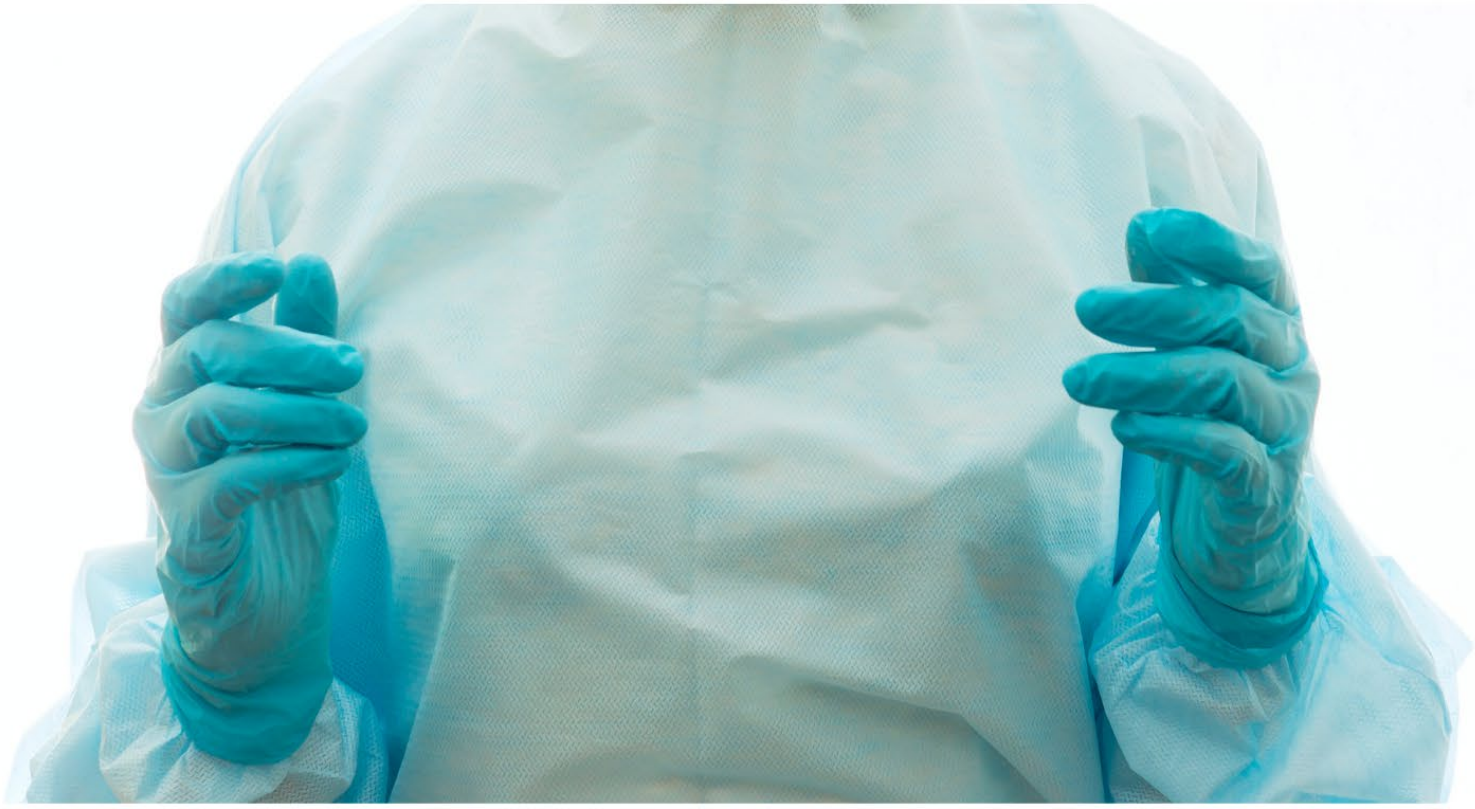

Guidelines for Prevention and Control of Multidrug-Resistant Organisms for Health Care Settings

Healthcare-Associated Infections (HAI) Prevention Program

Division of Public Health

Wisconsin Department of Health Services

WISCONSIN DEPARTMENT *of* HEALTH SERVICES

Contents

Wisconsin Department of Health Services
Division of Public Health
P-42513 (10/2022)

Statement of Purpose

Background

This document is an update to the Wisconsin Department of Health Services Division of Public Health *Guidelines for Prevention and Control of Antibiotic Resistant Organisms in Health Care Settings 2005*. This guidance is designed to aid health care facilities in the prevention and control of multidrug-resistant organisms (MDROs) across the continuum of care. This document focuses on MDROs of public health concern.

MDROs are an emerging threat to global public health. The potential for rapid spread within health care facilities and the difficulties of treating these infections make it critically important for public health to conduct surveillance across settings and promote aggressive infection control measures.

As highlighted in the Centers for Disease Control and Prevention's (CDC) 2019 *Antibiotic Resistance Threats in the United States*, more than 2.8 million antibiotic-resistant infections occur in the U.S. each year and more than 35,000 people die from them. Inappropriate antibiotic use and lack of infection prevention measures in one facility can affect other facilities because of the interconnected system of health care as patients and residents are transferred among common facilities and shared health care providers.

Purpose

These updated guidelines include new information on prevention and control measures for the management of MDROs, including methicillin-resistant *Staphylococcus aurus* (MRSA); vancomycin-intermediate and resistant *Staphylococcus aureus* (VISA, VRSA); extended-spectrum beta-lactemase (ESBL)-producing Enterobacterales; and carbapenemase-producing organisms.

CDC has also identified a subset of MDROs that are of special concern in nursing homes and require additional precautions. Those targeted MDROs are:

- Carbapenemase-producing *Acinetobacter baumannii*
- Carbapenemase-producing Enterobacterales (CRE)
- Carbapenemase-producing *Pseudomonas aeruginosa*
- Pan-resistant organisms
- *Candida auris*

These guidelines will review standard infection prevention and control measures appropriate for all settings, and specific measures for many health care settings that frequently deal with these organisms. Additionally, this update will address a type of transmission-based precautions known as enhanced barrier precautions (EBP), which are used in skilled nursing facilities (SNFs) when a targeted or epidemiologically important MDROs is found.

Note: This document is not a guide for medical treatment of persons colonized or infected with MDROs. Health care facilities should continue to consult with individual providers for treatment decisions along with facility policies to inform infection prevention and control practices.

Other Resistant Organisms

Other kinds of resistance exist and are widely prevalent in Wisconsin. Gram negative bacterial sources include ESBL and AmpC-producing Enterobacterales, non-molecular-based CRE, and non-molecular-based carbapenem-resistant *Pseudomonas aeruginosa* (CRPA). While these are not currently reportable to state health or national authorities, they may have significant clinical importance. Policies and procedures for transmission-based precautions for these organisms may apply, depending on the health care setting and individual facility policies. Among gram positive bacteria, MRSA and vancomycin-resistant *Enterococci* (VRE) can be clinically important and may have infection control significance.

Multidrug-Resistant Organisms Reportable in Wisconsin

There are many microorganisms that can be considered MDROs. Historically, transmission of MDROs is most frequently documented in acute care facilities, however, all health care settings are increasingly affected by the emergence and transmission of these organisms. The hands of health care workers can be a common mode of transmission. Studies have shown that MDROs can be present on the hands of health care workers after performing care activities, such as bathing; wound debridement and dressing; tracheostomy care; and catheter care, which can lead to further transmission of the organism. Additionally, MDROs can be found on equipment and surfaces in health care settings. These findings highlight the need for adherence to hand hygiene by health care workers, improved environmental cleaning and disinfection, and the use of transmission-based precautions. Risk factors for MDRO infections include underlying medical conditions, frequent hospitalizations, recent surgeries or procedures, indwelling medical devices (urinary catheters, endotracheal tubes and central veinous catheters), and broad-spectrum antibiotic use.

While any drug resistance affects clinical management and infection prevention practices, only select MDROs are of concern to public health. Factors that make MDROs a public health concern are high transmissibility, ability for patients to be silent carriers of the organism, and difficulty of treating diseases caused by the organism. The state of Wisconsin performs surveillance for some of these MDROs, which are described in this section.

Candida auris

Candida auris (C. auris) is a new and emerging fungal species that can spread in health care settings and cause outbreaks. Since first identified in Japan in 2009, *C. auris* infections have

been reported in more than 30 countries, including the United States. It can cause bloodstream infections, wound infections, and urinary tract infections, while leading to increased mortality. Per CDC, based on a limited number of patients reviewed, 30–60% of those with the infection died, but most had other comorbidities at the time of death that may have contributed.

C. auris is often multidrug-resistant and some strains are resistant to all three available classes of antifungals (azoles, polyenes, and echinocandins). *C. auris* is difficult to identify and is often misidentified by commonly used, automated hospital laboratory yeast identification methods. Misidentification can lead to inappropriate patient management and treatment.

C. auris, unlike other yeast, can persist in the health care environment for weeks, highlighting the need for placing patients and residents in contact precautions and thorough environmental cleaning with an EPA-registered, hospital-grade disinfectant with claims against *C. auris*. *C. auris* has been linked to numerous health care facility outbreaks with high rates of transmission among patients or residents on units due to contamination in the environment or shared equipment, as well as through person-to-person transmission. *C. auris* was added as a Category II reportable disease in Wisconsin in 2022. The Case Reporting and Investigation Protocol details the process of reporting a case in Wisconsin.

Carbapenemase-Producing Organisms (CPOs)

Carbapenemase-producing organisms (CPOs) are MDROs that contain mobile resistance elements that aid in the transmission of antibiotic resistance to other organisms. Gram negative bacteria that acquire this mobile resistance element produce carbapenemase enzymes that hydrolyze carbapenem antibiotics. Examples of the most common carbapenemases include: Klebsiella pneumoniae carbapenemase (KPC), New Delhi Metallo-beta-lactamase (NDM)-1, OXA, IMP, and VIM. CPOs include members of the Enterobacterales order (such as *E. coli, Klebsiella*), *Acinetobacter baumannii,* and *Pseudomonas aeruginosa*.

The Wisconsin State Laboratory of Hygiene (WSLH) began testing CRE organisms for KPC and NDM-1 via molecular testing (PCR) in 2010. Shortly thereafter, OXA-48 was also added to the standard tests for CRE. With the support of CDC's Antibiotic Resistance Lab Network (ARLN), WSLH added testing for VIM and IMP in 2017. CP-CRE was made reportable in 2018. WSLH has continued to add to its CPO testing capacity, including the addition of PCR testing for carbapenemases commonly found in *Acinetobacter baumannii* (OXA-23, OXA-24/40, OXA-58) in 2019. WSLH also has the capacity to perform whole genome sequencing on isolates to support outbreak investigation. As of July 2022, carbapenemase-producing carbapenem-resistant *Acinetobacter baumannii* (CP-CRAB), carbapenemase producing carbapenem-resistant *Pseudomonas aeruginosa* (CP-CRPA), and *Candida auris* joined carbapenemase-producing carbapenem-resistant Enterobacterales (CP-CRE) as reportable in Wisconsin.

Carbapenemase- Producing Carbapenem-Resistant *Acinetobacter baumannii* (CP-CRAB)

Acinetobacter baumannii is a species of gram negative bacteria commonly found in the environment, such as in soil and water. If introduced to the health care setting, this organism can survive for a long time on surfaces, which poses a challenge for environmental services when infection or colonization cases are identified. Many isolates of *Acinetobacter baumannii* contain carbapenemase genes that make the bacteria resistant to carbapenem antibiotics, such as ertapenem or meropenem. Some isolates of CP-CRAB are resistant to all available antibiotics (pan-resistant).

As part of the national AR Lab Network, WSLH began testing for CP-CRAB-specific carbapenemase genes (OXA-23-like, OXA-24/40-like, OXA-58-like) in August 2019. The majority of CP-CRAB cases were initially found in the Southeastern Region of Wisconsin, though CP-CRAB has been detected in nearly every region of the state through voluntary submissions to WSLH by clinical labs. The most common carbapenemase detected in Wisconsin CP-CRAB isolates is OXA-24/40 (99%). CP-CRAB is also more commonly detected in patients with wounds, artificial airways, and in patients with post-acute care connections. The frequent movement of patients or residents between facilities can increase transmission, especially when their MDRO status is not explicitly communicated. CP-CRAB was added as a Category II reportable disease in Wisconsin in 2022. The Case Reporting and Investigation Protocol details the process of reporting a case in Wisconsin.

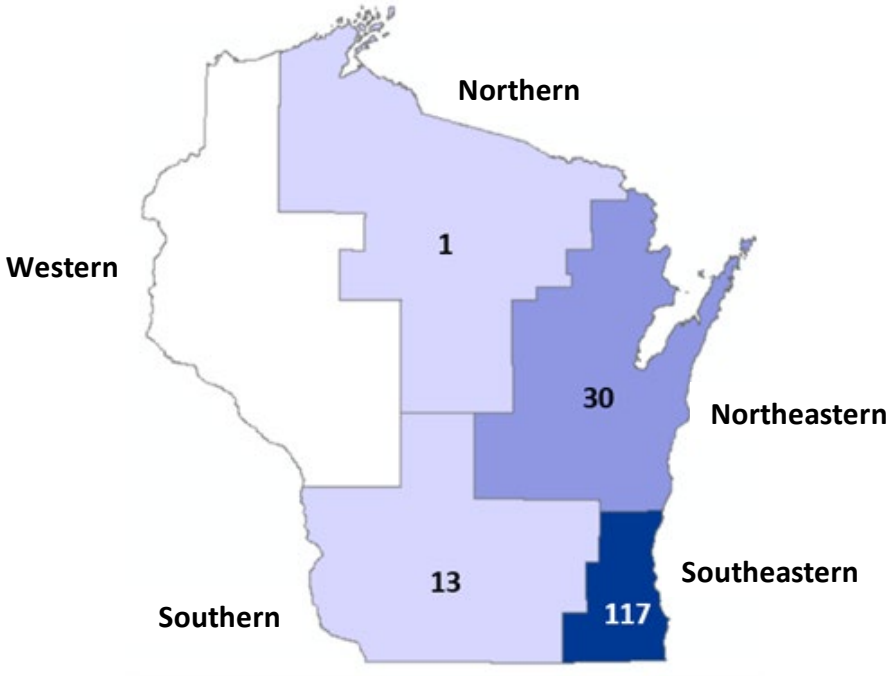

Figure 1. Distribution of CP-CRAB in Wisconsin, 2021

Table 1. CP-CRAB in Wisconsin, 2019–2021

	CRAB Isolates	OXA-24/40	OXA-23
2019	126	34	2
2020	85	74	0
2021	161	160	1

Carbapenemase-Producing Carbapenem-Resistant Enterobacterales (CP-CRE)

Enterobacterales is an order of bacteria commonly found in healthy human intestines. There are several species of bacteria within the Enterobacterales order, which include but are not limited to *Escherichia, Klebsiella, Enterobacter, Salmonella, Shigella, Citrobacter,* and *Yersinia*. CRE are Enterobacterales species that are resistant to at least one carbapenem antibiotic (for example: ertapenem, meropenem, imipenem, or doripenem).

There are several types of resistance common in Enterobacterales species. Some isolates have intrinsic resistance to certain antibiotics, including species such as *Proteus* spp., *Morganella* spp., and *Providencia* spp., which have intrinsic resistance to imipenem (a carbapenem antibiotic).

Infections with organisms that have resistance mechanisms, such as ESBLs, often need to be treated with carbapenem antibiotics, which are considered an antibiotic of last resort. Other enzymes called carbapenemases can increase resistance to these antibiotics as well. Because carbapenem antibiotics are so important for treatment, the CDC considers CRE to be an urgent threat, the highest level. Wisconsin initiated CRE surveillance in 2011 among hospitals using a laboratory-identified case definition for *E. coli*, certain Klebsiella species, and Enterobacter species. Skilled nursing facility (SNF) CRE surveillance was added in 2016. Carbapenemase-producing CRE (CP-CRE) is now a Category II reportable disease in Wisconsin. This applies to any species of CRE that tests positive for a carbapenemase such as KPC, NDM-1, OXA, IMP, or VIM. The Case Reporting and Investigation Protocol details the process of reporting a case in Wisconsin.

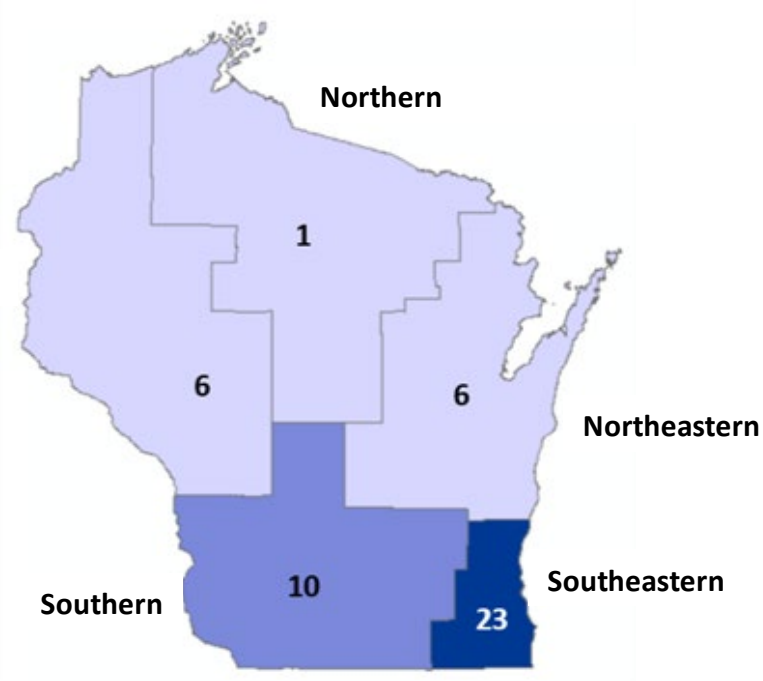

Figure 2. Distribution of CP-CRE in Wisconsin, 2021

Table 2. CP-CRE in Wisconsin, 2017–2021

	CRE Isolates	KPC	NDM-1	IMP	OXA-48
2017	41	39	0	0	2
2018	61	46	4	7	4
2019	42	30	7	4	1
2020	30	22	2	3	3
2021	46	30	11	5	1

Carbapenem-Resistant *Pseudomonas aeruginosa* (CRPA)

Pseudomonas aeruginosa is a species of gram-negative bacteria commonly found in the environment, such as in soil and water. CRPA has also been found to survive in biofilms in health care facility drains, making water management plans an essential component of reducing the spread of CRPA in health care. Many isolates of *P. aeruginosa* have high levels of intrinsic resistance to antibiotics, including carbapenems such as imipenem and meropenem. Carbapenemase-producing CRPA (CP-CRPA) that contain mobile resistance elements are rare but can be highly resistant and cause serious infections. *P. aeruginosa* also commonly colonizes and infects hospitalized patients and residents in LTCFs. CP-CRPA is rare in Wisconsin, and most cases identified to date have a history of international health care exposure. CP-CRPA was added as a Category II reportable disease in Wisconsin in 2022. The Case Reporting and Investigation Protocol details the process of reporting a case in Wisconsin.

Table 3. CP-CRPA in Wisconsin, 2017–2021

	CP-CRPA Isolates	KPC	NDM-1	VIM
2017	0	0	0	0
2018	1	0	1	0
2019	0	0	0	0
2020	2	0	1	1
2021	3	1	2	0

Methicillin-Resistant *Staphylococcus aureus* (MRSA)

MRSA is a skin-based bacterial pathogen transmitted person-to-person primarily by direct contact with an individual who is either colonized or infected with the organism. In health care settings, MRSA can cause serious infections including bloodstream infections, pneumonia, and surgical site infections. In recent years, prevention efforts made by health care facilities have slowed the spread of MRSA and reduced infections. However, MRSA infection is still a risk to patients and residents in health care settings and facilities should continue to review best practices and implement prevention measures.

Individual cases of MRSA are not reportable in Wisconsin, but institutional outbreaks of MRSA should be reported to public health when identified.

Vancomycin-Intermediate *S. aureus* (VISA) and Vancomycin-Resistant *S. aureus* (VRSA)

Evidence that *S. aureus* has become less susceptible to vancomycin began to be reported in the 1990s. The first documented case of VISA infection was reported in 1996 in a patient in Japan. Since then, infections with VISA have been reported in patients from the U.S., Europe, and Asia. Per a CDC January 2022 lab update report, 16 cases of VRSA have been reported in the U.S. since 2002. Although there is currently no evidence of transmission in health care settings, surveillance to detect these very difficult-to-treat organisms should be implemented in inpatient settings. VISA-VRSA cases are a Category I reportable in Wisconsin. The Case Reporting and Investigation Protocol details the process of reporting a case in Wisconsin. As of publication, no cases of VRSA have been detected in Wisconsin.

Strategies for Reducing the Risk of MDRO Transmission in Health Care Settings

Administrative Measures

Reduction of the burden of MDROs should be an institutional goal that is supported by administrative and managerial leadership. Administration should ensure that all necessary resources are available to the facility's infection prevention program, and management personnel should promote, support, and exemplify infection prevention practices among their staff.

Each health care facility should have designated infection prevention staff and a multidisciplinary infection prevention committee that will oversee infection prevention activities throughout the facility. Infection prevention committee membership will vary by facility type, but at a minimum should include:

- Infection prevention staff
- Physicians
- Nursing staff
- Quality assurance personnel
- Risk management staff
- Environmental services staff

The goal of the committee is to bring together individuals with expertise in different health care areas to prevent and control healthcare-associated infections, including MDROs. Below are administrative measures that should be included in facility infection prevention programs and committees.

- **Administrative representation:** A representative from administration should be included as a member of the institution infection prevention committee. This is a requirement for acute care facilities under Federal Conditions for Participation for Hospitals Part 482.
- **Compliance monitoring:** Rates of compliance with hand hygiene, appropriate use of personal protective equipment (PPE), and cleaning and disinfection practices among patient care staff should be routinely monitored, with regular performance feedback given to staff, managers, and administrative personnel.
- **Adherence to other guidelines:** The facility should adhere to other infection prevention guidelines which will help reduce the risk of acquiring infections from MDROs and other

healthcare-associated microorganisms, should be monitored. See Appendix B for additional guidelines.

- **Education:** The facility should provide education for staff on the sources of MDROs, how they are spread in health care facilities, the significance of MDRO infections in patients or residents, and how to prevent and control the spread of resistant organisms. Patients, residents, and their families should be educated on good hand hygiene practices and other strategies for preventing the spread of MDROs within the institution, as well as any specific MDROs if they test positive for one.
- **Inter-facility cooperation:** Administrative leadership should develop collaborative relationships and regional strategies such as partnerships between health care systems and local health departments. These partnerships should apply these strategies consistently across the continuum of care in a geographic location. This also includes notifying medical transport personnel of patient or resident isolation needs. It is important to reinforce with staff at all levels how interconnected all area health care entities are due to their shared care of patients and residents at different points in their care plans.

Antimicrobial Stewardship

The overuse and misuse of antimicrobials is a major contributing factor in the development of drug resistance in bacteria and yeast, as well as colonization and infection by drug-resistant organisms. Antibiotic pressure selects for organisms resistant to antibiotic agents used, which can lead to colonization and infection by MDROs. Antimicrobial stewardship encourages judicious use of antimicrobial agents with the goal of slowing the spread of MDROs.

Core tenets of antibiotic stewardship include:

- Treating true infections appropriately.
- Encouraging use of narrow spectrum agents or de-escalating therapy once culture results return.
- Treating true infections only, not colonization.
- Avoiding antibiotic prophylaxis.
- Monitoring local antibiotic resistance (antibiograms) to improve empiric antibiotic prescribing.

The facility's consulting pharmacist or infectious disease specialist should ideally be consulted for assistance in establishing these measures, as well as for more complicated decision-making. For additional information, visit the Wisconsin DHS Antimicrobial Stewardship Home Page.

Education

Health care workers should receive continuing education regarding basic infection prevention and control practices on a regular schedule, as well as whenever policies or procedures for transmission-based precautions change or are updated. Facilities should document the education given and the names of employees who complete the education. An important part of health care worker education is auditing practices such as hand hygiene and PPE use and providing follow-up and feedback to frontline workers to improve processes.

Patient and resident education is also essential for the prevention and control of MDROs. More information can be found on the DHS Reportable MDRO Page. Proper hand hygiene should be emphasized for all patients and residents. Additionally, patients or residents in transmission-based precautions and their families need education, including the reason for isolation, control measures, and expectations during visits within the isolation period and how to appropriately don and doff PPE if being used (see Appendix B).

Environmental Measures

Studies have implicated environmental reservoirs as sources of MDRO infection and colonization. All health care facilities should establish policies for cleaning and disinfection of the health care environment. These policies should include attention to training and competency of environmental and housekeeping staff, as well as a review of cleaning and disinfection products used.

Disinfectants used should be EPA-registered products that show proven efficacy against the targeted organisms. A list of EPA-registered products active against MRSA, VRE, and other MDROs can be found in Selected EPA-Registered Disinfectants. These products should be used according to the manufacturer's directions.

Facilities in which *C. auris* is identified or may be prevalent in the region should use products on List P: Antimicrobial Products Registered with EPA for Claims Against *Candida auris*. Ensure that environmental services staff are using these products to clean and disinfect rooms (daily and terminal), as well as shared and mobile equipment of patients with *C. auris* infection or colonization.

Environmental cleaning practices should be routinely monitored to prevent transmission of pathogens. The use of cleaning checklists for personnel, high-touch surface marking to assess areas that might be missed during cleaning, and direct observation are useful for documenting compliance and process improvement. Routine environmental culturing (bacterial culturing of swabbed surfaces) for contamination is not recommended for any MDROs.

Dedication of non-critical patient or resident care equipment to individuals or cohorting patients or residents with the same pathogen may also be useful in preventing spread of organisms. Institutions considering these measures need to determine if they possess adequate resources (both equipment and staff) to implement these measures without compromising

standard medical care for their patient and resident population. If not, meticulous cleaning and disinfection of equipment between uses are critical for preventing transmission.

Communication Between Health Care Facilities

All health care facilities (including acute care, long-term acute care, long-term care facilities, home health, etc.) that transfer a patient or resident are responsible for informing the receiving facility, ancillary service, and transport team of the patient's colonization or infection history and status prior to treatment or transfer.

If transmission-based precautions are used for patients or residents who are colonized or infected with a MDRO, identifying such persons at the time of readmission or transfer to a facility enables the appropriate precautions to be implemented promptly. Transmission precautions may vary by facility type, so it is also important to specify the MDRO history of the patient or resident being transferred. This remains a common gap in the transfer procedure and leads to patients and residents being placed in inappropriate precautions, which can facilitate transmission to others in the facility. Numerous MDRO outbreaks in the state can be traced back to transfer communication gaps.

Health care workers who are caring for patients or residents on transmission-based precautions should be made aware of appropriate control measures prior to room entry. This can be done by placing specific instructional signage on the door to the patient or resident room and flagging the patient or resident medical record.

Surveillance

Surveillance activities for MDROs include identifying sources, determining prevalence, monitoring rates of transmission in the health care facility, and determining host risk factors for carriage.

Surveillance activities include the following four items:

1. Analyzing clinical culture data to monitor trends in the percentage of isolates that are resistant.
2. Maintaining line lists of known infected and colonized patients and residents. This will vary depending on the organism. An example of how this can be accomplished is through flagging patients and residents who are positive for MDROs in the electronic medical record.
3. Obtaining selective surveillance cultures of high-risk patients and residents on admission to detect colonization or infection with certain MDROs.
4. Performing point prevalence culture surveys to identify host risk factors for colonization or infection with resistant organisms of epidemiologic importance or for determining trends in the rates of resistant isolates in the institution.

All health care organizations should implement a surveillance program that includes items 1 and 2 above. The implementation of additional surveillance activities depends on the epidemiology of resistant organisms and risk factors in the patient population. Items 3 and 4 should be considered when any of the following conditions below are present:

- When an organism previously unseen in the facility is detected
- When endemic rates of MDROs are high relative to their own institutional baseline or are increasing
- When ongoing transmission or outbreaks have not been brought under control

If a facility is interested in doing selected MDRO admission screening or point prevalence surveys, email the HAI Prevention Program or call 608-267-7711 to coordinate a screening strategy with testing through WSLH. WSLH offers fee-exempt colonization testing for carbapenemase-producing organisms and *Candida auris*.

Decolonization

Decolonization is generally not recommended as a routine component of controlling MDROs except for certain situations involving MRSA. MRSA decolonization can be targeted to MRSA-colonized persons or applied to populations deemed to be at high risk for infection, such as ICU or pre-surgical patients. MRSA decolonization therapy can include the administration of topical antimicrobial or antiseptic agents, with or without additional antimicrobial therapy. The decision to decolonize should be based on whether a patient would benefit clinically, the ability of the patient to tolerate the regimen, or the determination that ongoing transmission would be reduced.

Considerations for decolonization therapy:

- Determine benefits of decolonization on a case-by-case basis. Consult with infectious disease specialists or hospital epidemiologists to determine appropriateness of decolonization.
- Consider decolonizing health care workers only when there is epidemiologic evidence that they are sources of ongoing transmission.
- Implement additional strategies to increase the chances of successful eradication of MRSA if decolonization is attempted, such as:
    - Identify and treat all colonized sites.
    - Reduce bacterial load, such as adequate drainage, debridement, and device removal.
    - Consider close contacts, such as household contacts, as possible sources of re-colonization.

There are no recommendations for decolonizing people with *Candida auris*, CPOs, ESBLs, or VRE.

Infection Prevention Measures in All Health Care Settings

A large proportion of people with a history of MDRO colonization or infection are either intermittently or permanently colonized. Past histories of one or more negative cultures from previously colonized or infected patients do not guarantee that they will remain free of MDROs. Transmission of MDROs in a health care facility is an indicator that other organisms are also being transmitted, and that infection prevention and control measures need to be evaluated for effectiveness and adherence. Strict adherence to infection prevention and control measures should help reduce transmission of targeted MDROs, as well as many other organisms, in the health care setting.

Infection prevention and control measures used to prevent transmission of resistant organisms will depend on the type of health care facility and the prevalence of MDROs in the facility. The following are general prevention and control measures that should be instituted by facilities.

Infection Prevention and Control Plan

Each facility should develop a comprehensive, institution-specific plan to detect, prevent, and control colonization and infection with MDROs. Additionally, the plan should include strategies of antibiotic stewardship to minimize over-prescribing of unnecessary antibiotics based on national best practices and guidelines, as well as local antibiogram trends. The infection prevention and control plan should be developed and reviewed by the multidisciplinary infection prevention committee annually or when the scope of services or practice changes.

Hand Hygiene

In 2002, the CDC published *Guideline for Hand Hygiene in Health-Care Settings*. This guideline provides specific recommendations to promote improved hand hygiene practices and reduce transmission of pathogenic microorganisms to patients, residents, and personnel in health care settings.

Indications for hand hygiene are specified in the CDC guidelines. Facilities should educate staff on the importance of hand hygiene, as well as when hand hygiene with alcohol-based hand sanitizer versus soap and water should be done.

Standard Precautions

Standard precautions are a basic method of infection control designed to reduce risk of transmission of infectious agents from both recognized and unrecognized sources. This applies to all patients, regardless of their medical diagnosis. Standard precautions also entail the use of PPE, such as gowns, gloves, masks, face shields, and goggles to protect health care workers when anticipating contact with:

- Blood.
- All body fluids, secretions, and excretions (except sweat).
- Non-intact skin.
- Mucous membranes.

Transmission-Based Precautions

Transmission-based precautions are the second tier of basic infection control, beyond hand hygiene and standard precautions, and are to be used for patients or residents who may be infected or colonized with certain infectious agents for which additional precautions are needed to prevent infection transmission. There are three general categories of transmission-based precautions: contact precautions, droplet precautions, and airborne precautions.

Transmission-based precautions are used when the routes of transmission are not completely interrupted using standard precautions alone. Contact precautions, particularly in the acute care setting, should be part of the standard of care for individuals with MDROs, including patients or residents infected or colonized with *C. auris*, MRSA, VISA/VRSA, VRE, *C. difficile*, CRE, CRPA, ESBL, or other drug-resistant organisms in which the individual may be considered a high-risk for transmission. Contact precautions are indicated for the following:

- On units or in facilities where ongoing transmission is documented or suspected
- In the presence of acute diarrhea, draining wounds, or other sites of secretions or excretions that are unable to be covered or contained
- Among individuals who are colonized or infected with MRSA, VRE, CPOs, or another MDRO in the acute care setting
- Among those who have certain devices or conditions that require frequent access by acute care health care personnel for maintenance:
    - Indwelling urinary catheter-associated MDRO urinary tract infection or colonization; can be based on facility protocol
    - Chronic wounds
    - Tracheostomies with colonized or infected respiratory tracts or those who are unable to handle secretions

Institution-Specific Considerations

The institution-specific considerations discussed in this section are designed to aid health care providers involved in the prevention, detection, and containment of targeted MDROs across the continuum of health care. Each facility should assess their situation, consult clinical and administration leadership, and develop policies to implement guidance.

Acute Care and Long-Term Acute Care Facilities

Acute care facilities should follow the CDC's *2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings* and *Guideline for Hand Hygiene in Health-Care Settings.*

For additional strategies regarding the control of MDROs, including *C. auris*, MRSA, CRE, and VRSA, consult:

- Facility Guidance for Control of Carbapenem-resistant *Enterobacteriaceae* [Enterobacterales] (CRE), CDC
- Guide to the Elimination of Methicillin-Resistant Staphylococcus aureus (MRSA) Transmission in Hospital Settings: Second Edition. Currently available from APIC.
- Strategies to prevent methicillin-resistant Staphylococcus aureus transmission and infection in acute care hospitals: 2014 update, SHEA/IDSA
- Management of Multidrug Resistant Organisms in Health Care Settings, 2006, CDC
- Infection Prevention and Control for *Candida auris,* CDC
- Investigation and Control of Vancomycin-Resistant Staphylococcus aureus (VRSA): 2015 Update, CDC
- A Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals: 2014 Update, SHEA

Decisions by acute care facilities to discontinue contact precautions for certain MDROs should take the following into account:

- Hand hygiene and PPE compliance among health care workers and regular auditing of these practices
- Patient populations served
- Prevalence in the facility
- Local transmission rates of specific MDROs
- Best practices in infection prevention and published guidance from professional organizations

SHEA published expert guidance on the *Duration of Contact Precautions for Acute-Care Settings* in 2018 that expands upon this discussion. Additionally, CDC has provided guidance on the use of contact precautions for MRSA, which advocates for maintaining contact isolation in the acute care setting.

Nursing Homes

A facility should not deny admission due to colonization or infection with MDROs, including *C. auris*, MRSA, VRE, CRE, *A. baumannii*, and other MDROs, as well as *C. difficile*. The facility should base the decision to admit on its available space and ability to provide the level of care needed by the resident. Find guidance about prevention and control of targeted MDROs in the HAI

Prevention Program *Recommendations for Prevention and Control of Targeted Multidrug-Resistant Organisms in Wisconsin Nursing Homes.*

Standard Precautions

As previously stated, standard precautions are the basic layer of infection prevention designed to prevent the transmission of infectious agents across the health care continuum. Use standard precautions for the care of **all** residents as they are essential for preventing MDRO transmission, even with the use of additional transmission-based precautions.

Enhanced Barrier Precautions (EBPs)

CDC developed a nursing home-specific set of precautions that offer a midpoint between standard and contact precautions to accommodate the different populations in this setting and the longer-term care it provides. EBPs expand the use of PPE beyond situations in which exposure to blood and body fluids is anticipated. EBP refers to the use of a gown and gloves during high-contact resident care activities that provide opportunities for transfer of MDROs to staff hands and clothing. EBPs are not intended for acute care settings.

EBPs apply to all residents with:

- Infection or colonization with a targeted or other epidemiologically important MDRO, when contact precautions do not apply.
- Wounds and/or indwelling medical devices (central lines, urinary catheter, feeding rube, tracheostomy, ventilator) regardless of MDRO colonization status.

For additional information, refer to CDC Consideration for Use of Enhanced Barrier Precautions in Skilled Nursing Facilities or DHS *Recommendations for Prevention and Control of Targeted Multidrug-Resistant Organisms in Wisconsin Nursing Homes.*

Examples of high-contact resident care activities that require gown and glove use for EBPs include:

- Dressing
- Bathing or showering
- Transferring
- Providing hygiene
- Changing linens
- Changing briefs or assisting with toileting
- Device care or use (central line, urinary catheter, feeding tube, tracheostomy or ventilator)

- Wound care (any skin opening requiring a dressing)

Required PPE for EBP:

- Gloves and gown prior to the high-contact care activity
- Face protection (if performing an activity with a risk of splash or spray)

Staff should also change PPE before providing care for another resident.

Contact Precautions

Contact precautions include the use of gloves and a gown when health care personnel have contact with residents or their environment. Contact precautions are indicated:

- On units or in facilities where ongoing transmission is documented or suspected.
- In the presence of acute diarrhea, draining wounds, or other sites of secretions or excretions that are unable to be covered or contained.
- For residents with tracheostomies who are unable to handle secretions.

Room Placement for Residents on Contact Precautions

Ideally, place residents on contact precautions in a private room. When a private room is not available, consider placing the resident in a room with a resident(s) with the same microorganism, but no other known infection or colonization with a different MDRO. This practice is known as cohorting. The best roommate for a person with a MDRO is a patient who:

- Has intact skin.
- Has no invasive devices (such as a nasogastric tubes, tracheostomy or tracheal tube, IV lines, indwelling urinary catheters, or surgical wound sites).
- Is not significantly immune compromised (for example, neutropenic, on oral steroids, or on chemotherapy).

Modified Contact Precautions

The HICPAC/CDC 2006 *Management of Multidrug-Resistant Organisms in Healthcare Settings* guidelines recommend that: LTCFs modify contact precautions to allow MDRO colonized or infected residents whose site of colonization or infection can be appropriately contained and who can observe good hand hygiene practices to use common areas and participate in group activities.

Activities of Residents with MDROs

A facility should evaluate an individual's risk for transmission on a case-by-case basis and allow residents to socialize if precautions can be met. A facility multidisciplinary infection prevention

committee can discuss appropriate activities for these residents. In general, residents colonized or infected with MDROs may use common living areas, recreational areas, and dining facilities.

Residents who leave their rooms for activities should have clean, dry dressings and wear clean clothes or a clean cover gown. All residents should perform hand hygiene immediately before leaving their rooms. If necessary, cleanse residents' hands for them if they are unable to perform hand hygiene themselves. Hand hygiene should be done whenever hands become contaminated. Staff should be sure to offer hand hygiene to residents that require assistance before and after eating and after using the restroom.

In addition to the above requirements, residents colonized or infected with VRE or *C. difficile* should be continent (stool and urine) or have bodily fluids well-contained. Apply these requirements to residents in contact isolation for other conditions.

Assisted Living Facilities

A facility should not deny admission based on colonization or infection with MDROs. For residents who require minimal assistance with activities of daily living and have no indwelling devices (including indwelling urinary catheters), additional precautions beyond standard precautions are usually unnecessary unless a facility recognizes cluster of facility-acquired infections.

Emphasize hand hygiene in employee, resident, and visitor education. In addition to standard precautions, when caring for residents that require more assistance and have indwelling devices, follow the recommendations for nursing homes provided in this document.

Home Health and Hospice

In addition to standard precautions, health care personnel providing care in the home should follow the recommended practices for contact precautions when indicated as described by the CDC *Management of MDROs in Healthcare Settings*. Home health care workers should focus on preventing cross-transmission via clinical supplies, clothing, and other equipment carried to and from the patient's home. Alternatively, leave the clinical supply tote in the vehicle and only carry the disposable items used for the patient into the home. Clean reusable equipment in the patient's home or bag it before returning to the vehicle or facility for disinfection. Perform hand hygiene before leaving the patient's home.

Outpatient Clinics and Rehabilitation Facilities

Use standard precautions for all patients. Screen patients for the presence of productive coughs, draining wounds, or other signs and symptoms of infection. Once a patient has been identified with an MDRO, manage subsequent visits to the office or clinic carefully. Clean and disinfect any items or surfaces the patient may have had contact with, such as blood pressure cuffs, the examination table, or stethoscopes. Clean and disinfect items and surfaces with an

EPA-registered disinfectant (List H, List K) per the label instructions before use with another patient.

Refer to CDC's 2016 *Guide to Infection Prevention in Outpatient Settings: Minimum Expectations for Care* and *Guidelines for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings* (2007) regarding the proper use of gloves, gowns, handling linen, laundry, and isolation room solid waste.

Dialysis Settings

Use standard precautions, including gloves, gowns, masks, and eye protection for all patients when appropriate. Encourage hand hygiene, including frequent glove changes, and the use of alcohol-based hand rub (ABHR) or hand washing with soap and water.

Due to the nature of hemodialysis treatment and the high potential for blood and bodily fluid contamination, additional precautions for hemodialysis units should include:

- Restricted use of common medical supplies and equipment. Dispose of items taken to a dialysis station or clean and disinfect them with an EPA-registered disinfectant, as directed by the manufacturer, before returning to common clean areas. Prepare medications in dedicated clean areas. Dedicate unused swabs, syringes, medication, and other patient care items taken to dialysis stations to that patient, do not returned to common clean areas.
- Abstention from carrying common medical supplies or medications in pockets.
- Designation of clean areas for storage and preparation of medications, medical supplies, and equipment. Do not locate designated clean areas adjacent to contaminated areas.
- Maintenance, cleansing, and disinfection of dialyzers and other equipment, including environmental surfaces, between patients according to the manufacturer's instructions for use (IFU).

In 2016, the CDC updated selected information and recommendations in its 2001 Recommendations for Preventing Transmission of Infections Among Chronic Hemodialysis Patients. This document provides detailed guidelines for the prevention of infections, including MDROs and nonbacterial infectious diseases.

Outbreak Response

Outbreaks of MDROs can occur in different types of facilities. Outbreaks may occur within a wing, ward, or unit or may be facility wide. Standard and contact precautions, as well as adherence to other infection control measures, should be reviewed and reinforced. Initiation of more targeted interventions, such as cohorting and increased isolation precautions, may be

necessary. Wider application of contact precautions may be considered in non-colonized or infected individuals in conjunction with guidance from the Wisconsin HAI Prevention Program.

The CDC's 2019 *Interim Guidance for a Public Health Response to Contain Novel or Targeted Multidrug-resistant Organisms (MDROs)* provides recommended guidance in response to a cluster or outbreak associated with these organisms.

When an emerging novel or targeted MDRO is identified, colonization screening is recommended by CDC as an important part of the public health response. Colonization screening is essential as it identifies unrecognized carriers so that infection control measures can be targeted to prevent the spread of disease or illness.

All suspected MDRO outbreaks should be reported to the local health department and the Wisconsin Healthcare-Associated Infections (HAI) Prevention Program as a reportable condition. The HAI Prevention Program can provide tailored infection prevention guidance and laboratory support during outbreak investigations.

For more specific information on responding to MDRO outbreaks, refer to the DHS Reportable MDROs Page.

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Yokoe D, Anderson D, Berenholtz S, et al. A Compendium of Strategies to Prevent Healthcare-associated Infections in Acute Care Hospitals: 2014 Updates. *Infect Control Hosp Epidemiol*. 2014 Sep;35 Suppl 2:S21-31. doi: 10.1017/s0899823x00193833. PMID: 25376067.

Appendix A: Additional Infection Prevention Guidelines and Recommendations

- 2003 Guidelines for Environmental Infection Control in Heath Care Facilities, CDC
- Antimicrobial Stewardship, SHEA
- Antimicrobial Stewardship: Resources for Patients and Health Care Professionals, DHS
- Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals, SHEA
- Considerations for Use of Enhanced Barrier Precautions in Skilled Nursing Facilities, CDC HICPAC
- Hand Hygiene, APIC
- Hand Hygiene Guidance, CDC
- Healthcare-Associated Infections: Personal Protective Equipment, DHS
- Healthcare-Associated Infections: Precautions, DHS
- Hospital Antimicrobial Stewardship Core Elements, CDC
- Hospital Infection Prevention Requirements, CMS
- Infection Prevention and Control for *Candida auris*, CDC
- Long-term Care Antimicrobial Stewardship Core Elements, CDC
- Outpatient Antimicrobial Stewardship Core Elements, CDC
- Recommendations for Prevention and Control of Targeted Multidrug-Resistant Organisms in Wisconsin Nursing Homes, DHS

Appendix B: Education and FAQ Resources

- *Candida auris:* Fact Sheet for Health Care Settings, DHS
- Carbapenem-Resistant Acinetobacter baumannii (CRAB): Fact Sheet for Health Care Settings, DHS
- Carbapenem-Resistant Enterobacterales: Fact Sheet for Health Care Settings, DHS
- Carbapenem-Resistant Pseudomonas aeruginosa: Fact Sheet for Health Care Settings, DHS
- FAQs about Enhanced Barrier Precautions in Nursing Homes, CDC
- MDRO Fact Sheet for Health Care Personnel, DHS
- MDRO Fact Sheet for Housekeeping Staff, DHS
- MDRO Fact Sheet for Residents and Families, DHS
- MDRO Screening Tests Resident and Family Education, DHS
- MDRO Point Prevalence Screening Fact Sheet for Health Care Personnel, DHS
- Sequence for Donning and Removing PPE, CDC
- Vancomycin-Intermediate/Resistant *Staphylococcus aureus* (VISA/VRSA), DHS

Visit the Reportable Multidrug-Resistant Organisms webpage for more information on MDROs in Wisconsin and setting specific resources.

Appendix C: MDROs Not Reportable in Wisconsin

There are several MDROs that are not reportable to public health. They are important clinically, and their drug resistance may affect potential treatment. Some of these are emerging as public health issues and may become reportable in the future.

Azole-Resistant *Aspergillus fumigatus*

Aspergillus is a common mold (fungus) that lives indoors and outdoors. Immunocompromised people are at risk for developing aspergillosis from breathing in spores. Hospital-acquired infections can be associated with dust exposure from building renovation and construction. Some strains of *A. fumigatus* are resistant to azole antifungal medications, which can complicate treatment.

Drug-Resistant *Candida* species

While attention has been focused on *Candida auris*, which is commonly resistant to antifungal treatments, there are dozens of other *Candida* species that also show some level of resistance to antifungals. They cause common yeast infections, but also more serious bloodstream infections. Because antifungal treatment options are limited, resistance can make treatment difficult. CDC does surveillance for *Candida* through its Emerging Infections Program.

Extended-Spectrum Beta-Lactamase (ESBL)-Producing Enterobacterales

ESBL-producing Enterobacterales are an order of bacteria that are of concern in health care settings due to the rapid spread and ability to cause complicated infections in patients' health. ESBL enzymes break down penicillin and cephalosporin antibiotics to complicate antibiotic treatment options for infections caused by ESBL-producing bacteria. Bacteria are usually resistant to all classes of cephalosporins.

Vancomycin-Resistant Enterococcus (VRE)

VRE includes *Enterococcus faecalis, Enterococcus faecium,* or *Enterococcus* species unspecified (only those not identified to the species level) that are resistant to vancomycin by standard susceptibility testing methods or by results from FDA-approved test for VRE detection from specific specimen sources. (Minimum inhibitory concentration [MIC] ≥ 32 µg/mL.)

Enterococci are bacterial pathogens commonly found in the gastrointestinal (GI) tract, but can also be found in genitalia, the oral cavity, and on skin. The number of hospitalizations with infection due to VRE is still increasing in the U.S. According to the CDC, in 2017, VRE caused an estimated 54,500 infections among hospitalized patients and 5,400 estimated deaths in the U.S.

Both infected and colonized patients and residents can serve as sources for the spread of MDROs in health care facilities. VRE can spread through contact with contaminated surfaces or equipment, or through person-to-person spread, often via contaminated hands. The greatest contributor to the spread of VRE in health care settings is through direct or indirect contact

transmission via the hands of health care personnel. VRE can remain on dry environmental surfaces, including clothing, vital signs equipment, doorknobs, med prep areas, computer keyboards, and linen for days to weeks. Since the main source of VRE is the GI tract, eradication is generally not possible in individual patients. Individual cases of VRE infection or colonization are not reportable in Wisconsin at this time. Facilities should follow their specific policies on using transmission-based precautions for people colonized or infected with VRE.

Appendix D: Definitions

Antimicrobial resistance refers to bacteria, fungi, and other microorganisms that develop resistance to the antibiotics, antifungals, and other antimicrobials designed to kill them.

Antimicrobial stewardship refers to health care-based programs that focus on promoting appropriate antimicrobial use and preventing the emergence of MDROs with the overall goal of reducing antimicrobial utilization and improving patient outcomes.

Antibiogram is a cumulative antibiotic resistance report. Numbers represent the percent of tested specimens in a health care facility or region that are susceptible to an antibiotic.

Antibiotic susceptibility test (AST) is a test used to determine to which antibiotics a bacterial isolate is resistant or susceptible. Types of ASTs include disk diffusion, Etest, and micro-broth dilution.

Candida auris is an emerging fungus in the U.S. that is often multidrug-resistant, can cause outbreaks of health care-associated infections, and persists in the environment.

Carbapenem is a beta-lactam antibiotic with a penem core molecule used as treatment for severe bacterial infections and often reserved for MDROs. Examples of carbapenems include ertapenem, imipenem, and meropenem.

Carbapenemases are enzymes that produce resistance to carbapenem. Carbapenemases are often found on plasmids, which can transmit resistance between bacteria. Examples of carbapenemases include Klebsiella pneumoniae carbapenemase (KPC) and New Delhi Metallo-beta-lactamase (NDM).

Carbapenem-resistant organisms are bacteria that are resistant to carbapenem antibiotics. Infections caused by carbapenem-resistant organisms are difficult to treat. Examples include carbapenem-resistant Enterobacterales (CRE), carbapenem-resistant *Acinetobacter baumannii* (CRAB), and carbapenem-resistant *Pseudomonas aeruginosa* (CRPA). Bacteria can have either intrinsic resistance or acquired resistance, the latter commonly from mobile genetic elements such as carbapenemases.

Carbapenemase-producing organisms (CPOs) are gram negative bacteria that contain a gene for producing carbapenemases, which are often highly resistant and difficult to treat.

Colonization is a condition in which a microorganism is present in or on the body but has not invaded into tissue and is not causing disease.

Contact precautions are a type of transmission-based precaution (TBP). Contact precautions are used with individuals known or suspected to be infected or colonized with epidemiologically important microorganisms that can be transmitted by direct contact or by contact with environmental surfaces or patient care items in the patient environment.

Extended-spectrum beta-lactemase (ESBL)-producing Enterobacterales are gram negative bacteria containing enzymes that confer resistance to some antibiotics.

Enhanced barrier precautions (EBPs) are task-based precautions implemented for skilled nursing facility residents who are colonized or infected with a targeted MDRO, or for residents with lines, drains, or wounds living on the same unit or ward as the individual who is colonized or infected with a targeted MDRO. EBPs require gowns and gloves only for "high-contact resident care activities" with these two groups of residents. CDC currently recommends enhanced barrier precautions *only* for skilled nursing facilities.

Infection refers to a condition in which a microorganism is present in or on the body, has invaded tissue, and is causing signs and symptoms of disease.

In vitro refers to being performed or taking place in a test tube, culture dish, or elsewhere outside of a living organism.

Methicillin-resistant *Staphylococcus aureus* (MRSA) is *S. aureus* that tests oxacillin-resistant, cefoxitin-resistant, or methicillin-resistant by standard susceptibility testing methods or by a laboratory test that is FDA-approved for MRSA detection from isolated colonies. These methods may also include a positive result by any FDA-approved molecular test for MRSA detection from specific sources. (Minimum inhibitory concentration [MIC] ≥ 4 µg/mL for oxacillin and MIC ≥ 8 µg/mL for cefoxitin.)

Methicillin-susceptible *Staphylococcus aureus* (MSSA) is *S. aureus* that tests susceptible to oxacillin, cefoxitin, or methicillin by standard susceptibility testing methods or by a negative result from a test that is FDA-approved for MRSA detection from isolated colonies. These methods may also include a positive result from any FDA-approved test for MSSA from specific specimen sources. (Minimum inhibitory concentration [MIC] ≤ 2 µg/mL for oxacillin and MIC ≤ 4 µg/mL for cefoxitin.)

Minimum inhibitory concentration (MIC) refers to the lowest concentration of an antibiotic required to inhibit the growth of a microorganism. The MIC of an organism to a specific antimicrobial is compared against specific reference levels to determine if the organism is susceptible or resistant to that antimicrobial agent.

Multidrug-resistant organism (MDRO) is an umbrella term for bacteria and other microorganisms that are resistant to one or more classes of antimicrobial agent. Examples include MRSA, VRE, multidrug-resistant *Candida auris*, CRE, CRAB, CRPA, and CPOs.

Pan-resistant organism refers to microorganisms that are resistant to all antibiotics or antifungal agents to which they are tested.

Plasmids are mobile genetic elements that can be transferred between bacteria and can encode the ability to create resistance mechanisms, such as carbapenemases.

Standard precautions are basic infection control precautions designed for the care of all patients in health care settings, regardless of their diagnosis or presumed infection status. Examples of standard precautions include hand hygiene, sharps safety, and safe injection practices. Standard precautions protect both the patient and health care worker from infection, including preventing the spread of infection from patient-to-patient and to a patient via the health care worker.

Transmission-based precautions (TBPs) are the second tier of basic infection control, beyond standard precautions, and are to be used for patients or residents who may be infected or colonized with certain infectious agents for which additional precautions are needed to prevent transmission. The three levels of transmission-based precautions are contact, droplet, and airborne precautions.

Vancomycin-intermediate *Staphylococcus aureus* (VISA) is a strain of *Staphylococcus aureus* that has reduced (intermediate) susceptibility to vancomycin (minimum inhibitory concentration [MIC] of 4 to 8 µg /mL) or other glycopeptides.

Vancomycin-resistant *Staphylococcus aureus* (VRSA) is a strain of *Staphylococcus aureus* with in-vitro resistance to vancomycin (minimum inhibitory concentration [MIC] $\geq$ 16 µg /mL).

Vancomycin-resistant Enterococcus (VRE) are Enterococcus species that are resistant to vancomycin.