

Control of antibiotic-resistant bacteria in the office and clinic

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Infections with antibiotic-resistant bacteria, including methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococcus* and *Clostridium difficile*, are usually considered hazards of inpatient care. However, the potential to acquire these organisms is not restricted to the acute or long-term care setting. Ambulatory care procedures, such as dialysis, and follow-up of patients who acquired these organisms while in hospital can make some outpatient settings microcosms of inpatient care. The recent emergence of community-associated MRSA,^{1,2} vancomycin-resistant *Enterococcus*³ and *C. difficile*⁴ among patients with no known predisposing factors has increased the potential for offices and clinics to become silent reservoirs of these pathogens.

The risk of infection transmission in the office or clinic is lower than in the hospital because of fewer encounters, shorter contact times and exposure to a smaller number of bacteria.⁵ However, the consequences may be similar because the therapeutic options are limited and outcomes of some infections may be worse. This will affect mostly patients with underlying diseases, including immunosuppression, given their increased risk for infection, admission to hospital and need for invasive devices. In most ambulatory settings, general measures of infection control are sufficient to prevent transmission. However, if the patient population is more vulnerable, the index patient is heavily colonized or ongoing transmission is demonstrated, more intensive measures may be necessary.

Modes and risk of transmission in the outpatient setting

MRSA, vancomycin-resistant *Enterococcus* and *C. difficile* are most commonly transmitted by direct contact via contaminated people or indirect contact via contaminated objects).⁶⁻⁸ Less commonly, MRSA can be transmitted by expectorated respiratory secretions, such as from patients with cystic fibrosis.⁹ Up to 6% of individuals with nasal colonization by *S. aureus* who have concurrent rhinovirus infection may disperse high numbers of the bacterium into the environment ("cloud" syndrome).¹⁰

There are few studies documenting the spread of MRSA, vancomycin-resistant *Enterococcus* or *C. difficile* in offices or clinics. A single report describes MRSA transmission in a clinic for HIV-infected patients. Two health care workers developed MRSA soft-tissue infections with the same strain of community-associated MRSA cultured from environmental

Key points

- Hand hygiene and judicious use of antibiotics are essential for infection control.
- Patients should use an alcohol-based hand rub on arrival in the office or clinic.
- Health care workers should use an alcohol-based hand rub or soap and water before and after contact with patients.
- Better identification of the risk factors for transmission of resistant organisms is required in ambulatory care settings.

specimens, suggesting the role of contaminated inanimate objects in transmission.¹¹ The potential role of the environment in outpatient transmission is further supported by the isolation of MRSA from 2 of 9 outpatient chiropractic adjustment tables.¹²

Evidence for the transmission of vancomycin-resistant *Enterococcus* among outpatients is more robust, particularly among those receiving dialysis. Vancomycin-resistant *Enterococcus* was acquired by 17.8% of patients receiving outpatient peritoneal dialysis or hemodialysis, which correlated with vancomycin use in the outpatient setting.¹³ Eleven oncology patients with vancomycin-resistant *Enterococcus* reportedly contaminated the environment in 29% of health care encounters.¹⁴ In a study involving fecally continent patients, the hands of 36% of patients were colonized with vancomycin-resistant *Enterococcus*.¹⁵ Patients in this study contaminated 58% of chairs from hemodialysis sessions, 48% of couches from outpatient consultation sessions and 20% of health care worker gowns.¹⁵ Patients previously colonized with vancomycin-resistant *Enterococcus* can still contaminate the environment, although less frequently than those currently colonized.¹⁵ Incontinent patients may contaminate the outpatient environment more than continent patients.¹⁶

Patients with *C. difficile* in ambulatory-care settings may include those presenting for follow-up after diagnosis in hospital, those whose infection became apparent after discharge and those who acquired *C. difficile* in the community. Community-acquired cases may be idiopathic or may result from antibiotics administered in outpatient care. In Seattle, the prevalence of *C. difficile* disease among people receiving ambulatory care was 12 infections per 100 000 person-years and was correlated with the use of cephalexin and cefixime.¹⁷

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Table 1: Survival of methicillin-resistant *Staphylococcus aureus*, vancomycin-resistant *Enterococcus* and *Clostridium difficile* on dry inanimate objects¹⁸

Bacterium	Duration of survival
Methicillin-resistant <i>S. aureus</i>	7 days to 7 months
Vancomycin-resistant <i>Enterococcus</i>	5 days to 4 months
<i>C. difficile</i> spores	5 months

Contamination of *C. difficile* within an outpatient facility has not been described but is theoretically possible.

Higher numbers of bacteria or widespread contamination facilitates transmission of MRSA, vancomycin-resistant *Enterococcus* and *C. difficile*. Patients with draining wounds or abscesses or with diarrhea or fecal incontinence are more likely than those without these conditions to contaminate the environment.⁶ This increases the risk of spread.⁶

The ability of an organism to be transmitted is also dependent on its ability to survive in the environment. Table 1 describes the persistence of MRSA, vancomycin-resistant *Enterococcus* and *C. difficile* on inanimate surfaces.¹⁸ Despite individual patient and microbial factors, health care workers remain the main mode of spread. Therefore, they should remain the primary target of prevention strategies.

Infection prevention and control

There is little robust science to guide the clinical care of patients with MRSA, vancomycin-resistant *Enterococcus* and *C. difficile* in the ambulatory care setting. Most recommendations are based on suggestive clinical or epidemiological studies or theoretical rationale.⁶⁻⁸ Recent recommendations for managing drug-resistant pathogens in acute care support a two-tiered approach, with intensified measures in cases of ongoing transmission. Intensified measures are also advocated by some as standard practice in hemodialysis units and cystic fibrosis clinics.^{7,9,19} Despite this, such infection control measures will rarely be necessary in the office setting.

What should patients do on arrival in the office?

Patients should be encouraged to decontaminate their hands with an alcohol-based hand sanitizer on arrival.²⁰ In cystic fibrosis clinics, patients are advised to practice hand hygiene on arrival and departure from the clinic, because of the number of patients colonized with multidrug-resistant bacteria and the high colonization pressure in this setting.⁹

What should health care workers do?

Hand hygiene is the most essential element of infection control in any health care setting. Hand hygiene should be performed before and after contact with patients or their environment, before an aseptic procedure, after removing gloves, after exposure to body fluids, and when moving from a contaminated body site to a clean site.^{6,8,19,21} Alcohol-based hand rubs are generally preferred, but soap and water are indicated if no alcohol-based hand rubs are available, if hands are visi-

bly dirty, soiled or contaminated with proteinaceous material, or if contact with *C. difficile* spores may have occurred, because alcohol does not kill spores.⁸

Given the lack of evidence for transmission of MRSA and vancomycin-resistant *Enterococcus* in the outpatient setting, consistent application of routine practices and standard precautions will likely suffice in most environments. Additional contact precautions, such as gown and gloves, should be used when caring for patients with draining abscesses or wounds, uncontained diarrhea, fecal incontinence or cystic fibrosis, and if ongoing transmission has been demonstrated.⁶⁻⁹ Active surveillance cultures are not routinely recommended, although they may be indicated if an outbreak or ongoing transmission is suspected. Contact precautions are advised for care of patients with *C. difficile*-associated diarrhea in any health care setting;^{6,8} however, the role of contact precautions has not been validated in the ambulatory care setting.^{6,8}

Local guidelines and circumstances should determine practice in settings with specialized and vulnerable populations, such as in an oncology or transplant clinic). Hands must be decontaminated with soap and water or an alcohol-based hand sanitizer after gloves are removed.^{7,8}

Management guidelines for community-associated MRSA have been published.² Empiric antibiotic treatment targeting *S. aureus* should cover MRSA if the local prevalence rate of MRSA exceeds 15% of *S. aureus* strains.²² Patients should also be counselled about management in the home.

How should prevention and control be managed?

Hand hygiene agents should be available to patients and families in the office (Box 1).¹⁹ Flagging the charts of patients with MRSA or vancomycin-resistant *Enterococcus* may help determine isolation and treatment practices.⁸ Patients colonized with MRSA or vancomycin-resistant *Enterococcus* who re-

Box 1: Recommendations to prevent transmission of antimicrobial-resistant bacteria in the office and clinic

- Have alcohol-based hand rubs available for use by patients and health care workers
- Ensure that processes are in place for the identification of colonized or infected patients
- Move colonized or infected patients who have draining abscesses or wounds, uncontained diarrhea, fecal incontinence or cystic fibrosis to an examining room as soon as possible
- Adhere to routine hand-hygiene practices for all patients
- Use contact precautions, such as gown and gloves, when providing care to colonized or infected patients with draining abscesses or wounds, uncontained diarrhea, fecal incontinence or cystic fibrosis, and in situations where ongoing transmission has been demonstrated
- Continue with general housekeeping and equipment cleaning, disinfecting and sterilizing unless transmission in the office is demonstrated, in which case intensified measures may be considered
- Consult with experts, such as public health officials or hospital infection control personnel

quire contact precautions should be moved to an examination room as soon as possible on arrival in the office.^{8,9}

The principles for cleaning, disinfecting and sterilizing medical equipment, as well as cleaning and disinfecting the environment, are the same as in hospitals.²³ Germicides containing chlorine have been used in hospitals to prevent transmission of *C. difficile*.²⁴ The need for bleach in the ambulatory care setting has not been studied. Each office should develop a regular cleaning program. Although there are no explicit guidelines for the frequency of cleaning, commonly touched surfaces such as door knobs and toilet seats may require frequent cleaning.²³ The presence of carpet in heavy patient-traffic areas is discouraged because numerous spills are likely. Carpets are also discouraged in areas where immunocompromised patients are likely to stay for extended periods of time (e.g., infusion centres). If carpets are used, periodic deep cleaning is recommended.

Furniture should be easily cleanable, especially in areas where care is provided to high-risk patients and where contamination with bodily fluids is likely (e.g., pediatricians' offices).²³ Communal toys should not be porous or plush. Toys and magazines that have been mouthed or soiled must be removed from circulation. Toys should ideally be cleaned with a 1:100 bleach solution, washed with soap and water, and air dried between patients or at the end of each day.^{25,26}

Strategies to prevent transmission

A multimodal approach is required to prevent transmission. This includes administrative support, such as policies and guidelines about the identification and triage of patients and isolation precautions, and the availability of personal protective equipment and alcohol-based hand rubs or soap and water. There should also be education about these policies and judicious use of antibiotics. Since most cases of transmission in ambulatory care are a result of deficient infection-control practices, strict adherence to recommendations is paramount.⁶⁻⁸

Barriers to implementation

In hospitals, prioritization of infection prevention and control and patient safety by organizational leaders is associated with better adherence to infection-control practices.²⁷ Adherence in ambulatory care settings can be encouraged by demonstrated commitment by the physician or clinic director to infection prevention and control through allocation of financial resources for supplies, such as alcohol-based hand rubs and personal protective equipment, and personnel, such as housekeeping staff. Leaders should demonstrate the appropriate behaviours and ensure that office or clinic personnel are educated and informed. The negative impact of isolation precautions on direct patient contact and adverse events in the inpatient setting are controversial²⁸⁻³¹ and should not deter practice in ambulatory care. Although barrier precautions may be considered cumbersome,³² the outbreak in 2003 of severe acute respiratory syndrome in Toronto, Ontario, underscores the importance of incorporating basic infection-control measures into routine practice.³³

Knowledge gaps

The full extent of environmental contamination and transmission of MRSA, vancomycin-resistant *Enterococcus* and *C. difficile* in the ambulatory care setting is unknown, in part because of the lack of sensitive and standardized methods to detect and measure environmental contamination. Better identification of risk factors and measurement of the risk are needed. There are no validated data informing which infection control measures should be altered to fit various ambulatory care practices and patient populations. The threshold for intensifying efforts is also unknown. The presence of administrative controls and compliance with recommended infection control measures in various settings and the barriers to compliance have not been fully studied. The impact of barrier precautions and other measures on the interaction between patients and health care worker and patient satisfaction requires further study.

Conclusion

Evidence suggests that the transmission of MRSA, vancomycin-resistant *Enterococcus* and *C. difficile* in ambulatory care is infrequent. Thus, in most settings, routine infection-control measures are recommended. Ongoing surveillance in general and specialized outpatient settings will help determine the epidemiology of the colonization and infection, whether the pathogenicity of the strains is changing and how to modify infection control practices if required. Regardless, hand hygiene and judicious use of antimicrobials will remain essential elements of prevention and control in the office and clinic setting.

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