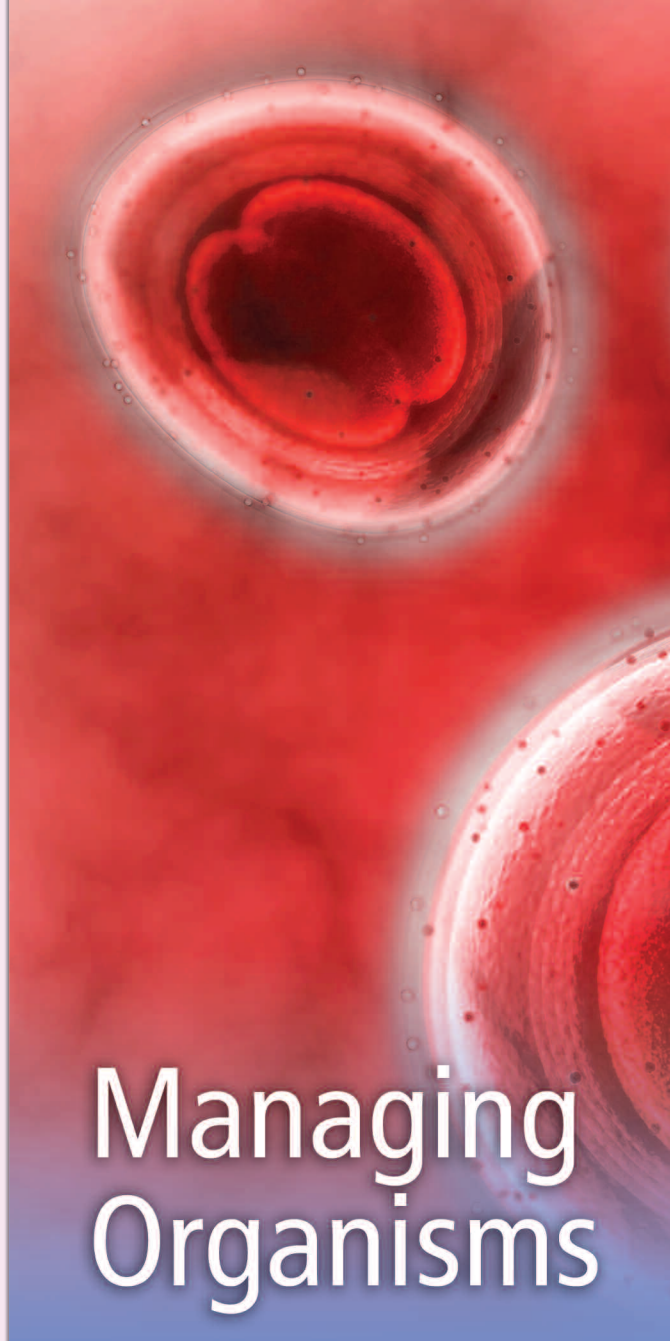


Multidrug-resistant organisms (MDROs), including methicillin-resistant *Staphylococcus aureus*, vancomycin-resistant enterococci, and certain gram-negative bacilli, are transmitted most frequently in acute care facilities. However, these MDROs have important infection control implications for care provided in the home setting. Little is known about the actual occurrence of MDROs among home care and hospice patients. To date, no published reports have described transmission of an MDRO from care provided in the home setting. Nonetheless, all providers of care in the home should be aware of MDROs and the potential for their transmission from one patient to another. The Centers for Disease Control and Prevention's (CDC) *Guideline on the Management of Multidrug-Resistant Organisms in Health-care Settings, 2006* provides recommendations for preventing and controlling the transmission of MDROs. This article discusses the Guideline's recommendations and how they may be implemented in the home setting by home health agencies, home infusion providers, hospices, and providers of durable medical equipment.



Managing Organisms

SURVEILLANCE,

Prevalence of Multidrug-Resistant Organisms

Multidrug-resistant organisms (MDROs), including methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE), and certain gram-negative bacilli and their increasing occurrence in hospitals (Kuehnert et al., 2005) and long-term care facilities (Trick, Weinstein, & DeMarais, 2001) have been described. However, these MDROs have important infection control implications for care provided in the home setting.



Multidrug-Resistant in Home Care and Hospice

PREVENTION, AND CONTROL

With no published studies or data, little is known about the actual occurrence of MDROs among home care and hospice patients. It is assumed that if a home care or hospice patient is infected or colonized with an MDRO, the patient acquired it while in the hospital or a nursing home.

To date, no published reports have described patient-to-patient transmission of an MDRO in home care. Nonetheless, all providers of care in the home should be aware of MDROs and the po-

tential for their transmission. Home care administrators should determine appropriate policies and procedures to ensure identification and prevention of MDROs among their patients.

Centers for Disease Control and Prevention's Guideline

The Centers for Disease Control and Prevention (CDC) has published a Guideline for the *Management of Multidrug-Resistant Organisms in Health-*

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care Settings, 2006 (Siegel, Rhinehart, Jackson, & Chiarello, 2006) to assist all healthcare organizations and infection control professionals with the aforementioned challenge. This is the first CDC Guideline to incorporate recommendations specifically for home care and hospice settings.

The Guideline contains recommendations based on the CDC/Healthcare Infection Control Practices Advisory Committee's (HICPAC) System for Categorizing Recommendations, which are listed in Table 1. The recommendations are ranked and generally are based on studies and data that support these recommendations. One of the challenges is that to date, no MDRO home care data exist, yet the Guideline applies to care provided in *all* healthcare settings. Therefore, some of the Guideline's content may not be as pertinent for care provided in the home setting as it is for care provided in an acute care setting. This article reviews the category IA, IB, and IC recommendations in this CDC Guideline and provides options for their implementation in home health agencies, by home infusion providers, in hospices, and by providers of durable medical equipment.

Administrative Measures

Regardless of the prevalence of MDROs in a home care or hospice organization's patient population,

administrative measures can be taken by management to prevent and control their transmission by making MDRO prevention and control an organizational patient safety priority (Siegel et al., 2006). Management can demonstrate its commitment to this patient safety priority by allocating financial and personnel resources to prevent and control MDRO transmission. For example, most freestanding home care and hospice organizations do not have the expertise within their internal staff and resources to analyze epidemiologic data, recognize problems with MDROs, or devise effective control strategies. Management should identify experts that can serve as consultants on an as-needed basis. Most often, such experts can be found at local hospitals and include senior infection control practitioners (ICPs), the hospital epidemiologist, or a physician trained in infectious diseases. If a home care agency detects or suspects that patient-to-patient transmission of an MDRO has occurred, an experienced infection control expert can be engaged to assist in the investigation to confirm the transmission and in the development of strategies to prevent further transmission.

The CDC Guideline includes the implementation of a multidisciplinary process to monitor and improve the staff's adherence to the

recommended isolation precautions (i.e., Standard and Contact Precautions) (Siegel et al., 2006). This means that all disciplines should be involved in making sure that isolation precautions are understood and implemented, that home care-acquired infections are properly reported, and that other measures taken by management to prevent and control the transmission of MDROs are followed (e.g., appropriate hand hygiene, visit scheduling, and a focus on high touch surfaces in the patient's environment during cleaning activities).

Additionally, systems should be implemented to identify patients colonized or infected with a target MDRO. Target MDROs are those determined to be the most prevalent among the patients, as identified through surveillance activities. These are discussed in the surveillance section of the article.

Table 1. CDC/HICPAC System for Categorizing Recommendations

Category IA	Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiologic studies.
Category IB	Strongly recommended for implementation and supported (but not strongly) by certain experimental, clinical, or epidemiologic studies and a strong theoretical rationale.
Category IC	Required for implementation, as mandated by federal or state regulation or standard.
Category II	Suggested for implementation and supported by suggestive clinical or epidemiologic studies or a theoretical rationale.
No recommendation	Unresolved issue. Practices for which insufficient evidence or no consensus regarding efficacy exist.

Note. From Siegel, J. D., Rhinehart, E., Jackson, M., Chiarello, L., & Hospital Infection Control Practices Advisory Committee. CDC. (2006). *Management of multidrug-resistant organisms in healthcare settings, 2006*. Available at: www.cdc.gov/ncidod/dhqp/pdf/ar/mdroGuideline2006.pdf.

A home care organization also may choose to participate in and support local, regional, and national coalitions to combat the growing problems with MDROs. A home care or hospice organization may support and participate in efforts undertaken by the county or state health department, the CDC, or the Association for Professionals in Infection Control and Epidemiology (APIC) on both national and local levels (Siegel et al., 2006). Examples of participation may include sharing data and information about the prevalence of MDROs in the organization's home care patient population served if and when it is requested, sharing effective prevention and control strategies at a local APIC chapter meeting, and attending educational sessions, teleconferences and webinars offered by the CDC and APIC.

At least annually, the home care agency's leadership should review the agency's experience with MDROs and provide a summary of information to the home care and hospice staff and management on how well the organization is doing in preventing and controlling the transmission of MDROs (Siegel et al., 2006). Such information should include

- The experience with target MDROs, including the prevalence and any evidence of patient-to-patient transmission.
- The results of assessments for organizational system failures (e.g., review of policies, procedures, and surveillance data; audits of hand hygiene compliance).
- Action plans implemented to address specific deficits in the staff's adherence to recommended infection prevention and control practices.
- The organization's effectiveness in preventing and controlling MDROs.

Staff Education and Training

During orientation and ongoing thereafter, education and training should be provided to all patient care staff. It should include

- The epidemiology and risks of MDROs
- Identification, prevention, and control, with an emphasis on the staff's role
- The home care and hospice organization's actual experience with managing MDROs including the prevalence of target MDROs and the effectiveness of prevention strategies.

Judicious Use of Antimicrobial Agents

Whereas infection control professionals and nurses can identify MDROs and take measures to

minimize their transmission, prevention of their development and risk for their acquisition lies mainly with the judicious use of antibiotics. Physicians in all settings should act in a considerate manner to ensure that

- The patient has a condition that requires treatment with an antibiotic.
- The antibiotic chosen is appropriate for use, and the bacteria are susceptible to the drug (Siegel et al., 2006).

Most home care and hospice patients are not cultured before receiving an antibiotic. However, when they are, as may be most likely for bloodstream infections in patients receiving home infusion therapy, the pharmacist should be proactive in ensuring that the drug is appropriate by reviewing the culture results, including the antibiotic susceptibility test results. If there is demonstrated resistance to the antibiotics ordered, the pharmacist should notify the ordering physician immediately.

Surveillance of MDROs in Home Care and Hospice

Identification of MDROs in home care and hospice patients relies primarily on reporting of the colonization or infection by a referring physician or organization such as a hospital or long-term care facility. Occasionally, a home care provider or hospice may identify an MDRO in a patient through a culture ordered while the patient is receiving home care. However, the home care organization cannot determine whether the MDRO was acquired as a result of home care or was previously present unless there are negative cultures of the same site acquired during the home care episode. Home care organizations should make efforts to ensure that the laboratories they use most frequently will notify staff immediately when an MDRO is identified in a patient culture (Siegel et al., 2006). Although the main goal for initiating surveillance of MDROs in home care is to identify transmission among home care patients, there also is a benefit in determining the organization's actual experience with MDROs through identifying and recording patients known to be infected or colonized with target organisms and establishing the epidemiology of MDROs in the home care or hospice organization's patient population.

The first step in establishing surveillance data for MDROs is to determine a baseline of experience. This can be accomplished by initiating a

simple log (or line listing) of patients known to be infected or colonized with an MDRO. This information usually will be reported to the hospice or home care agency by the referring organization or physician. Occasionally, a home care patient may be identified as colonized or infected with an MDRO through a culture obtained while the patient was receiving home care. Such patients should also be included in the log. In addition to a simple patient identifier, this log should include the patient's date of admission, the referral source (by name), the type of MDRO (e.g., MRSA, VRE), whether the patient is colonized or infected, and the site. It should also indicate whether the MDRO was known to be present at admission or whether it was identified during the course of home care.

Each month or quarter, depending on the size of the home care organization or the number of admissions, the infection control designee responsible for the log should summarize the agency's experience to identify any patterns or trends. At the end of each year, the data can be summarized and trended. Such data analysis should include the number of colonized or infected patients admitted each month or quarter, the total number of patients with MDROs, and the prevalence of MDROs (total number of patients with MDROs during a specific period, both new and existing cases). These numbers should be stratified by the type of MDRO (e.g., MRSA, VRE) and the site of the colonization or infection. Figure 1 provides an example of an annual prevalence summary for MDROs in an agency. The agency can then identify which referring organizations most frequently refer patients colonized or infected with an MDRO (Figure 2) and which sites are most often involved.

Whereas Figure 1 provides a number of MDRO cases per month, a prevalence rate also can be calculated. The numerator may be the number of patients present during the period who are in-

Month	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
MRSA	6	8	9	5	12	11	13	15	8	6	5	7
VRE	4	2	0	1	3	2	0	1	2	3	1	0
<i>C. diff</i>	3	2	3	4	1	2	0	3	2	1	0	0
GNB	1	1	0	0	0	0	0	1	0	0	0	0
Other	0	0	0	0	0	1	0	0	0	0	0	0

Figure 1. Number of MDRO patients per month by type of organism.

Source	MRSA	VRE	GNB	<i>C. diff</i>
Hospital A	12	2	1	3
Hospital B	2	3	2	6
Physician A	15	0	0	2
Physician B	22	0	0	1

Figure 2. Referral sources for MDROs by type of organism.

fectured or colonized with MRSA (or VRE or other important MDRO), and the denominator could be the number of patients receiving care for that period or, alternatively, the number of visits for that period (Figure 3). Thus, the prevalence can be tracked and trended from month to month or quarter to quarter using a prevalence rate rather than the number of cases. Use of a rate helps to control for variation in the number of patients cared for during the period.

The most important use of the log is to establish a baseline of experience with MDROs to recognize an increase in MDROs and the potential for their transmission to other home care patients. If an increase is noted, it may be attributable to an increase in the incidence (number of new cases identified) of a specific MDRO in a referring organization. The designated home care or hospice ICP can contact the ICP at the referring organization to inform that ICP of the data results and to inquire whether the referring organization is experiencing an increased incidence of the MDRO. Some MDROs may be considered reportable to the local or state health department, including vancomycin-resistant *Staphylococcus aureus* (VRSA), vancomycin-intermediate *Staphylococcus aureus* (VISA), MRSA, and penicillin-resistant *S. pneumoniae*. Each agency should check with the state health department to determine what

MDROs, if any, must be reported. Reporting of MDROs outside the organization also should be implemented when a patient is transferred from the home setting to another care setting if the organization is aware that

$$\frac{N \text{ (\# of patients with MRSA)}}{D \text{ (\# of patients receiving home care)}} \times 100 = \text{Prevalence Rate}$$

$$\frac{17}{113} \times 100 = 15\%$$

Figure 3. Prevalence rate for first quarter of 2007.

the patient is infected or colonized with an MDRO. The CDC Guideline recommends that the home care or hospice organization's staff notify the facility's staff before the patient is transferred (Siegel et al., 2006). For organizations that are accredited by The Joint Commission (JCAHO, 2005), this has been an infection control standard requirement and would not be considered a new requirement.

Prevention and Control of MDROs in Patient Care

Hand Hygiene

There is ample data to demonstrate that MDROs are most frequently transmitted via the hands (Siegel et al., 2006). The hands are easily contaminated during patient care and contact with environmental surfaces that may be contaminated in close proximity to the patient's care area. When hand hygiene is not maintained as required and gloves are not used appropriately, transmission of MDROs via hand contamination is more likely (CDC, 2002). Therefore, the most important patient care strategy for preventing and controlling the transmission of MDROs is to maintain good hand hygiene.

In home care, it is especially important to attend to good hand hygiene before leaving a home and immediately on entering another patient's home. Whenever possible, consideration should be given to limiting the number of direct care providers assigned to care for a patient infected or colonized with an MDRO (Siegel et al., 2006). Such limitation is aimed at reducing the exposure to others and to enhance the consistency of proper environmental cleaning and disinfection.

Standard Precautions

Standard Precautions must be used in providing care for all home care patients, including those known to be infected or colonized with MDROs. Such precautions are especially important during all contact with patients and their immediate environment when there is potential for contact with a

patient's blood, any body fluids, secretions, and excretions (except sweat), and when the staff member will be in contact with the patient's nonintact skin and mucous membranes (Occupational Health and Safety Administration [OSHA], 2001).

Contact Precautions

There are no data to guide the use of Contact Precautions for home care patients with MDROs. The need for Contact Precautions will depend on several variables, including whether

- The patient has uncontrolled secretions or drainage. Contact Precautions may be warranted to avoid contamination of clothing and potential transmission to subsequent patients.
- There has been evidence of MDRO transmission from one patient to another in the home care organization.
- The home care organization has evidence that there is poor compliance with Standard Precautions.

Thus, if a home care patient is colonized with an MDRO but secretions or drainage are controlled and there is little risk of environmental contamination, Contact Precautions may not be necessary. Each patient with an MDRO should be assessed on admission and also when the patient's condition changes (e.g., increased or uncontrolled drainage) to determine when Contact Precautions should be used in addition to Standard Precautions (Siegel et al., 2006).

Equipment and Supplies

Reusable noncritical patient care equipment brought into the patient's home should be limited to that required for the patient's care. Whenever possible, the equipment should be left in the patient's home until discharge, or the patient should be provided with disposable equipment (e.g., stethoscope). If noncritical patient care equipment cannot remain in the home, it should be cleaned and disinfected with a low-to-intermediate-level disinfectant before it is removed or returned to the nursing bag and used for another patient. If the equipment cannot be cleaned in the home, it may be placed in a plastic bag and transported after use to the area designated for cleaning and disinfecting equipment and patient care supplies (Siegel et al., 2006).

Environmental Measures

Surfaces and items in the home frequently touched by the patient may be contaminated with MDROs (Siegel et al., 2006). These may include items in close proximity to the patient (e.g., end table, TV remote control) and frequently touched surfaces in the patient's care environment (e.g., light switches, door knobs, surfaces in and surrounding the toilet) that are used by the patient. These items should be cleaned frequently. However, the home care or hospice organization's focus will be on educating the patient and family about cleaning the home environment and on good hand hygiene.

Intensified Interventions

A wealth of infection control literature describes outbreaks of MDROs in hospitals and the various strategies that have seemed effective in controlling these outbreaks. These strategies have been incorporated into the Guideline in a "second tier" of recommendations for controlling MDROs and are intended for implementation when

- The incidence or prevalence of MDROs in the patient population is not decreasing despite the organization's correct and consistent efforts to implement routine infection prevention and control measures.
- The first case or outbreak of an epidemiologically important MDRO (e.g., VRE, MRSA, VISA, VRSA, MDR gram-negative bacilli) is identified (Siegel et al., 2006).

It is not known whether the recommendations for intensified efforts are necessary, applicable, or appropriate in home care. Thus, a home care organization should be aware of its own experience and the epidemiology of target MDROs in its patient population. If a significant change is detected, such as documented patient-to-patient transmission from care provided in the home setting, the advice and guidance of experienced infection control professionals should be sought. This may include an individual ICP or a team that includes a physician hospital epidemiologist to determine the best course for the home care organization based on the specific variables of the situation and the type and risks within the patient population.

Although the Guideline could not provide more specific direction to home care and hospice organizations due to the lack of experience or study of MDROs in the home setting, home care and hos-

pice organizations will nonetheless benefit from the Guideline's instructional content and learn about their own experience with MDROs through their surveillance activities. As this knowledge is accumulated, there will perhaps be more data upon which to base specific recommendations for home care and hospice settings. ■

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