



State of New Hampshire
Recommendations for the Prevention and Control of
Multidrug-Resistant Organisms (MDROs) and
***Clostridium difficile* Infection (CDI) for**
Healthcare Agencies and Community Settings

Prepared by

New Hampshire Communicable Disease Epidemic Control Committee

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ABBREVIATIONS

AIIR	Airborne infection isolation room	HSEM	NH Homeland Security and Emergency Management
ASC	Ambulatory surgery center		
BIDC	Bureau of Infectious Disease Control	IC	Infection control
BSI	Bloodstream infection	ICP	Infection control professional
CA-CDI	Community-associated <i>Clostridium difficile</i> infection	ICU	Intensive care unit
CA-MDRO	Community-associated multidrug-resistant organism	IDIS	Infectious Diseases Impact Statement
CA-MRSA	Community-associated methicillin-resistant <i>Staphylococcus aureus</i>	IV	Intravenous
CDCS	NH DHHS, Communicable Disease Control Section	LTCF	Long-term care facility
CDSS	NH DHHS, Communicable Disease Surveillance Section	MDRO	Multidrug-resistant organism
CDC	U.S. Centers for Disease Control and Prevention	MDRSP	Multidrug-resistant <i>Streptococcus pneumoniae</i>
CDECC	NH Communicable Disease Epidemic Control Committee	MDR-TB	Multidrug-resistant <i>Mycobacterium tuberculosis</i>
CDI	<i>Clostridium difficile</i> infection	MHD	Manchester Health Department
CRE	Carbapenem-resistant <i>Enterobacteriaceae</i>	MRSA	Methicillin-resistant <i>Staphylococcus aureus</i>
CSTE	Council of State and Territorial Epidemiologists	MSSA	Methicillin-susceptible <i>Staphylococcus aureus</i>
DHHS	NH Department of Health and Human Services	NDPHCS	Nashua Division of Public Health & Community Services
DPHS	Division of Public Health Services	NH	New Hampshire
EMS	Emergency medical services	NHHA	New Hampshire Hospital Association
EPA	Environmental Protection Agency	NHICEP	NH Infection Control and Epidemiology Professionals
ESBLs	Extended-spectrum beta-lactamase-producing gram-negative bacilli	NIOSH	The National Institute for Occupational Safety and Health
GI	Gastrointestinal	OPIM	Other potentially infectious materials
GNB	Gram-negative bacilli	PAPR	Powered Air Purifying Respirator
GU	Genitourinary	PCP	Primary care provider
HA-MRSA	Healthcare-acquired methicillin-resistant <i>Staphylococcus aureus</i>	PHL	DHHS, Public Health Laboratories
HAI	Healthcare-associated infection	PIO	DHHS, Public Information Office
HCP	Healthcare personnel	PPE	Personal protective equipment
HICPAC	Healthcare Infection Control Practices Advisory Committee	SHEA	Society for Healthcare Epidemiology of America
		SSTI	Skin and soft tissue infection
		UTI	Urinary tract infection
		VISA	Vancomycin intermediate-resistant <i>Staphylococcus aureus</i>

VRE

Vancomycin-resistant *Enterococci*

WHO

World Health Organization

VRSA

Vancomycin-resistant
Staphylococcus aureus

DEFINITIONS

3 Cs: A framework of prevention principles: Ensure that the patient is *clean*, with drainage, secretions, and excretions *contained*, and is *cooperative* in any setting.

Carrier: An individual who is colonized at one or more body sites but who has no signs or symptoms of infection.

Cluster: A group of cases of a disease with well-defined distribution patterns in relation to time and/or place.

Cohort: Two or more patients who are physically separated from other patients.

Cohort staffing: The practice of assigning specified healthcare personnel (HCP) to care only for patients known to have a particular condition, such as infection with MDRO.

Colonization: The presence of microorganisms in or on a host with growth and multiplication but without tissue invasion or damage.

Community-associated (CA) infection: An infection resulting from an exposure to a source in the community, outside of a healthcare setting and without healthcare risk factors within the past year (e.g., hospitalization, surgery, or placement of a permanent medical device).

Containment measures: The separation of infected or exposed persons from non-infected persons by use of isolation, quarantine, or other restrictions on movement and activities.

Cooperative: Able and willing to understand and execute instructions.

Decolonization therapy: Topical and/or systemic antibiotic treatment administered for the purpose of eliminating an organism from a carrier.

Disinfection: A process that kills or destroys nearly all microorganisms, with the exception of bacterial spores, on inanimate objects.

Empiric: Actions based on experience.

Endemic: A baseline rate or an ongoing frequency at which a condition occurs in a defined area (e.g., state, county, facility).

Epidemic: An increase in the incidence of a condition above its expected endemic level of occurrence, which may signify an outbreak is occurring.

Epidemiologically important organism: Any organism transmitted in a healthcare setting that becomes targeted for control because it is or has become epidemiologically important. In determining what constitutes an “epidemiologically important organism,” the following characteristics apply:

- A propensity for transmission within healthcare facilities based on published reports and the occurrence of temporal or geographic clusters of greater than 2 patients. A single case of healthcare-associated invasive disease caused by certain pathogens is generally considered a trigger for investigation and enhanced control measures because of the risk of additional cases and severity of illness associated with these infections.
- Antimicrobial resistance to first-line therapies is difficult to treat because of innate or acquired resistance to multiple classes of antimicrobial agents.

- Common and uncommon microorganisms with unusual patterns of resistance within a facility.
- Association with serious clinical disease, increased morbidity and mortality.
- A newly discovered or reemerging pathogen.

Healthcare-associated infection (HAI): An infection that develops in a patient who is cared for in any setting where healthcare is delivered (e.g., acute care hospital, chronic care facility, ambulatory clinic, dialysis center, surgical center, home) and is related to receiving health care (i.e., was not incubating or present at the time healthcare was provided). In ambulatory and home settings, HAI would apply to any infection that is associated with a medical or surgical intervention performed in those settings.

Healthcare personnel (HCP): Any person who has close occupational contact of patients (i.e., within 3 feet), patient-care areas (e.g., patient rooms, procedure areas), or patient-care items (e.g., linens, other waste).

Hospital-associated (HA) infection: An infection resulting from an exposure to a source within a hospital that was not incubating at the time of admission (refer to Healthcare-associated infection).

Hyperendemic: High and continued incidence of a condition above baseline rate.

Immunocompetence: The capacity for a normal immune response.

Infection: The invasion of bacteria into a body site, multiplying in tissue, and accompanied by clinical signs of illness such as fever, elevated white blood count, purulence (pus), pneumonia, and inflammation (warmth, redness, swelling). It may be documented by positive cultures such as blood, sputum, wound, or urine.

Infection control (IC) measures: Measures practiced by healthcare personnel in healthcare facilities to decrease the risk for transmission and acquisition of infectious agents through proper hand hygiene, scrupulous work practices, and use of personal protective equipment (PPE), such as masks, gloves, gowns, and eye protection. The types of IC measures are based on how an infectious agent is transmitted and include Standard, Contact, Droplet, and Airborne Precautions. Additional information can be found at: http://www.cdc.gov/ncidod/dhqp/gl_isolation.html.

Isolation: The separation of persons with a specific contagious illness from contact with susceptible persons and the restriction of their movement to reduce exposure to infected persons. Isolation may be used voluntarily or compelled by public health authorities and usually occurs in a hospital but can be in a home or dedicated isolation facility.

Line list: A list of persons with a common disease or exposure, often including information specific to each person, such as date of onset, demographics, exposures, and/or clinical and treatment information. Line lists are typically formatted in a table such that each row represents an individual case or exposure and each column represents a category of specific information. Line lists are often used to track those infected during an outbreak.

Multidrug-resistant organism (MDRO): Bacteria that have become resistant to one or more classes of antimicrobial agents and usually are resistant to all but one or two commercially available antimicrobial agents. Common examples include MRSA, VISA/VRSA, VRE, ESBLs, and MDRSP [See Abbreviations Used in this Document for definitions.]

Non-hospital healthcare setting: Any setting where healthcare is delivered that is not a hospital, which may include emergency medical services (EMS) settings (e.g., ambulances), patient homes, long-term care (e.g., nursing homes, assisted living facilities), skilled nursing facilities, hemodialysis centers, residential schools, psychiatric hospitals, and physicians' offices.

Nosocomial infection: Any infection that develops in a patient during or as a result of an admission in a hospital setting and was not incubating or present at the time of admission (refer to Hospital-associated infection and Healthcare-associated infection).

Outbreak: An increase in the incidence of a condition above the baseline level, for which a common source (e.g., medical device) or common transmission route (e.g., person-to-person) is likely.

Personal protective equipment (PPE): Barrier protection recommended for use by an individual to prevent disease transmission. PPE may include gowns, gloves, masks, goggles, or face shields. The type of mask (e.g., surgical, N95) and other PPE is disease-specific, based on mode of transmission, and defined in the type of precautions.

Reservoir: A person, animal, organism, or substance in which an infectious agent lives and multiplies (usually without damaging its host) that is a source of infection to a susceptible host.

Risk factor: A characteristic that is associated with an increased occurrence of disease or other health-related event.

Surveillance: The systematic collection, analysis, interpretation, and dissemination of data on an ongoing basis, to gain knowledge of the pattern of disease or event occurrence in a population in order to control and prevent disease in that population.

Syndromic surveillance: A systematic collection and analysis of data through automated data acquisition and generation of statistical alerts. It is used to monitor disease indicators in real time to detect outbreaks of disease earlier than would otherwise be possible.

Summary

The emergence of multidrug-resistant organisms (MDROs) and *Clostridium difficile* are increasingly recognized as major threats to public health (1). MDROs are bacteria that have become resistant to one or more classes of antimicrobial agents. *C. difficile* is a spore-forming, toxin-producing, gram-positive anaerobic bacterium. *C. difficile* infections (CDIs) rarely have drug resistance, but most are related to antibiotic use and have significant mortality and morbidity. This guideline document represents the third update of “Recommendations for the Prevention and Control of Multidrug-Resistant Organisms (MDROs) and *Clostridium difficile* Infection (CDI) for Healthcare Agencies and Community Settings.”

Audience

These guidelines can be used as a reference in various healthcare and non-healthcare settings. The intended audience may include, but is not limited to: healthcare personnel, infection control (IC) and prevention staff, clinicians, dentists, nursing management, school nurses, paramedics, corrections staff, athletics trainers/coaches, occupational health professionals, and management in other non-healthcare settings.

How to use this document

This document includes MDRO and CDI prevention and control information adapted from guidelines at other public health agencies and organizations. These guidelines also include more information for specific settings. It should be noted that prevention and control strategies for CDI and MDRO overlap across all healthcare and non-healthcare settings. The document consists of three sections:

- I) Introduction
 - A. Purpose
 - B. Background
 - C. Process
 - D. Assumptions
 - E. NH DHHS role and responsibilities
- II) Recommendations
 - A. Priority activities
 - B. Prevention of emergence of MDROs (i.e., proper use of antibiotics)
 - C. Prevention of transmission of organisms person-to-person (i.e., transmission-based precautions, environmental measures, setting-specific recommendations)
 - D. General prevention (i.e., education and communication, surveillance, decolonization)
 - E. Animals in healthcare settings
- III) MDRO outbreak management

Three appendices at the end of the document provide more detail regarding CDI and MDRO control, as well as additional CDI and MDRO resources and frequently asked questions.

This document is not exhaustive and may not include guidance for every setting and circumstance. Please contact the NH DHHS Bureau of Infectious Disease Control (603-271-4496) with any questions about the content or how to use this document.

I. INTRODUCTION

A. Purpose

The purpose of this document is to:

- Provide guidance on the prevention and management of MDRO and CDI that occur in healthcare settings and the community;
- Provide guidance on the control of MDRO and CDI in New Hampshire, while maintaining quality of life for those patients/residents who are colonized or infected with MDRO/*C. difficile*;
- Assist New Hampshire healthcare personnel (HCP) in making informed decisions within the context of their practice setting and patient population;
- Facilitate safe patient movement across levels of care throughout the healthcare system; and
- Provide a consistent statewide approach to MDRO and CDI control in order to improve adherence to recommendations and reinforce patient/family confidence. There should be no fundamental differences in practice across the state and across the spectrum of care.

B. Background

Multidrug-resistant organisms or MDROs are defined as pathogens that have become resistant to one or more classes of antimicrobial agents and usually are resistant to all but one or two commercially available antimicrobial agents. Common examples of MDROs of clinical concern include methicillin-resistant *Staphylococcus aureus* (MRSA), *Staphylococcus aureus* with resistance to vancomycin (VISA/VRSA), vancomycin-resistant *Enterococci* (VRE), extended-spectrum beta-lactamase-producing gram-negative bacilli (ESBLs), multidrug-resistant *Streptococcus pneumoniae* (MDRSP), carbapenem-resistant *Enterobacteriaceae* (CRE), and multidrug-resistant *Acinetobacter*. *C. difficile* is a spore-forming, toxin-producing, gram-positive anaerobic bacterium. Although *C. difficile* itself has little resistance to antibiotics, most CDIs are related to antibiotic use and have significant mortality and morbidity. The emergence of MDROs and CDIs are increasingly recognized as major public health threats (1). The escalating prevalence of MDROs and CDIs over the last two decades poses significant challenges for both public health and clinical care settings:

- Infections caused by MDROs are more likely to result in hospitalizations, incur increased costs, require prolonged lengths of stay, and adversely affect clinical prognoses (2–4).
- MDROs and CDIs can spread to other patients and HCP.
- Resistance can potentially transfer to other microorganisms.

1. Multidrug-Resistant Organisms

MDRO are increasingly common in healthcare facilities. The prevalence of MDRO in healthcare facilities varies temporally, geographically, and by facility type. For example, studies have shown that intensive care units (ICUs) may have a higher prevalence of MDRO infections than non-intensive care settings (5,6). Additionally, the role of long-term care facilities (LTCFs) may be important for the epidemiology of MDROs, as patients may serve as reservoirs and vehicles for

MDRO introduction into acute care facilities (7,8). Previous studies have also shown that more than 20% of LTCF patients may be colonized with MRSA, and more than 10% may be colonized with VRE (9–12). In addition to MRSA and VRE, antibiotic-resistant gram-negative bacilli (GNB) are also common in these settings (e.g., *E. coli*, *Pseudomonas aeruginosa*, *Klebsiella* species) (13). In New Hampshire, MDROs have been identified in all healthcare settings, through the continuum of care, as well as in the general community.

There are several known risk factors for both colonization and infection of healthcare and community-associated MDRO (CA-MDRO). They include the following:

- Severity of illness;
- Previous exposure to antimicrobial agents;
- Underlying disease or conditions, particularly
 - Chronic renal disease;
 - Insulin-dependent diabetes mellitus;
 - Immunodeficiency; and
 - Peripheral vascular disease.
- Advanced age (over 65);
- Previous colonization with an MDRO;
- High patient-to-HCP ratio in the facility;
- Decline in functional status;
- Repeated hospital admissions and other contacts with the healthcare system;
- Invasive procedures such as
 - Dialysis;
 - Presence of invasive devices; and
 - Urinary catheterization;
- Wounds, dermatitis, or skin lesions; and
- Lack of attention to basic IC measures in the facility.

MDROs are not limited to healthcare facilities; infections resulting from exposures to sources within the community outside of a healthcare setting are known as community-associated infections. CA-MRSA is the most commonly identified CA-MDRO, and community transmission has been well documented in recent years. Investigations have revealed patterns of transmission among correctional facility inmates, athletes, military recruits, and daycare attendees (14–17). The spectrum of disease caused by CA-MRSA appears to be similar to that of methicillin-susceptible *Staphylococcus aureus* (MSSA) in the community. Skin and soft tissue infections (SSTIs) are the most frequently reported clinical manifestations of CA-MRSA, accounting for an estimated 77% of CA-MRSA infections (18); one study of purulent SSTIs in adult emergency department patients found that 59% were caused by MRSA (19). Less commonly, CA-MRSA has been associated with severe and invasive infections, including pneumonia, bacteremia, musculoskeletal infections, and necrotizing fasciitis (19). Invasive manifestations can occur as complications of a preceding SSTI or respiratory tract infection (particularly influenza); however, invasive infections can sometimes occur in otherwise healthy persons without recognized preceding infections or risk factors (18). A recent population-based study estimated the rate of invasive community-associated MRSA infections in the U.S. to be 4.6 infections per 100,000 persons, resulting in 0.5 deaths per 100,000 (20).

Recent studies and outbreak investigations have identified the following risk factors for infection with CA-MRSA (14–18):

- Living, working, or spending time in crowded conditions (e.g., institutional settings);
- Coming into frequent contact with others (e.g., sports team participation);
- Recent antimicrobial use (generally in the three months preceding infection);
- Compromised skin (i.e., lesions and other open cuts or wounds);
- Contaminated surfaces and shared items; and
- Lack of cleanliness and poor personal hygiene.

2. *Clostridium difficile* Infection

Clostridium difficile produces a variety of clinical outcomes, ranging from asymptomatic colonization and self-limiting diarrhea to life-threatening sepsis and pseudomembranous colitis. Recognized as a major cause of infectious diarrhea in hospitals and other healthcare settings, it is associated with considerable morbidity and mortality. Although *C. difficile* is not technically categorized as an MDRO, it is included with these recommendations because its epidemiological significance is related to that of MDRO in a number of ways:

- Mortality and morbidity rates within the past decade are at historically high levels (approximately 14,000 deaths in the U.S. and over 300,000 hospital stays per year);
- *C. difficile* is now the most common organism to cause healthcare-associated infection (HAI);
- Interconnectedness of HCP, the environment, and patient care equipment in the transmission and acquisition of *C. difficile*; and
- The paramount importance of antibiotic stewardship in the primary prevention of this infection (21,22).

A recent CDC Emerging Infections Program study analyzed population-based data to determine regional CDI patterns (23). The data illustrated that CDI has spread across the continuum of care; 94% of CDI cases were associated with receiving healthcare, and 75% of cases were among persons not currently hospitalized (including nursing home residents and patients recently discharged from the hospitals).

C. difficile is a spore-forming, gram-positive, strictly anaerobic bacillus. Its spores can survive outside the human body for weeks to months on environmental surfaces, medical equipment and devices. Further, the spore is not killed via typical hospital-grade disinfectants or, in the case of hand hygiene, by alcohol-based hand rubs (24). These characteristics make it especially challenging to control.

Transmission occurs when a patient comes into contact with the spore via contaminated environment, equipment, or hands of HCP (21). The patient ingests the organism, and once in the small intestine, it is able to germinate to a vegetative form. *C. difficile* may multiply if conditions are favorable (e.g., the patient has had a previous exposure to antibiotics). The two toxins produced by this organism (toxin A and B) cause the illness associated with CDI.

There are several known risk factors for both colonization and infection of healthcare and community-associated CDI (CA-CDI). Colonic bacterial flora in healthy adults is generally resistant

to *C. difficile* colonization; if flora are altered, resistance to colonization is lost. Thus, any factor associated with alteration of normal colonic flora increases the risk of *C. difficile* colonization after exposure to the organism. Such factors include the following:

- Advanced age (greater than 64 years old);
- Previous exposure to antimicrobial agents (especially clindamycin, ampicillin, and cephalosporins) or frequent antibiotic exposure;
- Recent gastrointestinal (GI) surgery/procedures;
- Proton-pump inhibitor administration;
- Disruption of the normal bowel flora;
- Immunosuppression (low serum antibody response to toxin A);
- Severe underlying disease; and
- Long length of stay in healthcare settings.

There are two important distinctions between colonization and disease.

- Symptomatic disease: Patient exhibits symptoms and tests positive for the organism and toxin.
- Asymptomatic colonization: No symptoms are present. Patient may still test positive for the organism and/or its toxin(s). Those patients asymptomatically colonized are not a case and are not at increased risk of developing CDI any more than negative-testing patients (21).

C. Process

This document is an update to the *NH Recommendations for the Prevention and Control of Multidrug-Resistant Organisms* that had last been revised in 2008. These updated guidelines were drafted by the Healthcare Associated Infections (HAI) Program with input from the NH Communicable Disease Epidemic Control Committee (CDECC), which consists of representatives from New Hampshire's two city health departments, physicians specializing in infectious diseases and epidemiology, representatives from the Homeland Security and Emergency Management (HSEM), NH DHHS' State and Deputy State Epidemiologists, other officials from NH DHHS, and partners such as the NH Hospital Association (NHHA). The final recommendations were modeled on Centers for Disease Control and Prevention (CDC) guidance, other state guidelines, and the Society for Healthcare Epidemiology of America (SHEA) Guidelines (25). It is anticipated that this document may undergo future revisions as conditions in NH change, and as guidance from CDC is updated. It will be reviewed regularly by NH CDECC, and revised when appropriate.

D. Assumptions

The development of this document was based on the following assumptions:

- There is evolving consensus regarding best practices for controlling MDROs and CDI, however, controversies still remain.

- Methods for surveillance of MDRO colonization and infection are imperfect, and those persons identified to be infected or colonized with an MDRO likely represent a small proportion of the total number of persons who are actually infected or colonized with an MDRO.
- Measures appropriate in outbreak settings may differ from those in non-outbreak settings.
- The term “patient” includes inpatients, outpatients, and residents of LTCFs unless otherwise specified.
- The scope of this document is not intended to address management of persons infected with multidrug-resistant *Mycobacterium tuberculosis* (MDR-TB). To request guidance or to report a case of MDR-TB, please contact the NH DHHS Tuberculosis Program at 603-271-4496.

It is also assumed that every New Hampshire healthcare facility has its own comprehensive guideline to MDRO and CDI control, developed in accordance with the IC and surveillance recommendations in this document. Such an approach should also address topics outside the purview of this document, such as:

- Strategies for the institution of and adherence to the IC measures described in this document;
- Educational approaches for HCP, other staff, patients, and visitors;
- Local communication objectives and methods; and
- An antibiotic stewardship program with guidelines regarding institutional antibiotic use in order to minimize unnecessary antibiotic use and mandate the appropriate use of vancomycin (26,27).

E. NH DHHS Role and Responsibilities

The role of NH DHHS is to provide recommendations to help control the emergence of MDRO/CDI and to identify and respond to MDRO-related threats to New Hampshire citizens.

Responsibilities of NH DHHS include the following:

- Encourage education and training for HCP and community members;
- Provide and update recommendations as appropriate;
- Provide advice regarding any relevant changes to NH DHHS’ list of reportable diseases (currently VRE, VRSA, and “any unusual occurrence or cluster of illness which may pose a threat to the public’s health” are included, but this list is subject to review and change);
- Provide data and statistical reports on the occurrence of reportable MDRO in New Hampshire; and
- Track and respond to outbreaks of MDRO and CDI.

Local and regional health departments will conduct or participate in educational campaigns for MDRO and CDI prevention.

Table 1. Examples of Clinically Relevant MDROs and CDI

Organism	Agent	Reservoir	Mode of Transmission	Comments
CDI	<i>C. difficile</i>	- Colonized and infected patients - Colonized HCP - Environment, fomites, and patient care equipment (28)	- Person-to-person - HCP hands - Environment - Fecal-oral route	CDC considers CDI an urgent threat 250,000 infections require hospitalization each year Deaths related to CDI increased 400% between 2000 and 2007 in part due to a more virulent bacteria strain (23)
CRE	Carbapenem-resistant <i>Enterobacteriaceae</i>	- Colonized and infected patients, especially those with devices and taking long courses of antibiotics - Colonized HCP - Environment, fomites, and patient care equipment (28)	- Person-to-person - HCP hands - Environment	CDC considers CRE an urgent threat Some CRE have become resistant to almost all antibiotics About half of all bloodstream infections (BSIs) caused by CRE result in death (29)
MRSA	Methicillin-resistant <i>S. aureus</i>	- Colonized and infected patients - Colonized HCP - Environment and fomites (28)	- Person-to-person - HCP hands - Environment	CA-MRSA infections most often present as skin infections Now endemic in most U.S. hospitals; most invasive MRSA infections are healthcare-acquired (HA) MRSA MRSA-colonized patients more likely to develop symptomatic infection than those with MSSA (30,31)
VISA VRSA	Vancomycin-(intermediate/resistant) <i>S. aureus</i>	- Colonized and infected patients - Colonized HCP - Environment and fomites (28)	- Person-to-person - HCP hands - Environment	VISA and VRSA rare in the U.S. Prolonged vancomycin use is one risk factor
VRE	Vancomycin-resistant <i>Enterococcus faecalis</i> or <i>faecium</i>	-GI, Genitourinary (GU), wounds - Environment and fomites	- Person-to-person - HCP hands - Environment	Often multi-resistant to penicillins and aminoglycosides
ESBL	Extended-spectrum beta lactamase-producing GNB	-GI - LTCFs and other similar settings	- Person-to-person - HCP hands - Environment	Important ESBL GNB include <i>Klebsiella</i> , <i>Pseudomonas</i> , <i>Serratia</i>
MDRSP	Multidrug-resistant <i>S. pneumoniae</i>	-Nasopharynx	- Person-to-person - Droplet	MDRSP often resistant to penicillin, erythromycin, trimethoprim, sulfamethoxazole, fluoroquinolones

II. RECOMMENDATIONS

A. Priority Activities

Preventing infections and antimicrobial resistance depends on appropriate practices being incorporated at all levels of care; there is no single approach applicable to all healthcare settings. The CDC Campaign to Prevent Antimicrobial Resistance in Healthcare Settings, launched in 2002, provides evidence-based principles and tools for implementation. Studies have shown that MDRO can be controlled, but successful outcomes generally rely on multiple interventions (32). These interventions have been grouped into seven main categories of priority activities, to focus control measures, and are organized under three main goals of preventing infections and antimicrobial resistance:

- The prevention of emergence of MDROs and CDI
 - Judicious use of antimicrobial agents
- The prevention of transmission of organisms from person-to-person
 - Administrative measures
 - IC measures
 - Environmental measures
- The prevention of infection by MDRO and CDI
 - Education and communication
 - Surveillance
 - Decolonization

Furthermore, the recent CDC *Antibiotic Resistance Threats* report ranks organisms of concern and provides tools, infographics, and details on the prevention activities mentioned above. The document also highlights the importance of promoting the development of new antibiotics and diagnostic tests for resistant bacteria (1).

B. The Prevention of Emergence of MDROs

1. *Judicious Use of Antimicrobial Agents*

Antibiotic stewardship is best accomplished through an organizational multidisciplinary antimicrobial management program (1,27–29,33,34). Optimal treatment of infections and appropriate antibiotic use is the goal. Limiting antimicrobial use alone may not control resistance. Materials and resources generated by national programs are available online [see Appendix C for resources].

Efforts should focus on:

- Effective treatment of infections rather than contaminants;
- Use of narrow-spectrum agents while reserving use of broad-spectrum or more potent antimicrobials for serious infections (i.e., when the pathogen is not known or other effective agents are unavailable);
 - Consider the use of antibiotics that are less likely to contribute to CDI (24);

- Review of antimicrobial utilization in the context of local susceptibility patterns (antibiograms);
- Avoid excessive duration of antimicrobial therapy;
 - Discontinue antibiotics when CDI emerges to prevent recurrence (24); and
- Implement strategies for influencing antimicrobial prescribing patterns (e.g., formulary restrictions, stop orders, computer-assisted management programs).

C. The Prevention of Transmission of Organisms from Person-to-Person

1. Administrative Measures

Approaches to the prevention and control of MDROs and CDI should be tailored to the specific needs and characteristics of each population and healthcare setting. Administrative leadership and commitment to preventing transmission is essential to ensure that programs and strategies are fully implemented and regularly evaluated. Key administrative measures include:

- Identification of persons with qualifications in IC and the epidemiology of MDROs/CDI, either in-house or through outside consultation, for assessment of the local MDRO problem and for the design, implementation, and evaluation of appropriate control measures (28);
- Involvement of environmental cleaning staff in the prevention and control of MDRO and *C. difficile*;
- Incorporation of IC practices into organizational patient safety programs;
- Provision of fiscal and human resources to maintain IC, occupational health, and environmental service programs responsive to emerging needs;
- Development of an infrastructure to guide, support, and monitor adherence to IC practices;
- Development and implementation of policies and procedures explaining how Standard and Transmission-based Precautions will be applied and enforced and the patient/family role in preventing transmission;
- Creation of systems to identify and communicate information about patients with potentially transmissible infectious agents;
- Development of methods to provide feedback to HCP and facility administrators regarding Transmission-based Precautions and infection surveillance and prevention; and
- Ensure education and training for HCP, patients, and families.

2. Infection Control Measures

IC measures are the cornerstone of prevention in all settings at all times. Factors associated with transmission of all organisms, including MDRO/CDI, can be categorized into the 3 Cs framework of prevention principles (34):

- **Clean:** The patient engages in personal hygiene practices, ensuring that body, hands, and clothing are clean before leaving the room, and is capable of maintaining good hygiene while out of the room. Hand hygiene shall occur prior to leaving the room and any time the

hands become potentially contaminated while out of the room. In addition, equipment used by the patient, such as a wheelchair or walker, must be cleaned and disinfected before leaving the room.

- **Contained:** The drainage, secretions, or excretions containing an infectious or potentially infectious area is covered and contained (e.g., dressing, disposable brief, surgical mask if coughing).
- **Cooperative:** The patient is cooperative with hygiene requests and procedures and has a sufficient understanding of ways they can assist in preventing the transmission of infection to others.

2.1. Four Core Actions

There are four core actions used to prevent and control MDROs and CDI in healthcare facilities (1):

1. Preventing infections and the spread of resistance;
2. Tracking resistant organisms;
3. Improving the use of antibiotics; and
4. Promoting the development of effective antibiotic and diagnostic tests for resistant organisms.

Enhanced measures may be indicated for:

- MDROs/CDI present in a highly vulnerable patient population (e.g., ICU);
- Increases in MDROs/CDI prevalence, despite IC measures; and
- Newly emergent MDROs.

2.2. Hand Hygiene

The single most effective means of reducing the potential for MDROs and CDI transmission is hand hygiene, including the use of soap and water and/or alcohol-based hand rubs (28,35).

Selection of appropriate hand hygiene practice in the care of patients with *C. difficile* continues to pose controversies, as spores are not inactivated by alcohol-based hand rubs. Hand hygiene with soap and water would appear to be the appropriate choice for those caring for the patient with *C. difficile*, since the friction used with soap and water hand hygiene should be sufficient to reduce the bio-burden of *C. difficile* on contaminated hands. However, there is no current evidence that, in the non-outbreak setting, hand hygiene with soap and water reduces the incidence of *C. difficile*; conversely, the use of alcohol-based hand rubs leads to an increase in CDI. The major factor affecting HCP hand contamination with *C. difficile* appears to be the use of gloves at all times in the care of the patient and their environment. Current recommendations are for the use of alcohol-based hand rubs in non-outbreak settings and the use of soap and water during an outbreak (24,36).

Patient hygiene and cleanliness may also help reduce potential MDROs and CDI transmission. This includes patient hand hygiene and bathing. Although a routine bed bath for patients with

CDI has not shown great efficacy in reducing the burden of spores, showering patients has been shown to be considerably more effective (37).

2.3. Precautions

Standard Precautions are IC practices that apply to the care of all patients, regardless of setting or known or suspected diagnosis or infection status. All blood, body fluids, secretions, excretions (excluding sweat), non-intact skin, and mucous membranes may contain transmissible infectious agents. Personal protective equipment (PPE)/barriers should be in place (28,33). Hand hygiene is a part of Standard Precautions. Laundering practices may also need to be reviewed to ensure that they are handled in a manner that prevents transfer of microorganisms to others and the environment [see Table 2: Standard Precautions].

Transmission-Based Precautions are indicated when the route of transmission may not be completely interrupted by Standard Precautions alone. These approaches include Contact Precautions, Droplet Precautions, and Airborne Precautions. Use depends on clinical symptoms or likely pathogens.

2.4 Initiation of Transmission-Based Precautions

Syndromic and Empiric Application: A group of symptoms that, together, is characteristic of a specific disorder or disease, without diagnostic confirmation of the pathogen. It is not possible to identify or confirm all infections in every situation. Use of appropriate Transmission-based Precautions when a patient develops signs and symptoms of a transmissible infection can reduce transmission opportunities.

Other Application: The identification of certain organisms may prompt Transmission-based Precautions, regardless of the clinical syndrome. Transmission-based Precautions may be implemented when:

- IC personnel decide that the identification of certain MDROs is epidemiologically important, especially in a high-risk setting (e.g., burn units, ICUs);
- MDRO infections have been epidemiologically linked to other patients or in outbreak situations; and
- Patients with presumptive *C. difficile* who are awaiting laboratory confirmation should be placed on Contact Precautions (21).

Table 2. Standard Precautions

Component	Recommendations
Hand hygiene	<p>After touching blood, body fluids, secretions, excretions, contaminated items; immediately after removing gloves; between patient contacts and after all animal contact (e.g., food, bedding, toys). Alcohol-based hand rubs may be appropriate when hands are not visibly soiled.</p> <p>Soap and water is recommended during outbreak situations.</p> <p>Please consult your organizational policy for surgical hand hygiene practice.</p>
Personal protective equipment (PPE) -Gloves -Mask, eye protection, face shield -Gown	<p>Before touching blood, body fluids, secretions, excretions, mucous membranes, non-intact skin, and contaminated items.</p> <p>During procedures/patient-care activities likely to generate splashes of blood, body fluids, secretions.</p> <p>During procedures/patient-care activities when contact of clothing/exposed skin with blood/body fluids, secretions, and excretions are anticipated.</p>
Soiled patient-care equipment	<p>Handle in a manner that prevents transfer of microorganisms to others and to the environment; wear gloves if visibly contaminated; perform hand hygiene. Disinfect between patient use or discard.</p>
Environmental control	<p>Develop procedures for routine care, allowing animals into the facility, cleaning, and disinfection of environmental surfaces, especially frequently touched surfaces in patient-care areas. Enhanced cleaning during outbreaks.</p> <p>Consider disinfectant change for spore-forming organisms (e.g., bleach for <i>C. difficile</i>).</p>
Textiles and laundry	<p>Handle in a manner that prevents transfer of microorganisms to others and to the environment.</p>
Safe injection practices (regarding needles and other sharps)	<p>Do not recap, bend, break, or hand-manipulate used needles; if recapping is required, use a one-handed scoop technique only. Use safety features when available. Place used sharps in puncture-resistant container.</p> <p>Use sterile, single-use, disposable needle/syringe for each injection. Prevent contamination of equipment and medication.</p>
Practices for lumbar puncture	<p>Use facemask when placing a catheter or injecting material into the spinal or epidural space.</p>
Patient resuscitation	<p>Use mouthpiece, resuscitation bag, and other ventilation devices to prevent contact with mouth and oral secretions.</p>
Patient placement	<p>Prioritize for single-patient room if patient is at increased risk of transmission, is likely to contaminate the environment, does not maintain appropriate hygiene, or is at increased risk of acquiring infection or developing adverse outcome following infection.</p>
Respiratory hygiene/cough etiquette Source containment of infectious respiratory secretions in symptomatic patients	<p>Instruct symptomatic persons to cover mouth/nose when sneezing/coughing at initial point of contact (i.e., triage and reception); use tissues and dispose in no-touch receptacle, perform hand hygiene after soiling of hands with respiratory secretions, wear surgical mask if tolerated or maintain spatial separation, greater than 3 feet if possible, 6 feet optimal. Wear surgical mask and protect mucous membranes when caring for person with signs/symptoms of respiratory infection.</p>
Device management	<p>Use catheters and indwelling devices only if essential. Use proper insertion and care protocols. Assess the need for the device regularly and remove as soon as feasible.</p>

Table 3. Transmission-Based Precautions

Precaution Type	Recommendations	Examples
<p><i>Contact Precautions:</i> Reduce the risk of transmitting infectious agents by direct or indirect contact with an infectious person and the person's environment.</p>	<p>Single patient room preferred.</p> <p>Spatial separation of patients at least 3 feet between beds in multi-patient rooms.</p> <p>The use of gloves and gown by any HCP and visitors for all interactions that may involve contact with the patient or patient's environment.</p> <p>Limiting transport and movement of patients outside of the room for medically necessary purposes. Consider dedicated equipment or clean/disinfect between patient uses.</p>	<p>MRSA, CDI, scabies, lice.</p> <p>Contact with body fluid, non-intact skin that cannot be covered or have drainage, and urine/stool that cannot be contained in incontinence products/urine/ostomy bags.</p>
<p><i>Droplet Precautions:</i> Reduce the risk of droplet transmission of infectious agents, spread through close respiratory or mucous membrane contact with respiratory secretions.</p>	<p>Single patient room preferred. May cohort patients if confirmed infections are the same organism/subtype.</p> <p>Separation of patients at least 3 feet and the curtain drawn between beds in multi-patient rooms.</p> <p>The use of a surgical mask (not respirator) for close patient contact.</p> <p>The use of gloves and gown by any HCP and visitors for all interactions that may involve contact with the patient or patient's environment.</p> <p>Limiting transport and movement of patients outside of the room for medically necessary purposes.</p> <p>Patient should wear a surgical mask prior to leaving the patient room.</p> <p>Observe respiratory hygiene/cough etiquette.</p>	<p>Influenza and any other suspected viral or bacterial respiratory infection</p> <p>Uncontained respiratory secretions.</p> <p>Unexplained fever and cough.</p>
<p><i>Airborne Precautions:</i> Reduce the risk of transmission of agents that remain infectious while suspended in the air.</p>	<p>An AIIR (Airborne Infection Isolation Room): single occupancy (or cohort) that meets the American Institute of Architects/Facility Guidelines Institute standards for AIIRs.</p> <p>Fit-tested National Institute for Occupational Safety and Health (NIOSH)-approved N95 respirator or Powered Air Purifying Respirator (PAPR) for HCP.</p> <p>Limit transport and movement of patients outside of the room for medically necessary purposes.</p> <p>If transport is necessary, patient should wear surgical mask (not N95), and all skin lesions should be covered.</p> <p>Where Airborne Precautions cannot be implemented due to limited engineering resources in a facility (e.g., physician's offices, LTCFs), the patient should wear a surgical mask and be placed in a single room. Try to keep negative pressure relative to the surrounding area with door closed except for entry and exit. Transfer to AIIR as soon as possible.</p>	<p>Tuberculosis, measles, and varicella</p>

Note: Consider the 3 Cs framework for precautions (see page 20).

2.5. Discontinuation of Transmission-Based Precautions

The optimal duration of Contact Precautions for the colonization or infection of individuals with MDRO is undetermined (28,33). Patients may remain colonized for long periods of time, shedding may be intermittent, and surveillance methods may not identify the return of an MDRO. The facility should have a policy that clearly states the criteria for discontinuing Transmission-based Precautions.

Options to consider include discontinuing precautions when the syndrome that prompted precautions is resolved, which may be marked by:

- Repeatedly negative cultures;
- No acute infection or drainage; and/or
- No risk factors to transmit to others.

It may be prudent to assume MDRO colonization is indefinite, and manage accordingly.

Patients with CDI who are no longer symptomatic (i.e., diarrhea has ceased) may continue to shed spores for an extended period of time. There is currently no recommendation to extend Contact Precautions beyond duration of illness. Extending Contact Precautions through the length of a hospital stay continues to be categorized as a special measure for control of *C. difficile* (24).

2.6. Patient Management in Hospital and Non-Hospital Healthcare Settings

Placement of all Patients

Every facility should develop a plan for appropriate management of all patients, which may be prioritized for the application to the CDI and MDRO-colonized or infected patient, but logically applies to all because the ability to detect colonization or infection is imperfect. This plan includes the principles that:

- A private room is always optimal. Give the highest priority to individuals who have conditions that may facilitate transmission (e.g., uncontrolled secretions/ excretions).

If a private room is not an option:

- Cohort patients together who are infected or colonized with the *same* organism, but not infected or colonized with different MDRO.
- Cohort patients with CDI with others that are infected with *same* organism or are not considered high risk (e.g., not on an antibiotic within the past 3 months).

If a private or cohort room is not an option, consider the care requirements as well as the cognitive and functional abilities of both the patient and the roommate:

Colonized/Infected Patient Should:	Roommate Should:
Have good hygiene.	Be immunocompetent.
Be able to follow instructions.	Be cooperative [see Infection Control Measures for definition].
Have drainage contained.	Have no invasive devices (e.g., Foley catheter, feeding tube, tracheostomy, drain, intravascular device) and have intact skin.

Patient Movement and Activities

In some settings where healthcare is delivered, when the patient is out of the precaution room, consider the following:

- Apply the principles of the 3 Cs to ensure the patient is clean and cooperative, and that the infection is contained.
- Infected or colonized patients should be permitted to participate in activities if draining wounds are covered, bodily fluids are contained, and the patient performs good hygienic practices.
- For MDRO-colonized or -infected patients without draining wounds, diarrhea, or uncontrolled secretions, establish ranges of permitted ambulation, socialization, and use of common areas based on their risk to other patients and on the ability of the colonized or infected patients to perform proper hand hygiene and other recommended precautions to contain secretions and excretions. Patients' hands should be cleaned upon leaving the room and anytime they become contaminated while out of their room. Alcohol-based hand rubs are exceptionally useful in such situations.
- Facilities should develop guidance to follow IC measures if the patient leaves the precaution room when the risk for complications has outweighed the risk of not walking/ambulating.
- Perform environmental cleaning after use [see Environmental Measures for more information].

3. Environmental Measures

Standard facility procedures can be followed for cleaning patient rooms (38). Priority should be given to items and surfaces that could be implicated in transmission.

- Clean and disinfect surfaces and equipment, including items in close proximity to the patient (rails, tables) and frequently touched surfaces in the care environment (e.g., knobs, bathrooms, light switches, call lights, phones [28,33]).
 - Facilities should consider using a 1:10 dilution of sodium hypochlorite or other product with the Environmental Protection Agency (EPA)-approved claim for *C. difficile* sporicidal activity to disinfect the environment in outbreak and hyperendemic settings (24).

- Ensure that patient care equipment (e.g., wall-mounted sphygmomanometers) and electronic equipment (e.g., computers) that remain in the patient room are cleaned and disinfected (24).
- Frequency and intensity of cleaning depends on the patient's level of hygiene and environmental contamination. Use of the EPA disinfectant for standard facilities is adequate.
- Disinfect reusable equipment (e.g., intravenous [IV] poles, cuffs, wheelchairs) and discard disposable equipment between patient use.
- When possible, items should be dedicated to the patient who is on Transmission-based Precautions, as long as the person requires the items, and then cleaned and disinfected prior to reuse by another patient.
- Shared items found in common areas should be cleaned on a regular basis with an EPA-registered disinfectant.
- In the absence of ongoing transmission, a private bathroom is not necessary for patients colonized or infected with enteric MDRO (provided Standard Precautions, personal hygiene, hand hygiene, and environmental cleaning are maintained).
- Commodes should be dedicated to one patient, but it is preferred that the infected/colonized patient use a toilet to reduce environmental contamination and exposure of HCP to infectious materials.
- Showers, tubs, and whirlpools should be cleaned and disinfected between patient use, per standard facility procedure.
- Follow standard facility procedures for trash disposal per the New Hampshire Department of Environmental Services' Waste Management Division. No additional or special handling is necessary.
- Standard Precautions also apply for laundry. No additional or special handling is necessary.
- No special precautions are needed for dietary, food service, or eating utensils. The combination of hot water and detergents used in industrial dishwashers is sufficient to sanitize such items. Food service workers must wear gloves when handling such items.
- Animal contacts require special considerations including but not limited to assurances of the health and vaccination status of the animal; animal bedding and equipment should be managed as patient bedding and equipment are; limitations on the type and duration of animal contact (e.g., petting, lying in bed, contact with animal saliva or other fluids) may change based on patient status. For local support in development of a facility plan, please contact the New Hampshire Veterinary Medical Association (NHVMA) or your local veterinary clinic.

4. Setting-Specific Recommendations

4.1. Healthcare Settings

Although exposures to MDROs and *C. difficile* may occur anywhere, the risks are far greater for these events to occur in the healthcare setting than in the community. Healthcare settings pose specific risks to both HCP and patients, as infection and transmission may occur more frequently.

Fortunately, healthcare settings may control the movements and activities of their HCP and patient population through reassignment of HCP or implementation of precautions for patients [see Patient Management in Hospital and Non-Hospital Healthcare Settings].

4.2. Ambulatory Care Settings, Walk-in Clinics, Urgent Care Centers, Physician Offices, and Outpatient Rehabilitation Centers

The majority of ambulatory care settings are not designed to implement all isolation practices and other Transmission-based Precautions (e.g., Airborne Precautions for patients with suspected tuberculosis, measles, or varicella). Nonetheless, specific syndromes of uncertain etiology (e.g., diarrhea, febrile respiratory illness, febrile rash) are routinely encountered in ambulatory settings and deserve appropriate triage. Facilities should develop and implement systems for early detection and management of potentially infectious patients at initial points of entry to the facility. To the extent possible, this includes prompt placement of such patients into a single-patient room or a separate space and a systematic approach to transfer when appropriate. When arranging for patient transfer, facilities should inform the transporting agency and the accepting facility of the suspected infection type (39).

- Standard Precautions and appropriate PPE: Ensure gloves and gowns are used for uncontrolled secretions (e.g., draining wounds, ostomy tubes/bags). Ensure safe injection practices for needles and other sharps. Use a facemask when placing a catheter or injecting material into the spinal or epidural space (39).
- Source containment: Patients with overt signs and symptoms of infection should spend as little time as possible in common waiting areas.
 - Sit separately from other patients.
 - Place into exam room as soon as possible.
 - When feasible give them the last appointment of the day, or before a break to allow sufficient time for cleaning/disinfection.
 - Consider posting signs at entrances for respiratory hygiene and cough etiquette.
- Any surfaces or equipment that may have been in contact with the patient (e.g., blood pressure cuffs, examination tables, stethoscopes) should be cleaned with an EPA- and facility-approved disinfectant prior to use for another patient.
- Apply the principles of the 3 Cs to guide patient management (see Infection Control Measures])
 - Provide patient and family education. Include information regarding appropriate hand hygiene, personal hygiene, wound care, MDRO management, environmental cleaning at home, and laundering.

4.3. Dental and Other Oral Healthcare Settings

While oral health HCP often consistently follow good hand hygiene practices and the wearing of PPE (e.g., gloves, masks, goggles), other steps may be taken to reduce the chance of spreading MDROs in the oral healthcare setting.

- In oral healthcare settings, modes of transmission of infection-causing organisms (including but not limited to MDRO) are both direct and indirect:
 - Blood, saliva, or other body fluids from an infected patient;
 - Contaminated objects (e.g., instruments, equipment, environmental surfaces) or contaminated hands of dental HCP if hand hygiene is not performed before touching another patient;
 - Spray/droplets of contaminated body fluid generated by dental procedures or by coughing or sneezing; and
 - Inhalation of airborne organisms.

- In outpatient oral health practices, strict enforcement of Standard Precautions, including ensuring that PPE is used for anticipated contact with uncontrolled secretions and other potentially infectious body fluids, is considered adequate in most circumstances to prevent the transmission of MDROs (40).
 - In addition to wearing PPE, safe work practices protect the mucous membranes and non-intact skin of HCP from contact with potentially infectious material.
 - These practices include keeping contaminated gloved and ungloved hands from touching the wearer's mouth, nose, eyes, or face, a practice that creates self-inoculation.
 - Proper placement of PPE before patient contact will help avoid the necessity of making PPE adjustments (with possible face or mucous membrane contamination) during use.

- CDC recommendations for sterilization and disinfection of patient care items, such as dental instruments, are specific to the potential risk for infection associated with their use (40). CDC recommends using sterile single-use disposable items whenever possible. If this is not possible, follow CDC Guidelines for Disinfection and Sterilization (41).
- Surfaces such as floors, walls, and sinks should be regularly cleaned with an EPA-registered hospital disinfectant.
 - Physical removal of visible blood, body fluids, and other debris soiling any surface by wiping or scrubbing prior to disinfection is critical.
 - Dental chairs, trays, and other equipment in the patient's immediate environment (clinical contact surfaces) must be cleaned between patients with a disinfectant approved by the EPA for this purpose.
 - Surface barriers or covers should be used whenever possible.
- Oral health practice policies should address the timing and extent of HCP education about IC procedures throughout the dental office. This should include training about potentially infectious occupational exposure, work restrictions related to employee health, and the specific responsibilities of the HCP with respect to IC, including the use of PPE (40).

- Dental offices do not need to do routine surveillance cultures, nor should HCP routinely be cultured to ascertain carrier status.
- Consultation with an infectious disease physician or the New Hampshire Department of Health and Human Services would provide additional strategies in case management or hyperendemic situations.

4.4. Dialysis Centers

Hemodialysis patients are at a high risk for infection because of the frequent use of catheters and vascular access for prolonged periods. Patients on dialysis also have weakened immune systems and require frequent hospitalizations and surgery, increasing their risk of infection (40). MDROs and CDI are more common in patients with severe illness and who have had multiple hospitalizations, surgical procedures, or received prolonged courses of antimicrobial agents (42).

- Follow the Recommendations to Prevent Transmission of Infections in Chronic Hemodialysis Patients (43).
- Ensure proper cleaning, sterilization, and disinfection of equipment, supplies, and environmental surfaces. These can be vehicles for bloodborne viruses and pathogenic bacteria. The external surfaces of the dialysis machine are the most likely sources for contamination in this setting and should be a focus of environmental cleaning/disinfecting.
- Maintain a comprehensive IC program specifically designed for the hemodialysis setting, including routine serologic testing and immunization of patients, surveillance, and training and education of patients, family, and healthcare personnel (43).
 - Ensure IC precautions designed to prevent transmission of bloodborne viruses and bacteria among patients.
 - Ensure safe injection practices, including proper use of single-dose and multi-dose vials.
 - Educate HCP about proper IC techniques for initiation, care, and maintenance of access sites.
 - Training and education for patients or family members regarding infection prevention practices at least annually, addressing the following topics: personal and hand hygiene, patient responsibility for proper care of the access site, signs and symptoms of infection, and recommended vaccinations (43).

4.5. Home Healthcare, Home Hospice, and Visiting Nurse Associations

Risk of transmission during home healthcare has been demonstrated (44). Home HCP should focus on preventing cross-contamination via their clinical bag, clothing, and any other equipment that is carried to and from the patient's home. This can be accomplished by:

- Use the “bag technique”: Identify a clean and safe area for the healthcare bag. Choose a place to set the bag that allows sufficient space to work, is close to the patient, has a source of water, and is away from pets and children. Never set the healthcare bag on the floor.

- Adher to Standard Precautions;
- Use disposable patient care items;
- Clean or bag reusable equipment prior to leaving the patient’s home for cleaning and disinfection before use on another patient;
- Leave dedicated non-disposable equipment in the home until the patient is discharged from home care services;
- Clean and disinfect equipment prior to re-issuing to another patient’s home;
- Apply Standard Precautions and hand and personal hygiene practices universally;
- Explain Standard Precautions and the use of gloves when handling secretions and excretions and hand hygiene during and after care to family and patient;
- Discard any disposable articles saturated with secretions (e.g., soiled dressings, tissues) in a red biohazard bag and disposing of these items in the patient’s routine trash; and
- Adopt policies to address MDRO and CDI surveillance, appropriate communication with treating clinicians, and patient transfer (45).

For household contacts, the following information and education should be provided:

- Risk of transmission has not been quantified (28).
- Do not share personal items (e.g., razors, towels, bar soap);
- Promptly and regularly clean all surfaces contaminated by secretions, excretions, or touched by contaminated hands; and
- Immunosuppressed or seriously ill household contacts should not have contact with MDRO or CDI secretions/excretions, and should promptly wash their hands if contact is unavoidable (28).
- No special procedures are necessary for home laundry.

4.6. Long-Term Care Facilities, Residential and Residential Rehabilitation Settings, Specialty/Psychiatric Hospitals, and Hospice Centers

LTC facilities include many different types of facilities. Some strive to replace the “hospital-like environment” with a place that patients can consider home. Other facilities care for patients who come to them directly from the hospital for short-term acute care where a “hospital-like” environment is appropriate. The prevention and control of MDRO should be tailored to the specific needs and characteristics of each population and healthcare setting. Each facility should determine the type of isolation (Standard or Transmission-based Precautions) required depending on the organism, the patient, and the circumstances at the facility. Once interventions are implemented, ongoing surveillance and assessments should continue to determine if additional intervention or consultation is needed.

- Problem-solve and adapt guidelines to the specific situation.
 - For MDRO-colonized or infected patients without draining wounds, diarrhea, or uncontrolled secretions, establish ranges of permitted ambulation, socialization, and use

of common areas based on their risk to other patients and on the ability of the colonized or infected patients to perform proper hand hygiene and other recommended precautions to contain secretions and excretions (33).

- If patient is not, or cannot be, cooperative, facility HCP should assist patients with hand hygiene.
- Private rooms in LTC facilities are not usually available or practical. Review placement of patient and roommate [see Placement of All Patients].
- For *C. difficile*: ensure the least amount of contact with infectious material (e.g., patient with CDI may be assigned the bathroom with the non-CDI patient using a bedside commode).
- Apply the principles of the 3 Cs to determine whether rehabilitation and group activities outside the room may be allowed [see Infection Control Measures].
 - Ensure that the patient is clean, with drainage, secretions, and excretions contained. Infected or colonized patients should be permitted to participate in activities if draining wounds are covered, bodily fluids are contained, and the patient performs good hygienic practices.
 - For MDRO colonized or infected patients without draining wounds, diarrhea, or uncontrolled secretions, establish ranges of permitted ambulation, socialization, and use of common areas based on their risk to other patients and on the ability of the colonized or infected patients to perform proper hand hygiene and other recommended precautions. If patient is not cooperative or cannot be cooperative, then the HCP washes the patients' hands.
 - Patients' hands should be cleaned upon leaving the room and anytime they become contaminated while out of their room. Alcohol-based hand rubs are exceptionally useful in such settings (although soap and water are recommended in outbreak situations).
 - Facilities should develop guidance (e.g., plan of care) to follow IC measures if Transmission-based Precautions are implemented.
- The facility should have a policy that clearly states the criteria for discontinuing Transmission-based Precautions.
 - The optimal duration of Contact Precautions for MDRO or CDI colonization or infection is undetermined. Patients may remain colonized for long periods of time, shedding may be intermittent, and surveillance methods may not identify the return of an MDRO.
- Options to consider include discontinuing precautions when the syndrome that prompted precautions is resolved, no acute infection or drainage is present, or no risk factors for transmission to others is present.

4.7. Medical Transport and Emergency Medical Services

Medical transport presents a unique opportunity to minimize the spread of MDROs. Many patients who are affected by MDROs have complex courses of care, potentially requiring patient transfer and movement between several different facilities of varying type, size, and location. Patient travel and transport is part of the “patient picture,” and timely inter-facility communication before and at

the time of transfer to increase awareness about patient infection and/or colonization status helps to ensure that adequate (e.g., type) precautions are taken. This includes making responders aware of any potential hazards and risks associated with their patients (44).

- Standard Precautions and vehicle cleaning routines are adequate to transport patients with MDRO. This includes respiratory etiquette and use of masks if needed for respiratory infections/uncontained secretions.
- Emergency medical services (EMS) responders may not be hospital-based and have varied levels of infection prevention knowledge. EMS personnel include not only paramedic and emergency medical technicians, but also other first responders including firefighters, police, and public safety officers (44).
- EMS and medical transport personnel are at risk of being exposed to infectious pathogens including MDROs, as well as transmitting infections to patients and community contacts. It is crucial that EMS personnel are healthy when performing work duties. Exclusion and restriction policies should be put in place for employees to self-report illness and/or exposures without punitive measures such as lost wages, benefits, or job status.
- Specific concerns that EMS settings must address include the need to clean and disinfect work equipment, including transport vehicles.
- EMS personnel have a reasonable expectation of having contact with blood or other potentially infectious materials (OPIM), thus a comprehensive infection prevention program or steps must be established to ensure risk reduction and a safe environment for HCP. Components aimed at preventing exposure and infection include the use of barrier techniques, equipment design, and procedures such as education, hand-washing, needlestick safety, PPE, environmental cleaning, and the use of Standard Precautions (44).

4.8. Non-Healthcare Settings

The recognition and control of MDROs in non-healthcare settings pose unique considerations. Although the prevalence of such infections in the general public is far lower than in healthcare settings, several factors make the control of MDROs challenging in community settings. Those at risk for becoming infected and/or transmitting these organisms are generally unknown, and when risks are known, fewer controls exist. Furthermore, there is often little in-house expertise regarding the recognition, control, and prevention of these organisms, generally requiring some degree of outside expertise or assistance when situations arise.

4.9. Athletics (including physical education, competitive sports, and fitness centers)

- Establish protocols to reduce chances of transmission (e.g., routine cleaning of equipment, no sharing of equipment).
- Hand and personal hygiene is essential for the prevention of MDROs in athletic settings due to the pervasive nature of direct physical contact with other people and equipment (49,50).
- Athletes should be educated regarding steps they may take to prevent infections (58).
- Showers should be taken daily, after each workout/practice, and after participation in contact activities. Showers should be taken before using whirlpools/other pools, and only those with intact skin should be allowed to use these areas of the athletic facility.

- Soap and warm water and/or alcohol-based hand rubs should be used for hand hygiene, using a paper towel to dry hands each time. Hands should be washed after direct physical contact and handling shared equipment.
- Athletes should not share personal items such as towels, razors, ointments/balms/moisturizers, clothing/uniforms, or personal sports equipment (33, 49,50,58,59).
- Appropriate environmental cleaning procedures should be reviewed with environmental services staff (58,59).
 - Shared sports equipment should be cleaned after each use, as should high-touch or high-risk surfaces, such as massage chairs, locker room benches, sauna/steam room seats, shower chairs/seats, sinks, toilets, and showers.
 - Linens such as towels and sheets should be changed and laundered after each use.
 - Linens, underclothes, and uniforms should be washed in a washing machine with water and laundry detergent, and dried completely on the hottest recommended setting.
- Screen for wounds and skin lesions that may be potentially infected. Wounds/lesions must be kept covered and contained (58).
 - In school athletic situations, wounds/lesions and known and potential infections should be reported to the school nurse, coach, trainer, and/or athletic director. Follow up with the patient’s primary care provider (PCP) as soon as possible.
 - Restrict the patient from all contact sports if wounds/lesions are not properly covered or contained.
- Provide training to key stakeholders (e.g., athletes, clients, school nurses, camp directors, coaches) regarding how to recognize potentially infected wounds (58).

4.10. Correctional Facilities

The control and prevention of MDROs and CDI are made especially challenging by competing priorities of inmate and correctional worker safety, security, and containment, as well as by the availability of resources in this setting (e.g., staff time and space to house inmates). MDRO infections in the correctional setting have been associated with unsanitary tattoo practices, poor inmate hygiene (e.g., infrequent showering), the sharing of personal items (e.g., soap, towels), and self-treatment, including wound care, using unsanitary equipment (e.g., fingernail clippers, tweezers) (57).

- Basic prevention
 - Screening and surveillance measures should be implemented routinely to ensure prompt detection of MDROs. Opportunities for surveillance include health screening during intake, during hospital/infirmary transfer, bacterial culture results, and general observation by correctional staff (57).
 - Inmates and correctional staff should be educated regarding signs and symptoms of MDROs and prevention strategies (e.g., handwashing, personal hygiene, maintenance of sanitation systems).

- A hand hygiene program consisting of oversight and education should be established for correctional facility staff and inmates. Adequate handwashing supplies for inmates diagnosed with MDROs, and for the staff that is in contact with them is critical (33,57).
- Sanitation should be assessed regularly, with any lapses rectified in accordance with local policies and procedures.
- Containment
 - Correctional facility HCP should be consulted for diagnosis and treatment.
 - All inmates infected with MDROs should be instructed in regular handwashing, maintenance of personal hygiene (including regular showers), and the importance of keeping wounds covered (33,57).
 - Decisions regarding housing assignments should be made utilizing the MDRO Inmate Housing Guidelines (57).
 - A plan should be developed to ensure that dressings can be replaced safely. Draining wounds must be adequately dressed to prevent contamination of environmental surfaces, and dressings should be changed regularly. Inmates should be instructed in the proper disposal of their used bandages in accordance with local policy (57).
- Inmate transfers
 - *Non-required transfers*: Inmates infected with MDROs should ordinarily not be transferred until their infection has been adequately treated and the risk of contagion is controlled (57).
 - *Required transfers*: Inmates infected with MDROs whose transfer is absolutely required for security or medical reasons should have their draining wounds dressed the day of the transfer with bandages that adequately contain the drainage (57). The following should occur prior to the transfer:
 - Escort officers should be notified of the inmate's condition and be educated on IC measures, including the importance of hand hygiene, protective measures, safe disposal of contaminated dressings, and decontamination of security devices and reusable restraints (e.g., handcuffs, leg irons, martin chains). They should be advised to use disposable restraints when feasible.
 - The clinical director (or designee) of the sending institution should notify the receiving institution's clinical director or health services administrator of the pending transfer of an inmate with suspected or confirmed MDRO infection.
 - *Releases*: Inmates with MDRO SSTIs who are scheduled for release should:
 - Have draining infections bandaged to adequately contain excretions/secretions prior to release;
 - Be given sufficient antibiotics to complete the course of treatment;
 - Be counseled on practical IC measures to prevent transmission to household members and other anticipated close contacts; and
 - Be given assistance in accessing follow-up medical services (57).

- Follow recommendations for Long-Term Care, Residential Settings, Residential Rehabilitation Settings, Specialty Hospitals, and Hospice Centers Setting (above) tailored to the specific needs of the population.

4.11. Daycare or Adult Care Centers

- Follow recommendations for Schools [below].
- Apply the principles of the 3 Cs to guide individual management.
- Thorough environmental cleaning should occur frequently, especially if there is sharing of toys and/or common items.
- Parents, legal guardians, or others authorized by the parent should be notified immediately when a child has a sign or symptom requiring exclusion from the facility. Consult the *DHHS Disease Handbook for Childcare Providers* (56).
 - The illness prevents a child from participating comfortably in activities;
 - The illness results in greater care need than the staff can provide; and
 - The child has any of the following conditions: oral temperature of 101°F or greater, signs or symptoms of severe illness, uncontrolled diarrhea, vomiting, or rash with fever or behavior change.
- Hand and personal hygiene should be emphasized.
 - Follow appropriate diapering recommendations to prevent transmission (56).
- Contact the NH DHHS Childcare Licensing Unit for diaper and other recommendations (603-271-9025).

4.12. Classrooms

Schools may rely on various personnel to control MDROs, including facility managers, environmental services staff, administrators, and nurses, whose clinical knowledge varies.

- Apply the principles of the 3 Cs to guide individual management for medical needs in non-healthcare settings.
 - Those at risk of transmitting MDROs in the school setting are likely to be unknown; therefore direct skin, non-intact skin, or mucous membrane contact with body fluids and secretions should be avoided at all times. Open wounds should be kept clean, covered, and away from contact with others (48).
- Designating and training specific staff in appropriate IC practices and developing a written protocol for handling MDRO situations will be especially important when HCP with clinical qualifications are unavailable.
- Alert anyone with close physical contact with the patient of the infection if there was known or potential contact with secretions or open skin lesions/wounds.
- Report lesions or open wounds to the school nurse (or individuals responsible for healthcare delivery) and follow up with the patient's PCP as soon as possible (50).

- Cover wounds/lesions. Patient may be excluded from school if the infection remains uncontained (47,52).
 - Dressings may be discarded in regular trash, unless saturated with blood.
- Hand and personal hygiene: Use soap and water and/or alcohol-based hand rubs (47–52).
 - Wash hands before/after contact with lesion and dressings.
 - Use a new paper towel each time to dry hands.
- Do not share personal items (47–52). Young children should be supervised and discouraged from oral contact with their own or each other’s hands and items. Older children should be discouraged from sharing food, personal items, and skin care products.
- Ongoing and thorough environmental cleaning of high-touch surfaces (e.g., door handles, faucet handles, handrails, shared desks, computers, musical instruments, vending machines, push bars, transportation, drinking fountains, bathrooms, nurses’ offices, childcare centers) is critical to prevent MDRO in school settings (47).
 - Environmental services staff should be educated regarding selection, application, and storage of cleaning agents to ensure appropriate and safe use.
- Dishes do not need special handling; hot water and detergent or dishwashers are adequate.

4.13. Workplace

Necessary precautions depend on the specific characteristics of the workplace setting and the duties involved, which vary substantially. Most settings require individual identification and assessment of risks present and the incorporation of appropriate control mechanisms [see Appendix C: Additional MDRO Resources and Materials].

- Some factors that pose unique considerations and challenges for the prevention of MDROs in the workplace include:
 - Settings that incorporate athletic facilities, food handling and preparation, the laboratory environment, as well as those requiring direct physical contact with humans or animals (54);
 - Work requiring the handling of human or animal waste material and/or other organic materials such as body fluids, fertilizers, soil, water, and agricultural products; or takes place in shared or confined workspaces or utilizing shared equipment (54);
 - Situations where there is a clear potential for traumatic injury (53–55).
- Important considerations for IC include personal hygiene, not sharing personal items, and environmental cleaning (53–55).
- The workplace should maintain and make accessible a worksite-specific first aid kit, including gloves, face shields, gowns, and cardiopulmonary resuscitation (CPR) masks.
- Incidents occurring in the workplace should be reported to managers, occupational health and safety representatives, and/or human resources personnel so the appropriate healthcare and treatment procedures can be provided (55).

D. The Prevention of Infection with MDROs and CDI

Patients are vulnerable to colonization and infection with MDROs and *C. difficile* due to factors including severe disease, underlying medical conditions and comorbidities, and/or recent procedures. However, in addition to controlling existing infections, general IC approaches can reduce the conditions that engender and exacerbate the prevalence of infections with MDROs. Effective infection prevention depends on appropriate clinical practices being universally incorporated into routine care. These practices include device management (e.g., preventing pneumonia in intubated patients, preventing bloodstream infections [BSIs] from central lines, preventing urinary tract infections [UTIs] from indwelling urinary catheters); using antimicrobials wisely (e.g., targeting likely or known pathogens, optimizing timing and duration of administration); source control (e.g., respiratory/cough etiquette, hand hygiene, wound debridement); as well as skin care and prevention of pressure ulcers. Standard Precautions, however, remain the foundation of IC measures.

1. Education and Communication

- Within the facility:
 - Identify or note (i.e., flag) records of patients colonized or infected with MDROs while maintaining appropriate confidentiality. Currently, there are no recommendations for flagging the records of patients with CDI who are readmitted and colonized. Flagging mechanisms ensures all pertinent HCP are aware and can take actions to reduce/eliminate transmission of infection.
 - Identify suspect or confirmed cases before or during admission when feasible.
 - Follow Standard and Transmission-based Precautions.
- Inter-facility:
 - Communicate with receiving facilities and transportation agencies/individuals, suspect or actual cases within 48 hours.
 - Suspect or actual cases of MDRO and CDI alone should not preclude admission or transfer to another facility.
- Provide ongoing and initial education to all HCP (including environmental services personnel) regarding the following:
 - Care and placement of patients to reduce further transmission;
 - Use of PPE;
 - Hand hygiene;
 - Appropriate implementation of IC measures (e.g., AIIR);
 - Environmental cleaning, disinfecting, sterilization;
 - Device management (e.g., indwelling catheters, central lines);
 - Source control (e.g., respiratory etiquette, wound debridement);
 - Skin integrity as it relates to IC;
 - Aspiration pneumonia; and

- Antibiotic stewardship.
- Provide confidential education for patients, families, and visitors regarding the following:
 - Standard Precautions and PPE, handwashing, respiratory hygiene and cough etiquette, general hygiene (e.g., not sharing personal items), duration of isolation, disposal of contaminated items, and laundering of clothing and linens.
 - For CDI, the need to use gowns and gloves by family members and other visitors has not been resolved. Minimum expectations are that family and visitors perform hand hygiene before entering and after leaving the patient’s room (24).

2. Surveillance

Routine collection of active surveillance cultures of all patients for MDROs and CDI at admission is not recommended by NH DHHS or the CDC. Because body flora is dynamic, active surveillance cultures constitute a “snapshot” of a single point in time. Therefore, active surveillance cultures are not warranted (60). HCP should closely observe their patients for the signs and symptoms of active infections with MDROs and CDI.

However, screening high-risk patients for MDROs may be indicated in the following situations:

- In certain settings such as burn units and ICUs, and in certain pre-operative procedures as determined by facility IC personnel;
- Patients with risk factors for infections with MDROs and CDI [see Background]; and
- HCP should be cultured only if epidemiologic data implicate them as a possible source of transmission (33).

Diagnostic cultures are recommended when there is reason to suspect an infection or possible source of dissemination of MDROs or CDI:

- Stool, rectal, or perirectal swab culture in patients with a history of VRE or contact with VRE patients;
- Nasal, perirectal, or wound culture in patients with a history of MRSA or contact with MRSA patients;
- Infection site culture with directed susceptibility testing for VRSA/VISA in a patient with a history of extensive vancomycin use failing vancomycin therapy for MRSA; and
- Test only patients with clinically significant diarrhea and or abdominal cramping for *C. difficile*. Patients with formed stools should not be tested for *C. difficile* (21,24).

For those facilities choosing to conduct active or passive surveillance, these approaches should include routine laboratory-based procedures to detect and communicate evidence of MDRO in clinical isolates (33). As part of such a surveillance system, facilities should:

- Establish laboratory-based procedures to detect and communicate evidence of MDRO in clinical isolates;
- Establish systems to ensure that clinical microbiology laboratories (in-house and referral) promptly notify IC personnel or a designee when a novel resistance pattern for the facility is detected;

- Prepare facility-wide antimicrobial susceptibility (antibiogram) reports, and monitor such reports for evidence of changing resistance that may indicate emergence or transmission of MDRO, and develop and monitor special-care unit-specific antimicrobial susceptibility reports (e.g., ventilator-dependent units, ICUs, oncology units) if indicated; and
- Monitor trends in incidence of target MDROs in the facility over time to determine if MDRO rates are decreasing, or if additional interventions are needed (33).

3. Decolonization

Decolonization entails treatment of persons colonized with a specific MDRO to eradicate carriage of that organism. Routinely attempting decolonization of MDROs is not recommended at this time.

- Efficacy is questionable. For example, MRSA recolonization is common after treatment, and there is no clinically proven decolonization regimen for VRE (33).
- Attempts at decolonization may result in emergence of additional resistance to the agents used (33).
- Decolonization has little impact on the long-term incidence of infections (7,61,62).

NH DHHS recommends limiting the use of decolonization to outbreaks or other high-prevalence situations, especially those affecting special-care units (33). HCP implicated in the transmission of MRSA are candidates for decolonization and should be treated and submit an isolate that is culture-negative before returning to direct patient care (33). Asymptomatic HCP colonized with MRSA who have not been linked epidemiologically to transmission do not require decolonization (33). There are no recommendations for decolonization of *C. difficile*.

4. Animals and MDROs in Hospital Healthcare Settings

Animals can serve as sources of zoonotic pathogens that could potentially infect patients and HCP. Transmission between animals and humans, and vice versa, has been reported for several MDROs (e.g., MRSA, VRE), although the frequency of such transmission is unclear (63,64). Like people, animals may be symptomatic or asymptomatic carriers of MDROs. Although evidence regarding the role animals play in transmission is not conclusive, research indicates that most strains in pets originate from humans (64). MDRO protocols should address requirements and procedures for animal visitation and co-habitation in hospital healthcare settings.

General guidelines exist for animals in healthcare facilities (38). Requirements for animals visiting healthcare facilities are important in decreasing transmission of pathogens including MDROs. Such requirements may include:

- Ensuring the animal is in good health without open wounds or obvious dermatologic lesions;
- Strict enforcement of hand-hygiene measures after animal contact;
- Use of barrier protective measures; and
- Possibly excluding animals from special care areas (e.g., burn units).

Animals diagnosed with MDROs may be excluded from healthcare facilities. Many of the principles and precautions used for decreasing transmission from human patients are also appropriate for animals diagnosed with MDROs, including:

- Appropriate wound care and coverings;
- Strict hand hygiene;
- Barrier protective measures when touching items such as the animal's bedding, bandages, or any other objects that may have been in contact with the infected areas;
- Appropriate disinfection of bedding and environmental surfaces; and
- Restricting contact with immunocompromised individuals.

III. MDROs AND CDI OUTBREAK MANAGEMENT

To classify a cluster of MDRO or CDI cases as an outbreak, the situation must have the presence of:

- Active transmission or evidence of biologically plausible transmission; and
- Clinical illness related to the organism.

The primary goals of outbreak management are to:

- Control and prevent further disease;
- Identify factors that contributed to the outbreak;
- Develop and implement measures to prevent further outbreaks in the future; and
- Contribute to educational efforts.

By New Hampshire State statute RSA 141-C, HCP and laboratories shall report to the NH DHHS Bureau of Infectious Disease Control (BIDC) any cluster of illness within 24 hours.

- During normal business hours reports shall be made to the BIDC at phone number 603-271-4496 or fax number 603-271-0545. After normal business hours or on weekends, the phone report shall be made to the New Hampshire Hospital switchboard at 1-800-852-3345 to request the BIDC public health nurse on call.
- Working in conjunction with the BIDC, an action plan [see Appendix A: Two-Tiered Approach to MDRO Control] will be developed to:
 - Initiate and maintain a line list of suspected, probable, and confirmed cases;
 - Determine whether or not additional surveillance techniques are warranted. In some situations, it may be appropriate to culture HCP/staff and patients as part of case-finding efforts;
 - Review the role of antimicrobial use in the MDRO outbreak;
 - Reinforce IC practices (e.g., instituting Transmission-Based Precautions);
 - Cohort patients/HCP;
 - Exclude ill HCP from work until well;

- Educate HCP and the public;
 - Decolonize carriers if recommended or proven effective;
 - Decolonize and restrict from work any colonized HCP implicated in transmission;
 - Implement patient-dedicated use of non-critical equipment;
 - Clean and disinfect the environment and equipment; and
 - HCP cleaning rooms where patients are on Transmission-based Precautions should follow Healthcare Infection Control Practices Advisory Committee (HICPAC) guidance on proper cleaning methods.
- Working in conjunction with the BIDC, an action plan [see Appendix B: Two-Tiered Approach to CDI Control] will be developed during hyperendemic or outbreak situations of CDI. Targeted measures include:
 - Individualized measures for each facility after performing an IC assessment;
 - Hand hygiene with soap and water and glove use reinforced (24);
 - Patients who have diarrhea and are awaiting test results for CDI should be placed on Contact Precautions (24);
 - Contact Precautions should be continued for the duration of the hospital stay or until the patient's diarrhea ceases and the patient remains symptom-free for 48 hours (24);
 - An assessment of the adequacy of environmental cleaning/disinfecting (24);
 - Considering the addition of sodium hypochlorite or an EPA-approved sporicidal agent in situations where appropriate cleaning is taking place, but transmission of CDI is continuing (24); and
 - No culturing or decolonization of HCP or asymptomatic patients is carried out.

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Appendix A: Two-Tiered Approach to MDRO Control

Tier 1. General Recommendations for Routine Prevention and Control of MDROs in Healthcare Settings						
Administrative Measures/ Adherence Monitoring	MDRO Education	Judicious Antimicrobial Use	Surveillance	Infection Control Precautions to Prevent Transmission	Environmental Measures	Decolonization
<p>Make MDRO prevention/control an organizational priority. Provide administrative support and both fiscal and human resources to prevent and control MDRO transmission. <i>(IB)</i></p> <p>Identify experts who can provide consultation and expertise for analyzing epidemiologic data, recognizing MDRO problems, or devising effective control strategies, as needed. <i>(II)</i></p> <p>Implement systems to communicate information about reportable MDRO to administrative personnel and state/local health departments. <i>(II)</i></p> <p>Implement a multi-disciplinary process to monitor and improve HCP adherence to recommended practices for Standard and Contact Precautions. <i>(IB)</i></p> <p>Implement systems to designate patients known to be colonized or infected with a targeted MDRO and to notify receiving healthcare facilities or HCP prior to transfer of such patients within or between facilities. <i>(IB)</i></p> <p>Support participation in local, regional and/or national coalitions to combat emerging or growing MDRO problems. <i>(IB)</i></p> <p>Provide updated feedback at least annually to HCP and administrators on facility and patient-care unit MDRO infections. Include information on changes in prevalence and incidence, problem assessment and performance improvement plans. <i>(IB)</i></p>	<p>Provide education and training on risks and prevention of MDRO transmission during orientation and periodic educational updates for HCP; include information on organizational experience with MDRO and prevention strategies. <i>(IB)</i></p>	<p>In hospitals and LTCFs, ensure that a multi-disciplinary process is in place to review local susceptibility patterns (antibiograms), and antimicrobial agents included in the formulary, to foster appropriate antimicrobial use. <i>(IB)</i></p> <p>Implement systems (e.g., susceptibility report comment, pharmacy or unit director notification) to prompt HCP to use the appropriate agent and regimen for the given clinical situation. <i>(IB)</i></p> <p>Provide HCP with antimicrobial susceptibility reports and analysis of current trends, updated at least annually, to guide antimicrobial prescribing practices. <i>(IB)</i></p> <p>In settings with limited electronic communication system infrastructures to implement HCP prompts, etc., at a minimum implement a process to review antibiotic use. Prepare and distribute reports to HCP. <i>(II)</i></p>	<p>Use standardized laboratory methods and follow published guidelines for determining antimicrobial susceptibilities of targeted and emerging MDRO.</p> <p>Establish systems to ensure that clinical micro labs (in-house and outsourced) promptly notify infection control or a medical director/designee when a novel resistance pattern for that facility is detected. <i>(IB)</i></p> <p>In hospitals and LTCFs:</p> <p>...develop and implement laboratory protocols for storing isolates of selected MDRO for molecular typing when needed to confirm transmission or delineate epidemiology of MDRO in facility. <i>(IB)</i></p> <p>...establish laboratory-based systems to detect and communicate evidence of MDRO in clinical isolates <i>(IB)</i></p> <p>...prepare facility-specific antimicrobial susceptibility reports as recommended by CLSI; monitor reports for evidence of changing resistance that may indicate emergence or transmission of MDRO <i>(IA/IC)</i></p> <p>...develop and monitor special-care unit-specific antimicrobial susceptibility reports (e.g., ventilator-dependent units, ICUs, oncology units). <i>(IB)</i></p> <p>...monitor trends in incidence of targeted MDRO in the facility over time to determine if MDRO rates are decreasing or if additional interventions are needed. <i>(IA)</i></p>	<p>Follow Standard Precautions in all healthcare settings. <i>(IB)</i></p> <p>Use of Contact Precautions:</p> <p>--- In acute-care settings: Implement Contact Precautions for all patients known to be colonized/infected with target MDRO. <i>(IB)</i></p> <p>--- In LTCFs: Consider the individual patient's clinical situation and facility resources in deciding whether to implement Contact Precautions <i>(II)</i></p> <p>--- In ambulatory and home care settings, follow Standard Precautions <i>(II)</i></p> <p>---In hemodialysis units: Follow dialysis specific guidelines <i>(IC)</i></p> <p>No recommendation has been made regarding when to discontinue Contact Precautions. <i>(Unresolved issue)</i></p> <p>Masks are not recommended for routine use to prevent transmission of MDRO from patients to HCP. Use masks according to Standard Precautions when performing splash-generating procedures, caring for patients with an open tracheostomy with potential for projectile secretions, and when there is evidence for transmission from heavily colonized sources (e.g., burn wounds).</p> <p>Patient placement in hospitals and LTCFs:</p> <p>When single-patient rooms are available, assign priority for these rooms to patients with known or suspected MDRO colonization or infection. Give highest priority to those patients who have conditions that may facilitate transmission (e.g., uncontained secretions or excretions). When single-patient rooms are not available, cohort patients with the same MDRO in the same room or patient-care area. <i>(IB)</i></p> <p>When cohorting patients with the same MDRO is not possible, place MDRO patients in rooms with patients who are at low risk for acquisition of MDRO and associated adverse outcomes from infection and are likely to have short lengths of stay. <i>(II)</i></p>	<p>Follow recommended cleaning, disinfection and sterilization guidelines for maintaining patient care areas and equipment.</p> <p>Dedicate non-critical medical items to use on individual patients known to be infected or colonized with an MDRO. Prioritize room cleaning of patients on transmission-based Precautions. Focus on cleaning and disinfecting frequently touched surfaces (e.g., bed rails, bedside commodes, bathroom fixtures in patient room, doorknobs) and equipment in immediate vicinity of patient.</p>	<p>Not recommended routinely.</p>

Category IA: Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiological studies.

Category IB: Strongly recommended for implementation and strongly supported by some experimental, clinical, or epidemiological studies.

Category IC: Required for implementation, as mandated by federal and/or state regulation or standard.

Category II: Suggested for implementation and supported by suggestive clinical or epidemiologic studies or theoretical rationale.

No recommendation: Unresolved issue. Practices for which insufficient evidence or no consensus regarding efficacy exists.

Tier 2. Recommendations for Intensified MDRO Control Efforts

Institute one or more of the interventions described below when 1) incidence or prevalence of MDRO are not decreasing despite the use of routine control measures; or 2) the *first* case or outbreak of an epidemiologically significant MDRO (e.g., CRE, NDM-1, VRE, MRSA, VISA, VRSA, MDR-GNB) is identified within a healthcare facility or unit (*IB*). Continue to monitor the incidence of target MDRO infection and colonization; if rates do not decrease, implement additional interventions as needed to reduce MDRO transmission.

Administrative Measures/Adherence Monitoring	MDRO Education	Judicious Antimicrobial Use	Surveillance	Infection Control Precautions to Prevent Transmission	Environmental Measures	Decolonization
<p>Obtain expert consultation from persons with experience in IC and the epidemiology of MDRO, either in-house or through outside consultation, for assessment of the local MDRO problem and guidance in the design, implementation and evaluation of appropriate control measures. (<i>IB</i>)</p> <p>Provide necessary leadership, funding, and day-to-day oversight to implement interventions selected. (<i>IB</i>)</p> <p>Evaluate healthcare system factors for role in creating or perpetuating MDRO transmission, including staffing levels, education and training, availability of consumable and durable resources; communication processes, and adherence to IC measures. (<i>IB</i>)</p> <p>Update HCP and administrators on the progress and effectiveness of the intensified interventions. (<i>IB</i>)</p>	<p>Intensify the frequency of educational programs for HCP, especially for those who work in areas where MDRO rates are not decreasing. Provide individual or unit-specific feedback when available. (<i>IB</i>)</p>	<p>Review the role of antimicrobial use in perpetuating the MDRO problem targeted for intensified intervention. Control and improve antimicrobial use as indicated. Antimicrobial agents that may be targeted include vancomycin, third-generation cephalosporins, antianaerobic agents for VRE; third generation cephalosporins for ESBLs; and quinolones and carbapenems. (<i>IB</i>)</p>	<p>Calculate and analyze incidence rates of target MDRO (single isolates/patient; location-, service-specific). (<i>IB</i>)</p> <p>Increase frequency of compiling, monitoring antimicrobial susceptibility summary reports. (<i>II</i>)</p> <p>Implement laboratory protocols for storing isolates of selected MDRO for molecular typing; perform typing if needed. (<i>IB</i>)</p> <p>Develop and implement protocols to obtain active surveillance cultures from patients in populations at risk. (<i>IB</i>)</p> <p>Conduct culture surveys to assess efficacy of intensified MDRO control interventions.</p> <p>Conduct serial (e.g., weekly) unit-specific point prevalence culture surveys of the target MDRO to determine if transmission has decreased or ceased. (<i>IB</i>)</p> <p>Repeat point-prevalence culture-surveys at routine intervals and at time of patient discharge or transfer until transmission has ceased. (<i>IB</i>)</p> <p>If indicated by assessment of the MDRO problem, collect cultures to assess the colonization status of roommates and other patients with substantial exposure to patients with known MDRO infection or colonization. (<i>IB</i>)</p> <p>Obtain cultures from HCP for target MDRO when there is epidemiologic evidence implicating a staff member as a source of ongoing transmission.</p>	<p>Use of Contact Precautions: Implement Contact Precautions routinely for all patients colonized or infected with a target MDRO. (<i>IA</i>)</p> <p>Don gowns and gloves <i>before or upon entry</i> to the patient's room or cubicle. (<i>IB</i>)</p> <p>In LTCFs, modify Contact Precautions to allow MDRO colonized/infected patients whose site of colonization or infection can be appropriately contained and who can perform good hand hygiene practices to enter common areas and participate in group activities.</p> <p>When active surveillance cultures are obtained as part of an intensified MDRO control program, implement Contact Precautions until the surveillance culture is reported negative for the target MDRO. (<i>IB</i>)</p> <p>No recommendation is made for universal use of gloves and/or gowns. (<i>Unresolved issue</i>)</p> <p>Implement policies for patient admission and placement as needed to prevent transmission of the problem MDRO. (<i>IB</i>)</p> <p>When single-patient rooms are available, assign priority for these rooms to patients with known or suspected MDRO colonization or infection. Give highest priority to those patients who have conditions or behaviors that may facilitate transmission (e.g., uncontained secretions or excretions). When single-patient rooms are not available, cohort patients with the same MDRO in the same room or patient-care area. (<i>IB</i>)</p> <p>When cohorting patients with the same MDRO is not possible, place MDRO patients in rooms with patients who are at low risk for acquisition of MDRO and associated adverse outcomes from infection and are likely to have short lengths of stay. (<i>II</i>)</p> <p>Stop new admissions to the unit or facility if transmission continues despite the implementation of the intensified control measures. (<i>IB</i>)</p>	<p>Implement patient.-dedicated use of non-critical equipment. (<i>IB</i>)</p> <p>Intensify and reinforce training for environmental staff who work in areas targeted for intensified MDRO control. Some facilities may choose to assign dedicated staff to targeted patient care areas to enhance consistency of proper environmental cleaning and disinfecting services. (<i>IB</i>)</p> <p>Monitor cleaning performance to ensure consistent cleaning and disinfection of surfaces in close proximity to the patient and those likely to be touched by the patient and HCP (e.g., bedrails, carts, bedside commodes, doorknobs, faucet handles). (<i>IB</i>)</p> <p>Obtain environmental cultures (e.g., surfaces, shared equipment) only when epidemiologically implicated in transmission. (<i>IB</i>)</p> <p>Vacate units for environmental assessment and intensive cleaning/disinfecting when previous efforts to control environmental transmission have failed. (<i>II</i>)</p>	<p>Consult with experts on a case-by-case basis regarding the appropriate use of decolonization therapy for patients or HCP during limited period of time as a component of an intensified MRSA control program. (<i>II</i>)</p> <p>When decolonization for MRSA is used, perform susceptibility testing for the decolonizing agent against the target organism or the MDRO strain epidemiologically implicated in transmission. Monitor susceptibility to detect emergence of resistance to the decolonizing agent. Consult with microbiologists for appropriate testing for mupirocin resistance, since standards have not been established.</p> <p>Do not use topical mupirocin routinely for MRSA decolonization of patients as a component of MRSA control programs in any healthcare setting. (<i>IB</i>)</p> <p>Limit decolonization to HCP found to be colonized with MRSA who have been epidemiologically implicated in ongoing transmission of MRSA to patients. (<i>IB</i>)</p> <p>No recommendation can be made for decolonization of patients who carry VRE or MDRGNB.</p>

Note: Two-Tiered Approach to MDRO Control adapted from Siegel JD, Rhinehart E, Jackson M, Chiarello L, and the Healthcare Infection Control Practices Advisory Committee. Management of Multidrug-Resistant Organisms in Healthcare Settings, HICPAC Advisory Committee. October 2006.

Appendix B: Two-Tiered Approach to CDI Control

Tier 1. General Recommendations for Routine Prevention and Control of CDI in Healthcare Settings						
Administrative Measures/ Adherence Monitoring	<i>C. difficile</i> Education	Antimicrobial Stewardship	Surveillance	Infection Control Precautions	Environmental Measures	Decolonization
<p>Implement a laboratory-based alert system to provide immediate notification to infection control professional (ICP) and clinical personnel about newly diagnosed CDI patients (24).</p> <p>Establish a system to monitor testing for <i>C. difficile</i> or its toxins on diarrheal (unformed) stool, unless ileus is suspected. (B-II)</p> <p>Measure compliance with CDC or World Health Organization (WHO) hand hygiene and Contact Precaution recommendations (24).</p> <p>Receive and review reports of process and outcome measures (senior hospital leadership, nursing leadership, clinicians who care for patients at risk for CDI).</p> <p>Process Compliance with hand hygiene guidelines.</p> <p>Compliance with Contact Precautions.</p> <p>Compliance with environmental cleaning and disinfection.</p> <p>Outcome Ongoing incidence density of CDI to permit longitudinal assessment of the processes of care [minimum: review healthcare-onset and healthcare-associated rates].</p>	<p>Educate HCP, environmental service personnel, and hospital administration about CDI (24).</p> <p>Educate patients and their families about CDI as appropriate (24).</p>	<p>Encourage appropriate use of antimicrobials (24).</p> <p>Non-CDI Treatment Antimicrobials: This includes both avoiding antimicrobial exposures if the patient does not have a condition for which antimicrobials are indicated (asymptomatic bacteriuria in a non-pregnant patient) and selecting antimicrobials associated with a lower risk of CDI when possible.</p> <p>CDI Treatment Antimicrobials: Assure that patients with CDI are receiving appropriate severity-based treatment for their infection may also improve clinical outcome of CDI in these patients. Monitor for cessation of other antimicrobials when treating CDI.</p>	<p>Conduct CDI surveillance and analyze and report CDI data (24).</p> <p>At a minimum, calculate healthcare-onset and healthcare associated CDI rates at the unit/ward and/or organizational levels to detect outbreaks and monitor patient safety (24, 65)</p>	<p>Use Contact Precautions for infected patients, single-patient room preferred.</p> <p>Place patients with CDI on Contact Precautions to help reduce person-to-person spread of the organism.</p> <p>Ensure appropriate hand hygiene is performed</p> <p>Patient placement: Cohorting of patients is acceptable when private rooms are not available. Consider: Place patients with stool incontinence preferentially in private rooms. Do not cohort patients who are discordant with other epidemiologically significant organisms (e.g., VRE, MRSA). Remove gowns and gloves when moving from one patient to the other.</p> <p>Discontinue contact precautions for duration of illness with CDI (i.e. when diarrhea ceases and patient's normal bowel status has returned). There is no need to obtain negative cultures to discontinue precautions.</p>	<p>Ensure cleaning and disinfection of equipment and the environment (24).</p> <p>Routine environmental screening for <i>C. difficile</i> is not recommended (65).</p> <p>Identify and remove environmental sources of <i>C. difficile</i> including replacement of electronic rectal thermometers with disposables (65).</p> <p>Data are conflicting as to whether inactivation of spores is necessary to prevent <i>C. difficile</i> transmission, especially in an endemic setting. Consideration of bleach or other sporicidal should occur in a hyperendemic or outbreak situation along with other infection prevention practices.</p> <p>Routinely, assess the adequacy of cleaning and disinfection practices. Address these practices before changing products.</p> <p>Ensure patient care equipment and electronic equipment (e.g., computers) remain in patient rooms until they are cleaned/disinfected.</p> <p>Educate environmental service staff frequently regarding cleaning and disinfection to account for turnover, and utilize appropriate languages.</p> <p>Dedicate noncritical patient care items (e.g., blood-pressure cuffs, stethoscopes) to single patients diagnosed with <i>C. difficile</i>. When not possible, ensure adequate cleaning/disinfection between patient encounters. Follow manufacturer's instructions for disinfectant and contact time.</p>	<p>Currently there are no data to support detection or isolation of asymptomatic patients who are colonized.</p>

Tier 2. Recommendations for Intensified CDI Control Efforts

Institute one or more of the interventions described below when 1) incidence or prevalence of CDI are not decreasing despite the use of routine control measures; or 2) the *first* case or outbreak of CDI is identified within a healthcare facility or unit. *(1B)* Continue to monitor the incidence of CDI and, if rates do not decrease, implement additional interventions as needed to reduce CDI transmission.

Administrative Measures/ Adherence Monitoring	CDI Education	Judicious Antimicrobial Use	Surveillance	Infection Control Precautions to Prevent Transmission	Environmental Measures	Decolonization
<p>When CDI incidence remains higher than the institutions' goal, a CDI risk assessment should be performed. This assessment should include (but not limited to):</p> <p>Determining the location of new CDI cases within the affected area (e.g., same room or scattered); the adequacy of hand hygiene and contact precautions; and the adequacy of environment and equipment cleaning.</p> <p>Meet with leadership frontline workers to assess possible improvements for prevention.</p> <p>Review laboratory procedures to determine if testing methods or test performance has changed.</p>	<p>Educate HCP, environmental service personnel, and hospital administration about CDI (24).</p> <p>Educate patients and their families about CDI as appropriate (24).</p>	<p>Initiate an antimicrobial stewardship program.</p>	<p>Intensify the assessment of compliance with process measures including: Contact precautions, hand hygiene (compliance and technique) (24).</p> <p>Assess the adequacy of room cleaning/disinfecting (24).</p>	<p>During outbreaks or in settings with hyperendemic CDI, perform hand hygiene with soap and water as the preferred methods before exiting the room of a patient with CDI (24).</p> <p>Place patients with diarrhea under contact precautions while <i>C. difficile</i> testing is pending (24).</p> <p>Prolong the duration of contact precautions after the patient becomes asymptomatic until hospital discharge (24).</p>	<p>Facilities should consider using a 1:10 dilution of sodium hypochlorite (household bleach) or other product with the EPA-approved claim for <i>C. difficile</i> sporicidal activity to disinfect the environment in outbreak and hyperendemic settings in conjunction with other IC measures. The solution should have a contact time that meets the manufacturers' recommendations for <i>C. difficile</i> spores.</p>	<p>No recommendations for decolonization</p>

MDRO AND ANTIMICROBIAL RESISTANCE

RESOURCES AND MATERIALS

Background: The emergence of multidrug-resistant organisms (MDRO) and *Clostridium difficile* are increasingly recognized as major public health threats. MDRO are defined as bacteria that have become resistant to one or more classes of antimicrobial agents. *C. difficile* is a spore-forming, toxin-producing, gram-positive anaerobic bacterium. Although *C. difficile* infections (CDI) have little resistance, most are related to antibiotic use and have significant mortality and morbidity.



DRUG RESISTANCE

CDC Threat Report 2013

A snapshot of the burden and threats posed by MDRO.
<http://www.cdc.gov/drugresistance/threat-report-2013/>

Get Smart for Healthcare

A campaign focused on improving prescribing practices in healthcare facilities.
<http://www.cdc.gov/drugresistance/healthcare/>

MDRO AND SPECIFIC HEALTHCARE SETTINGS

Animals and MRSA in Hospital Healthcare Settings

*Guidance on the transmission, symptoms, and treatment of methicillin-resistant *Staphylococcus aureus* (MRSA).*
<http://www.cfsph.iastate.edu/Factsheets/pdfs/mrsa.pdf>

Compendium of Measures to Prevent Disease Associated with Animals in Public Settings

Standardized recommendations for public health officials.
<http://www.nasphv.org/Documents/AnimalContactCompendium2013.pdf>

Compendium of Strategies to Prevent Healthcare Associated Infections in Acute Care Hospitals

Science-based, practical recommendations for acute-care hospitals for prevention of common healthcare-associated infections (HAIs).
<http://www.shea-online.org/PriorityTopics/CompendiumofStrategiestoPreventHAIs.aspx>

Recommendations for Preventing Transmission of Infections among Chronic Hemodialysis Patients

Science-based, practical recommendations for prevention of HAIs in dialysis settings.
<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5005a1.htm>

Greater New York Hospital Collaborative/United Hospital Fund Antimicrobial Stewardship Toolkit

A basic framework for establishing an antimicrobial stewardship program at acute-care or long-term care facilities.
<http://www.uhfny.org/publications/880859>





HAND HYGIENE

Hand Hygiene in Healthcare Settings

A variety of resources including provider guidelines, patient empowerment materials, promotions, and educational tools.

<http://www.cdc.gov/handhygiene/>

High 5 for a Healthy NH Campaign

A multi-faceted strategy patient safety program geared towards engaging hospitals and ambulatory surgery centers.

<http://www.healthynh.com/index.php/high-5-for-a-healthy-nh.html>

Estimates for the total cost of
Multidrug Resistant Organisms
to the U.S. Economy are as high as
\$20 Billion Dollars
in direct hospital costs.

- CDC Threat Report 2013

WORKPLACE

Workplace Safety Infection Control

A fact sheet providing information about basic infection prevention techniques and equipment for the workplace.

http://www.betterhealth.vic.gov.au/bhcv2/bhcarticles.nsf/pages/Workplace_safety_-_infection_control

The National Institute for Occupational Safety and Health (NIOSH)

Providing research and recommendations to prevent worker injury and illness.

<http://www.cdc.gov/workplace/>

Advisory Committee on Dangerous Pathogens – Infection at work: Controlling Risks

A guide for employers and the self-employed on identifying, assessing, and controlling infection risks in the workplace.

<http://www.hse.gov.uk/pubns/infection.pdf>

Occupational Health and Safety Administration (OSHA) Multidrug-Resistant Organisms Resource

A fact sheet identifying the risk factors and possible solutions for MDRO.

<https://www.osha.gov/SLTC/etools/hospital/hazards/mro/mro.html>

MEDICAL TRANSPORT

Communication during Patient Transfer of Multidrug-Resistant Organisms

Webinar on the impact of MDRO and guidance on the sharing of MDRO status between facilities.

<http://public.health.oregon.gov/DiseasesConditions/CommunicableDisease/HAI/Prevention/Pages/Interfacility-Communication.aspx>

APIC Guide to Infection Prevention in Emergency Medical Services

Guide for maintaining the safety of EMS system responders and their patients while reducing exposure risks.

http://apic.org/Resource_/EliminationGuideForm/e1ac231d-9d35-4c42-9ca0-822c23437e18/File/EMS_Guide_web.pdf

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Multidrug-Resistant Organisms

What are Multidrug-resistant organisms (MDRO)?

Multidrug-resistant organisms (MDRO) are bacteria that have become resistant to certain antibiotics, and these antibiotics can no longer be used to control or kill the bacteria. MDRO are found mainly in hospitals and long-term care facilities but can also be found in the community.

What does it mean to be colonized?

Sometimes MDRO can be present on or in your body but not cause any symptoms of illness. This is called colonization. Colonization rarely becomes an infection.

What types of infections do MDRO cause?

MDRO can cause infections in almost any part of the body, including bloodstream, lungs, urinary tract, wounds, skin, and surgical sites.

Can you treat MDRO?

MDRO are difficult to treat because they do not respond to many common antibiotics. Healthcare providers need to determine the type of MDRO a patient is infected with in order to choose the correct antibiotic. Treatment with the wrong antibiotic or not taking antibiotics according to a provider's instructions can slow recovery and make the infection harder to cure.

Who is most likely to get a MDRO infection?

People in good health usually don't get MDRO infections. People who have other underlying condition(s), conditions requiring prolonged use of antibiotics, previous infection or colonization, invasive devices such as central lines or catheters, wounds, and the elderly are at a greater risk of acquiring a MDRO.

How do MDRO spread?

- Healthcare personnel hands
- From the environment (e.g., bed rails, tables, tubes)
- Direct contact with open wounds or lesions

What can I do to help prevent MDRO infection?

- Make sure that all healthcare personnel clean their hands before and after caring for you.
- Only take antibiotics as prescribed by your doctor.
- Be sure to clean your own hands often, especially after using the restroom and before eating.
- Clean surfaces in bathrooms, kitchens and other areas on a regular basis with household detergent/disinfectants.

What are some of the things that healthcare facilities are doing to prevent MDRO?

- Clean hands before and after caring for every patient.
- Clean hospital rooms and medical equipment that have been used for patients with MDRO.
- Use Transmission-based Precautions to prevent MDRO from spreading. This means:
 - Patients may have a single room or share a room with someone else who also has the same infection or isn't at risk for infection.
 - Healthcare personnel may put on protective equipment (i.e., gloves, gowns, masks).
 - Visitors may be asked to wear protective equipment.
- Monitor the spread of MDRO and educate caregivers on prevention.
- Use antibiotics appropriately and only when needed.

For specific concerns, call the New Hampshire Department of Health and Human Services, Bureau of Infectious Disease Control at 603-271-4496 or 1-800-852-3345 x4496. For further information, refer to the Centers for Disease Control and Prevention website at www.cdc.gov

Clostridium Difficile

What is *Clostridium difficile*?

Clostridium difficile is a spore-forming bacterium that causes severe diarrhea and may cause more serious intestinal conditions such as colitis.

What is the meaning of the term *C. difficile* diseases?

They are the diseases that result from *C. difficile* infections (CDI) such as colitis, more serious intestinal conditions, sepsis, and rarely death.

What are the symptoms of *C. difficile* disease?

- Watery diarrhea (at least three times a day for two or more days)
- Fever
- Loss of appetite
- Nausea
- Abdominal pain/tenderness

How is *C. difficile* treated?

C. difficile is generally treated for 10 days with antibiotics prescribed by a healthcare provider.

How do people get *C. difficile* infections (CDI)?

People in good health usually don't get CDI. People who have other illnesses or conditions requiring prolonged use of antibiotics and the elderly are at a greater risk of acquiring CDI.

The bacteria are found in feces. People can become infected if they touch items or surfaces that are contaminated and then touch their mouths or mucous membranes. Healthcare personnel can spread the

bacteria to other patients or contaminate surfaces through hand contact.

What can I do to help prevent *C. difficile* infections?

- Make sure that all healthcare personnel clean their hands before and after caring for you.
- Only take antibiotics as prescribed by your doctor.
- Be sure to clean your own hands often, especially after using the restroom and before eating.
- Clean surfaces in bathrooms, kitchens and other areas on a regular basis with household detergent/disinfectants.

What are some of the things that healthcare personnel are doing to prevent CDI?

- Clean their hands before and after caring for every patient.
- Clean hospital rooms and medical equipment that have been used for patients with CDI.
- Use contact precautions to prevent *C. difficile* from spreading to other patients. Contact precautions means:
 - Patients may have a single room or share a room only with someone else that also has *C. difficile* or is at low risk for infection.
 - Healthcare personnel will put on gloves and wear a gown over their clothing while taking care of patients with CDI.
 - Visitors may be asked to wear a gown and gloves.
 - Apply the 3 C's (clean, contained, cooperative) to guide patient management.

For specific concerns, call the New Hampshire Department of Health and Human Services, Bureau of Infectious Disease Control
603-271-4496 or 1-800-852-3345 x4496.

For further information, refer to the Centers for Disease Control and Prevention website at www.cdc.gov.