *Staphylococcus aureus* [17,18].

Issues related to infection control in outpatient clinics, dialysis centers, ambulatory surgery centers, endoscopy suites, and home infusion therapy will be reviewed here. Principles of infection control in long-term care facilities are discussed separately. (See "[Principles of infection control in long-term care facilities](#)".)

GENERAL PRINCIPLES

General principles of infection control include issues related to standard precautions (hand hygiene, use of gloves and masks) and isolation precautions. These issues are discussed in detail separately. (See "[Infection prevention: Precautions for preventing transmission of infection](#)".)

In general, the recommendations for infection control in outpatients is extrapolated from the inpatient setting and/or based on expert opinion.

Administrative issues — Administrative and logistical support is essential [19]. The facility staff should include one or more members trained in infection prevention. Adequate equipment and supplies must be available, including hand hygiene products, personal protective equipment, and disinfectant solutions. In addition, infection control programs should include important elements such as the development of written policies and procedures, adherence to hand hygiene, cleaning and disinfection, performance of infection surveillance, compliance with public reporting guidelines, and monitoring of health care worker safety. Another important aspect is the provision of continuous educational and training services to the health care staff.

Upon first establishing an infection control program in the outpatient setting, performing a baseline survey is recommended in order to identify potential areas for improvement. Follow-up surveys should then be performed periodically thereafter. Published survey tools can provide useful checklists for evaluation [20,21].

Hand hygiene — The principles of hand hygiene advocated in hospitals are applicable to outpatient settings ([table 1](#)) [22]. Hand hygiene compliance in ambulatory care areas is relatively low. As an example, one study noted a hand hygiene compliance rate of 36 percent among hemodialysis staff [23]. Another study in a glaucoma clinic noted that only 18 percent of health care workers performed appropriate hand hygiene [24].

Surveillance — Surveillance for infection in outpatient settings is inherently difficult. Detecting infections among outpatients typically requires retrospective reviews of medical records and/or prospective audits. Automated systems can be used to perform prospective surveillance for infections following outpatient procedures; examples include a German reference database designed to document surgical site infections in ambulatory surgery [25] and linking institutional databases to detect bloodstream infections following endoscopic retrograde cholangiopancreatography [26].

OUTPATIENT CLINICS

Various outbreaks have occurred in outpatient clinics, including respiratory infections such as influenza [27], transmission of bloodborne pathogens [14-16], transmission of community-acquired methicillin-resistant *S. aureus* [17,18], and gastrointestinal infections such as norovirus [13].

Several factors contribute to the transmission of infectious pathogens within outpatient clinics:

- Close proximity of patients
- High turnover of clinic visitors
- Noncompliance with hand hygiene
- Suboptimal disinfection of instruments
- Use of multiple-dose vials (MDVs)
- Lack of isolation or inadequate isolation of infected or colonized patients
- Lack of oversight by infection control personnel
- Paucity of regulatory guidelines
- Misperception among health care workers of transmission risk

The American Academy of Pediatrics has published guidelines regarding infection control in pediatric ambulatory settings [28]; these recommendations can also be generalized to adult outpatient clinics:

- Infection control programs should form a team dedicated to managing ambulatory services.
- Standard precautions should be followed with every patient. (See "[Infection prevention: Precautions for preventing transmission of infection](#)", section on 'Standard precautions'.)
- Sinks and alcohol hand-rub solutions should be readily available to enhance compliance with hand hygiene.
- Patients that require transmission-based precautions should be separated from the general clinic population (ie, minimal waiting time, appointments given at the end of the day). Personal protective equipment should be readily available for use by health care workers as needed (gowns, masks, respirators, gloves).
- To minimize transmission of respiratory pathogens, individuals with respiratory symptoms should follow respiratory etiquette (cover mouth and nose with a tissue when coughing or sneezing, dispose of tissue after use, and perform hand hygiene after contact with respiratory secretions).
- Safe injection practices and instrument disinfection should be monitored carefully.

Safe injection practices — Outbreaks due to unsafe injection practices occur most frequently in outpatient settings [14,29-32]. In one review summarizing 33 outbreaks of hepatitis B and hepatitis C in outpatient settings between 1998 and 2008, all outbreaks occurred as a result of breaches of fundamental principles of infection control by health care workers [30]; all of these outbreaks could have been avoided if safe injection practices had been used. The reason for the

increased frequency of unsafe infection practices in outpatient settings is unclear; possibilities include limited infection control oversight [1,33,34] and inadequate follow-up of identified breaches in infection control in outpatient settings [35].

Guidelines for safe injection practices have been issued by the United States Centers for Disease Control and Prevention as part of the "One and Only Campaign" [36,37]:

- Standard aseptic techniques must be used; these include hand hygiene, maintenance of an aseptic field, proper preparation of injection site, and use of gloves.
- A sterile, single-use, disposable needle and syringe should be used for each injection.
- Single-dose vials are preferred over multiple-dose vials whenever possible.
- If MDVs must be used, their use should be dedicated to a single patient whenever possible. MDVs should never be accessed a second time with the same needle, even if the injection is to be used on the same patient. MDVs should be discarded when the beyond-use date has been reached, when doses are drawn in a patient treatment area (rather than a dedicated medication preparation area such as a nurses station), or any time the sterility of the vial is in question.
- Medication from single-dose vials, fluid infusions, and administration sets should not be used for more than one patient.
- Bags or bottles of intravenous solution should not be used as a common source of supply to multiple patients.
- Used sharps should be properly disposed of at the point of use.
- A surgical mask is required for injections into the epidural or subdural space.

Other measures to reduce transmission of infection include improved viral hepatitis surveillance and case investigation, health care provider education and training, professional oversight, and increased public awareness to improve safe injection practices [30]. Specific training is required to ensure that health care workers understand and adhere to recommended practices of aseptic technique and general principles of infection control.

DIALYSIS CENTERS

Transmission of infection in dialysis centers can occur via contaminated devices, equipment and supplies, environmental surfaces, and hands of health care workers. Various methods of

contamination and transmission have been described, including:

- Contaminated water [38-41]
- Inadequate disinfection of equipment [42-44]
- Machinery and equipment malfunction [45,46]
- Improper hand washing [47]
- Lack of universal precautions [48-50]

Patients on dialysis are at increased risk for infection with nosocomial pathogens given immunosuppression and frequent contact with the health care system [51]. Pathogens transmissible to patients receiving dialysis include:

- Bacteria [46,52-55]
- Hepatitis B [45,48,56,57] (see "Hepatitis B virus and dialysis patients")
- Hepatitis C [49,50,58-60] (see "Hepatitis C virus infection in patients on maintenance dialysis")
- HIV [61,62] (see "Human immunodeficiency virus and dialysis")
- Mycobacteria [42,43]
- Fungi [63]

Patients on dialysis are at high risk for exposure to multidrug-resistant organisms, including methicillin-resistant *S. aureus* (MRSA) and vancomycin-resistant enterococci (VRE) [64]. Patient-to-patient transmission of organisms in hemodialysis units may occur via direct contact between patients or via the hands of health care workers [65].

Bacteremia occurs in approximately 2 percent of patients on dialysis; vascular access infection occurs in 1 to 7 percent of patients [66-70]. As a result, patients on dialysis are more likely to receive antimicrobial therapy than patients not on dialysis, promoting emergence of drug resistance [71-73]; one study noted that patients on dialysis are more than 11 times more likely to receive *vancomycin* upon admission to the hospital than other patients [74].

Therefore, antimicrobial stewardship in dialysis centers is critical.

Issues related to infection associated with hemodialysis catheters are discussed separately.

Infection control practices — The United States Centers for Disease Control and Prevention has issued guidelines for infection control in hemodialysis centers; components of infection control in dialysis centers include [65]:

- Patients on dialysis should undergo routine testing for hepatitis B virus and hepatitis C virus infection.

- Hepatitis B vaccination should be provided to susceptible patients.
- Gloves should be worn when caring for the patient or touching dialysis equipment. Gloves should be removed and hand hygiene should be performed between patients.
- Single-use items or items dedicated to specific patients should be used preferentially (including syringes, alcohol swabs, medication vials).
- If multiple-dose medication vials must be used, individual doses should be prepared in a clean (central) area away from dialysis stations. Multiple-dose medication vials should not be carried between stations.
- Areas for storage and handling of medications and clean supplies should be clearly designated and should be separate from areas where used equipment or blood samples are handled.
- The dialysis station (eg, machines, chairs, beds, tables) should be cleaned and disinfected between patients.

Contact precautions should be implemented for patients with known colonization or infection due to multidrug-resistant organisms (eg, MRSA or VRE), particularly those with high risk of spreading multidrug-resistant organisms due to fecal incontinence, diarrhea, or infected skin wounds [71]. (See "[Infection prevention: Precautions for preventing transmission of infection](#)", section on '[Contact precautions](#)'.)

AMBULATORY SURGERY CENTERS

Infection rates in the setting of ambulatory surgery are similar to those encountered with traditional inpatient procedures [25,75], and ambulatory surgery centers should conform to the same infection control standards as inpatient surgical facilities. Surveillance for infectious complications (via clinical monitoring or automated systems) should be continued for 30 days following the procedure.

Properly identifying devices that may be reprocessed and confirming the adequacy of cleaning, disinfection, and sterilization procedures are of paramount importance.

Immediate-use steam sterilization (IUSS), previously referred to as flash sterilization, refers to steam exposure of unwrapped medical instruments followed by immediate use in the absence of interim storage. This is in contrast with traditional sterilization (known as "terminal

sterilization"), in which instruments are sterilized within packaging designed to maintain sterility and facilitate storage for later use.

Terminal sterilization is preferred over IUSS. In some circumstances, IUSS may be appealing, particularly in the setting of high case turnover in which sterilized devices are needed for immediate use. The Association for the Advancement of Medical Instrumentation has issued standards for the use of IUSS [76]; these include:

- IUSS should be used only in the setting of emergent need for specific instrument(s) in the absence of a sterilization alternative.
- The IUSS cycle parameters (exposure time, temperature, drying time) should be strictly monitored. Proper functioning of the sterilizer should be checked, and a designated individual should complete records of the sterilization process.
- Items processed by IUSS should be transferred immediately to the sterile field using a containment device.
- IUSS should not be used for implant devices, decontamination of instruments used on patients with suspected prion diseases, or for reprocessing of single-use items.

The Association of periOperative Registered Nurses has established an [online course](#) for infection prevention in ambulatory surgery centers.

ENDOSCOPY SUITES

Endoscopy suites must follow infection control measures carefully to prevent the transmission of pathogens during endoscopic procedures. Infection is usually transmitted via contaminated instruments that act as reservoirs for pathogens [77]. The most commonly incriminated organisms are gram-negative bacilli [78,79], mycobacteria [80], and hepatitis viruses [29].

Flexible endoscopes require thorough cleaning followed by high-level disinfection [81]. However, the complex structure of the endoscope makes reprocessing difficult. The ability of microorganisms to form biofilms on the surface of the internal channels of the endoscope further complicates the process [82].

Issues related to endoscope disinfection are discussed further separately. (See "[Preventing infection transmitted by gastrointestinal endoscopy](#)".)

HOME INFUSION THERAPY

Indications for home infusion therapy include outpatient parenteral antibiotic therapy [83] and chronic therapies such as enzyme replacement [84] or hormonal therapy [85].

Catheter infection and bacteremia are major safety considerations [86-88]; infection control practices should focus on proper catheter insertion and care. Home care agencies should follow guidelines for prevention of intravascular catheter-related infections [89]; these include:

- Health care worker education and training
- Routine monitoring of catheter site
- Hand hygiene and aseptic techniques when accessing the catheter
- Use of [chlorhexidine](#) for skin antisepsis
- Proper application of catheter site dressings
- Replacement of administration sets at 72-hour intervals, unless otherwise indicated [90]
- Appropriate preparation of infusion solutions

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "[Society guideline links: Infection control](#)".)

SUMMARY

- General principles of infection control include issues related to standard precautions (hand hygiene, use of gloves and masks) and isolation precautions. The principles of hand hygiene advocated in hospitals are applicable to outpatient settings ([table 1](#)). Personal protective equipment should be readily available for use (gowns, masks, respirators, gloves). (See '[General principles](#)' above.)
- In outpatient clinics, patients requiring transmission-based precautions should be separated from others (ie, minimal waiting time, appointments given at the end of the day). Individuals with respiratory symptoms should cover their mouth and nose with a tissue when coughing or sneezing, dispose of tissue after use, and perform hand hygiene after contact with respiratory secretions. (See '[Outpatient clinics](#)' above.)
- Safe infection practices include use of a sterile, single-use, disposable needle and syringe for each injection. Single-dose vials are preferred over multiple-dose vials whenever

possible. Medication from a single-dose vial should never be administered to more than one patient. (See ['Safe injection practices'](#) above.)

- In dialysis centers, the dialysis station (eg, machines, chairs, beds, tables) should be cleaned and disinfected between every patient. Gloves should be worn when caring for the patient or touching dialysis equipment. Hands should be washed between each patient. Single-use items or items dedicated to specific patients are preferred (including syringes, alcohol swabs, medication vials). Contact precautions should be implemented for patients with known colonization or infection due to multidrug-resistant organisms. (See ['Dialysis centers'](#) above.)
- Ambulatory surgery centers should conform to the same infection control standards as inpatient surgical facilities. Traditional sterilization is preferred over immediate-use steam sterilization (IUSS); if IUSS is used, the procedure should be monitored closely and follow standards as described above. (See ['Ambulatory surgery centers'](#) above.)
- Endoscopy suites must follow infection control measures carefully to prevent transmission of pathogens during endoscopic procedures; organisms include gram-negative bacilli, hepatitis viruses, and mycobacteria. Issues related to endoscope disinfection are discussed further separately. (See ["Preventing infection transmitted by gastrointestinal endoscopy"](#).)
- Risks associated with home infusion include catheter infection and bacteremia; infection control practices should focus on proper catheter insertion and care. (See ['Home infusion therapy'](#) above.)

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Topic 13989 Version 13.0

GRAPHICS

Hand-hygiene technique

When decontaminating hands with an alcohol-based hand rub, apply product to palm of one hand and rub hands together, covering all surfaces of hands and fingers, until hands are dry. Follow the manufacturer's recommendations regarding the volume of product to use.

When washing hands with soap and water, wet hands first with water, apply an amount of product recommended by the manufacturer to hands, and rub hands together vigorously for at least 20 seconds, covering all surfaces of the hands and fingers. Rinse hands with water and dry thoroughly with a disposable towel. Use towel to turn off the faucet.

Liquid, bar, leaflet, or powdered forms of plain soap are acceptable when washing hands with soap and water. When bar soap is used, small bars of soap and soap racks that facilitate drainage should be used.

Multiple-use cloth towels of the hanging or roll type are not recommended for use in health care settings.

Data from:

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