

Multidrug-Resistant Organisms, a Growing Concern

Resources for nurses and health care systems.

Multidrug-resistant organisms are microorganisms (primarily bacteria) that are resistant to one or more classes of antibiotics. Frequently encountered organisms include methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococcus faecium* and *E. faecalis* (VRE), and a variety of multidrug-resistant gram-negative bacilli (see *Multidrug-Resistant Gram-Negative Bacilli*). Less common but of increasing concern are the emerging strains of MRSA that are resistant to vancomycin: *S. aureus* with intermediate resistance to vancomycin (VISA) and *S. aureus* that's fully resistant to the drug (VRSA).

Although the names of some multidrug-resistant organisms imply resistance to only one antibiotic, isolates of these organisms are often resistant to several antibiotics in the same class or to several classes of antibiotics. Some are considered “panresistant,” that is, they're not sensitive to any antibiotic against which they're tested.

In general, resistant strains of most bacteria aren't more virulent than their antibiotic-sensitive counterparts. (MRSA is probably an exception; more patients colonized with MRSA develop symptomatic infections than do patients with methicillin-susceptible *S. aureus*.¹) The problem with multidrug-resistant organisms is that treatment options are limited. Clinicians have fewer drugs from which to choose, making it more difficult to find those that are safe and effective. Sometimes prescribers are forced to use

older, more toxic drugs, often drugs without sufficient data to guide dosage or duration of therapy for infections caused by multidrug-resistant organisms.² In addition, limited treatment options can result in increases in costs, lengths of hospital stay, and mortality rates.

more likely to have multiple risk factors for infection: they may be severely ill or immunocompromised (or both); have had recent surgery or other invasive procedures; and have indwelling devices such as central lines, Foley catheters, or endotracheal tubes.

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The prevalence of resistant organisms varies widely according to geographic area³; the percentage of infections caused by multidrug-resistant strains rather than by sensitive strains of the same organisms is also strongly correlated with type of facility, hospital size, and the level of care provided.⁴ In general, patients are more likely to acquire resistant organisms in acute care hospitals than in long-term care facilities, in large institutions rather than small hospitals, and in tertiary care facilities.⁴

Nevertheless, vulnerable patients can be found in any health care setting. These “susceptible hosts” are the people who are at greatest risk for acquiring any infection, whether caused by antibiotic-sensitive or antibiotic-resistant organisms. Patients in ICUs and on certain specialty units (oncology, bone marrow transplantation, and solid organ transplantation, for example) are

ICUs in particular are likely to be “high contact” units, where patients typically experience frequent, sometimes prolonged, physical contact with a greater number of staff members than patients in non-ICU areas. Such contact increases the number of opportunities for the transmission of microorganisms.

Once infection or colonization with a multidrug-resistant organism has been identified at a facility, its transmission and persistence depend upon the number of vulnerable patients, the antibiotic choices made by clinicians at the facility, the number of patients colonized or infected with the organism (“colonization pressure”), and the implementation of and adherence to infection-control protocols.^{1, 5, 6}

RESOURCES

There are a number of Web sites and publications that provide extensive information on

multidrug-resistant organisms and their prevention and control.

Publications. The following three publications make an excellent toolbox to invigorate any facility's approach to multidrug-resistant organisms.

- *Management of Multidrug-Resistant Organisms in Healthcare Settings*, 2006: <http://bit.ly/dFOFap>. This in-depth document from the Healthcare Infection Control Practices Advisory Committee (HICPAC) of the Centers for Disease Control and Prevention has a wealth of information and more than 400 references.
- Cohen AL, et al. Recommendations for metrics for multidrug-resistant organisms in healthcare settings: SHEA/HICPAC position paper. *Infect Control Hosp Epidemiol* 2008; 29(10):901-13. The first step in any program to control multidrug-resistant organisms is to learn what you're dealing with at your facility. What organisms do your patients have? What are your infection rates? Who are your most vulnerable patients? Establishing a baseline for a particular facility or clinical practice ensures that prevention and control efforts are tailored to a specific population. These recommendations from the Society for Healthcare Epidemiology of

America and HICPAC provide a detailed, practical guide to defining, measuring, and tracking these organisms.

- McDonald LC, et al. Recommendations for surveillance of *Clostridium difficile*-associated disease. *Infect Control Hosp Epidemiol* 2007;28(2):140-5. *Clostridium difficile*, despite increasingly virulent and resistant strains, isn't usually referred to as a multidrug-resistant organism, but most hospitals include *C. difficile* surveillance and control efforts in their overall plan for dealing with resistant organisms. These recommendations provide a guide to defining, measuring, and tracking *C. difficile* infections.

Web sites. Several sites provide reference documents and regular updates concerning multidrug-resistant organisms.

- www.apic.org. Web site of the Association for Professionals in Infection Control and Epidemiology. Among other resources, includes guidelines on the elimination of MRSA in both hospital and long-term care settings.
- <http://cdc.gov>. Click on "Healthcare Providers," then "Antibiotic Resistance Resources for Healthcare Providers." Detailed information for both consumers (patient-education materials) and

health care workers on a variety of resistant organisms, plus information on efforts to decrease antibiotic resistance.

- <http://chica.org>. The Community and Hospital Infection Control Association of Canada. Click on "Links and Resources" for information on antibiotic-resistant organisms.
- www.idsociety.org. Infectious Diseases Society of America. Particularly helpful are numerous guidelines on prescribing antibiotics and the society's "Bad Bugs, No Drugs" reports on antibiotic resistance.
- www.shea-online.org. Society for Healthcare Epidemiology of America. Includes many documents describing evidence-based strategies. ▼

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5. Merrer J, et al. "Colonization pressure" and risk of acquisition of methicillin-resistant *Staphylococcus aureus* in a medical intensive care unit. *Infect Control Hosp Epidemiol* 2000;21(11):718-23.
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Multidrug-Resistant Gram-Negative Bacilli

There are no standard definitions for multidrug-resistant gram-negative bacilli, but a short list of examples can be helpful:

- Extended-spectrum β -lactamase-producing *Klebsiella pneumoniae*
- Carbapenem-resistant *K. pneumoniae*, *K. oxytoca*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Acinetobacter baumannii*, and *Enterobacter* species
- Organisms intrinsically resistant to the broadest-spectrum antibiotics, such as *Burkholderia cepacia* and *Stenotrophomonas maltophilia*