Guidelines for Prevention and Control of Infections Due to Antibiotic-Resistant Organisms

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I. Statement of Purpose

This document is an update of the Florida Department of Health *Guidelines for the Control of Antibiotic Resistant Organisms 2010.* While much of the information on the epidemiology of the organisms, control measures, contact precautions, and institution specific control measures mentioned in the previous version remain unchanged, many advances in the prevention and control of drug-resistant organisms have been made, largely in response to increasing antimicrobial resistance and reduction of the available options for treatment. However, much of the basic infection prevention and control practices were adopted from the Healthcare Infection Control Practices Advisory Committee (HICPAC) national guidelines, which have not been updated since the 2010 version of this guide.

These expanded guidelines include new information on prevention and infection control measures in the management of antibiotic-resistant organisms, including methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE), *Clostridium difficile,* and multidrug-resistant gram-negative organisms such as *Acinetobacter baumannii, Klebsiella pneumoniae,* and carbapenem-resistant Enterobacteriaceae (CRE). The 2010 version of this guide focused largely on differentiating between community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA) and health care-associated MRSA (HA-MRSA). Over the past few years with the high incidenceof MRSA, the clinical distinction between CA and HA-MRSA has been reevaluated and they are now collectively regarded as MRSA. However, it should be noted that health care facilities make a distinction between CA and HA-MRSA in their surveillance definitions. These surveillance definitions provide the basis for several of the definitions provided in the next section of this guidance document.

This update will also address new Centers for Disease Control and Prevention (CDC)-based initiatives for antibiotic stewardship and the clean hands campaign.

Since no single approach to the control of antibiotic-resistant organisms is appropriate for all health care facilities, these guidelines will review standard control measures appropriate for all settings and specific measures for many of the health care settings that frequently encounter these organisms.

This document is not a guide to the medical treatment of persons colonized or infected with MRSA, VRE, or other multidrug-resistant organisms (MDRO), which is the responsibility of the individual patient's health care team. These guidelines also do not encompass the whole body of knowledge on this subject. Several resources from the CDC and other professional infection control organizations are provided for review and supplemental information.

The audience for these guidelines include physicians and their office staff, schools, infection control practitioners, and others in the continuum of care involved in the control of antibiotic-resistant organisms in non-acute health care facilities, including county health departments (CHDs).

II. Definitions

Acinetobacter baumannii — A ubiquitous gram-negative species of bacteria which can colonize the skin, respiratory tract, and soft tissue of individuals and persist on environmental surfaces.

Active Surveillance Culture (ASC) — A culture sample collected from a patient for laboratory testing to determine if the patient is colonized with a multidrug-resistant organism or another pathogen of epidemiologic importance.

Carbapenem-Resistant Enterobacteriaceae (CRE) — Any *Escherichia coli*, *Klebsiella oxytoca*, *Klebsiella pneumoniae*, or *Enterobacter* spp. testing resistant to imipenem, meropenem, doripenem, or ertapenem by standard susceptibility testing methods or documented to produce carbapenemase.

Carrier — An individual who is persistently colonized at one or more body sites with a multidrug-resistant organism or other pathogen of epidemiologic importance.

***Clostridium difficile* Infection (CDI)** — Positive test for toxin-producing *C. difficile* on an unformed stool specimen (conforms to the shape of the container) and the patient has evidence of pseudomembranous colitis on gross anatomic (includes endoscopic exams) or histopathologic exam.

Cluster — For this document, a cluster is defined as an excess occurrence of disease in a time and place that lacks a documented cause.

Cohort — Two or more patients colonized or infected with the same antibiotic-resistant organisms, physically separated from other patients not known to be infected or colonized with an antibiotic-resistant organism.

Colonized — Any person who is culture-positive for an antibiotic-resistant organism but has no signs or symptoms of infection.

Contact Precautions — Contact precautions or the equivalent are used with specified patients known or suspected to be infected or colonized with epidemiologically important microorganisms that can be transmitted by direct contact with the patients or indirect contact with environmental surfaces or patient-care items in the patient environment. Contact precautions include proper patient placement and the use of personal protective and environmental measures as recommended by the Health Care Infection Control Practices Advisory Committee/Centers for Disease Control and Prevention (HICPAC/CDC) Isolation Guidelines. Health care workers should wear a gown and gloves while in the patient's room, remove the gown and gloves before leaving the room, and perform hand hygiene when entering and leaving the room (APIC, 2017).

Community-Associated Methicillin-Resistant *Staphylococcus aureus* (CA-MRSA) — A positive MRSA culture obtained as an outpatient or before hospital day 3 in a patient without documentation of a health care risk factor (not linked to inpatient medical care, e.g. in a hospital, nursing home, dialysis facility).

Decolonization Therapy — Topical and systemic antibiotic treatment administered to eliminate the carriage state in an individual. Typically associated with MRSA.

***Enterococcus* Species** *(E. faecium* and *E. faecalis)* — Ubiquitous gram-positive micro-organisms that commonly colonize the lower gastrointestinal tract of both men and women and the periurethra of women.

Extended-Spectrum Beta-Lactamases (ESBLs) — Bacteria including the multidrug-resistant gram-negative bacilli (MDR-GNB) that produce a beta-lactamase enzyme capable of hydrolyzing penicillins, the extended-spectrum cephalosporin and monobactam groups of antimicrobials allowing for increased resistance to these agents. (e.g., *Klebsiella spp. Escherichia coli, Pseudomonas aeruginosa, Enterobacter spp., Acinetobacter spp.)*

Health Care-Associated Infection (HAI) — Localized or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) that was not present on admission.

Health Care-Associated Community-Onset Methicillin-Resistant *Staphylococcus aureus* (HACO-MRSA) — As part of the surveillance definition, if the positive MRSA culture was obtained in an outpatient setting or before the fourth calendar day of hospitalization and had one or more of the following: 1) a history of hospitalization, surgery, dialysis, or residence in a long-term care facility in the previous year, or 2) the presence of a central vascular catheter (CVC) within 2 days prior to MRSA culture, the MRSA infection is considered HACO-MRSA (CDC, 2014).

Health Care-Associated Methicillin-Resistant *Staphylococcus aureus* (HA-MRSA) — The number of patients who are classified as either HO or HACO.

Hospital-Onset Methicillin-resistant *Staphylococcus aureus* (HO-MRSA) — The surveillance definition is a positive MRSA culture obtained on or after the fourth calendar day of hospitalization, where admission is hospital day 1.

Infection — The presence of an organism in the body, such as MRSA or VRE, causing disease (e.g., urinary tract infection, pneumonia, abscesses), characterized by the clinical manifestations of the disease, such as increased white blood cell count, fever, pus, or erythema.

***Klebsiella pneumoniae* Carbapenemase (KPC)** — A plasmid-mediated carbapenem-hydrolyzing beta-lactamase enzyme produced by certain strains of enteric bacilli (e.g., *Klebsiella spp. E. coli, Enterobacter spp.)* allowing for increased resistance to the carbapenem and cephamycin groups of antimicrobial agents, in addition to the extended-spectrum cephalosporins.

Methicillin-Resistant *Staphylococcus aureus* (MRSA) — Includes *S. aureus* cultured from any specimen that tests oxacillin-resistant, cefoxitin-resistant, or methicillin-resistant by standard susceptibility testing methods, or by a laboratory test that is FDA-approved for MRSA detection from isolated colonies; these methods may also include a positive result by any FDA-approved test for MRSA detection from specific sources.

Methicillin-Susceptible *Staphylococcus aureus* (MSSA) — *S. aureus* cultured from any specimen testing intermediate or susceptible to oxacillin, cefoxitin, or methicillin by standard susceptibility testing methods, or by a negative result from a test that is FDA-approved for MRSA detection from isolated colonies; these methods may also include a positive result from any FDA-approved test for MSSA from specific specimen sources.

Multidrug-Resistant Organism (MDRO) — Typically defined as microorganisms that are resistant to two or more classes of antimicrobial agents.

Outbreak — The Florida Department of Health, Division of Disease Control and Health Protection under Florida Administrative Code, Rule 64D-3.028, defines an outbreak as an increase in the number of cases of a disease or condition compared to the expected number in a particular period and geographical area. For diseases where the expected number is zero, a single case constitutes an outbreak. This definition may not be the working definition in a health care setting.

Personal Protective Equipment (PPE) — The Occupational Safety and Health Administration (OSHA) defines PPE as equipment worn to minimize exposure to hazards that cause serious workplace injuries and illnesses. PPE is to be used when administrative and engineering controls are insufficient to adequately protect the health care worker from splash/spray, airborne and contact contamination. These items may include gloves, gowns, masks, eye, and face protection, and other items such as respirators, which are used as protection for the health care worker while in contact with infective patients.

Standard Precautions — Basic infection control precautions designed for the care of all patients in health care settings, regardless of their diagnosis or presumed infection status. Standard Precautions protect both the health care provider from infection and the spread of infection from patient to patient from the health care worker. These include hand hygiene, use of gloves, gown, mask, eye protection or face shield, depending on the anticipated exposure; respiratory hygiene and cough etiquette, and safe injection practices. Also, equipment or items in the patient environment likely to have been contaminated with infectious body fluids must be handled in a manner to prevent transmission of infectious agents.

Staphylococcus aureus — A ubiquitous species of gram-positive bacteria found on the skin and in the anterior nares of most people.

Transmission-Based Precautions — Additional safeguards to be used with Standard Precautions for patients documented as or suspected to be infected/colonized with highly transmissible or epidemiologically important pathogens in order to interrupt transmission in a health care setting. These include airborne precautions, droplet precautions, and contact precautions.

Vancomycin-Intermediate/Glycopeptide-Intermediate *Staphylococcus aureus* (VISA/GISA) — A strain of *Staphylococcus aureus* that has reduced (intermediate) susceptibility to vancomycin (minimum inhibitory concentration [MIC] of 4 to 8 µg/ml, CLSI standard) or other glycopeptides.

Vancomycin-Resistant *Staphylococcus aureus* (VRSA) — A strain of *Staphylococcus aureus* with in-vitro resistance to vancomycin (minimum inhibitory concentration [MIC] ≥ 16 µg /ml, CLSI standard).

Vancomycin-Resistant *Enterococcus* (VRE) — *Enterococcus faecalis*, *Enterococcus faecium*, or *Enterococcus* species unspecified (only those not identified to the species level) that are resistant to vancomycin by standard susceptibility testing methods or by results from any FDA-approved test for VRE detection from specific specimen sources.

III. Introduction

Infectious diseases caused by MDROs are a major and costly public health problem. The Active Bacterial Core Surveillance (ABCs): Emerging Infections Program Network estimated that in 2014, MRSA was associated with approximately 72,444 life-threatening infections and 9,194 deaths in the U.S. (CDC, 2014).

MRSA infections have become less novel but still pose a serious threat to health and are a leading cause of health care-associated infections according to the CDC. Data indicate that other drug-resistant organisms such as carbapenem-resistant Enterobacteriaceae and *C. difficile* are organisms of urgent threat. In the CDC, Antibiotic Resistance Threats 2013 report, *C. difficile* was found to cause 250,000 infections per year and 14,000 deaths, in addition to $1 billion in excess medical costs per year (CDC, 2013). Other MDROs such as vancomycin-resistant *Enterococcus* (VRE) and *Acinetobacter baumannii* are also major contributors to infectious disease morbidity and mortality. MDROs contribute to longer hospital stays, prolonged periods of infectivity, greater opportunities for the spread of infection, and higher direct and indirect costs.

One published analysis of the economic burden of MDROs analyzed the cost difference between MRSA and MSSA infections. The results show a cost of $34,657 to care for patients with MRSA compared with $15,923 for patients with MSSA (Filice et al., 2010). Data from other MDRO studies also indicate that VRE, *C. difficile, A. baumannii,* and other drug-resistant organisms may contribute significantly to the health care burden (Cosgrove, CID 2006).

No single remedy exists for antibiotic resistance. A coordinated multidisciplinary approach is required to address the problem. Comprehensive use of general infection prevention and control practices and procedures is essential for the prevention of infections with drug-resistant organisms. Also, measures to limit or eliminate inappropriate antibiotic use at all levels of clinical care are essential for preventing drug resistance in hospitals, nursing homes, and outpatient settings. Infection or colonization with MRSA, VRE, CRE, *C. difficile,* and other MDROs may require additional transmission-based infection control measures.

Currently, MRSA, CRE, VRE, *C. difficile,* and multidrug-resistant gram-negative bacilli are the most important examples of antibiotic-resistant organisms, and they represent the larger problem of antibiotic resistance in general. Control of transmission requires the comprehensive practice of infection prevention and control procedures with specific considerations for the organism and patient-care setting. These guidelines outline recommendations to prevent the spread of these and other organisms in specific health care settings including acute care settings, long-term care (LTC) facilities, rehabilitation facilities, psychiatric facilities, hospice, home health care, outpatient clinics, correctional health care, transport service, and other settings in which people colonized or infected with drug-resistant organisms may be treated or encountered.

IV. Background

A. Methicillin-Resistant *Staphylococcus aureus* (MRSA)

Methicillin-resistant *S. aureus* is a variant of *S. aureus* which is resistant to all beta-lactam antibiotics (including penicillins, cephalosporins, and cephamycins). It may also be resistant to one or more other classes of antibiotics. By definition, MRSA must be resistant to one of the following semi-synthetic penicillins: methicillin, oxacillin, or nafcillin. Treatment of MRSA infections should be based on the susceptibility results from the patient culture.

MRSA strains have been identified as a major source of health care-associated infections and outbreaks in the U.S. and Florida. For over four decades, MRSA has presented a challenge for infection control departments of hospitals attempting to control and eradicate this organism. In recent years, long-term acute-care hospitals, long-term care facilities, rehabilitation centers, and small community hospitals have seen increasing numbers of cases. These facilities experience continuous reintroduction of resistant organisms due to the recurrent admissions and transfers of patients within these settings.

In the 2010 update of this guide, CA-MRSA was on the rise in individuals without health care-associated risk factors. The Active Bacterial Core Surveillance (ABCS): Emerging Infections Program Network estimates that approximately 16,522 cases annually are caused by strains of CA-MRSA (CDC, 2014). It should be noted that the ABCS report uses surveillance definitions to differentiate between CA and HA-MRSA.

Through the years, CA-MRSA strains have made their way into health care settings causing infections (Chen, 2013) and making it clinically difficult to differentiate between CA and HA-MRSA. For this reason, genetic testing and definitions are important for determining a true distinction (Mediavilla, 2012).

1. Health Care-Associated MRSA (HA-MRSA) ─ Infection and colonization are typically seen in older individuals with one or more of the risk factors outlined in Section VI. Resistance to multiple classes of antimicrobial agents is common.

2. Community-Associated MRSA (CA-MRSA) ─ Community-associated MRSA cases were frequently seen in younger persons and involved skin and soft tissue infections. However, as mentioned previously, clinical differentiation has become difficult as CA strains have made their way into health care settings. Per the CDC Infection Control guidelines, clinical manifestations of CA-MRSA can be similar to or potentially more severe than traditional health care-associated MRSA infections among hospitalized patients (https://www.cdc.gov/infectioncontrol/guidelines/mdro/epidemiology.html). The most common CA-MRSA strain in the United States (USA300) has become common in health care settings. The USA300 strain is routinely resistant to erythromycin. Many CA-MRSA infections may be effectively treated with good wound care with or without oral antibiotics, while more resistant strains may require intravenous vancomycin. HA-MRSA has also been demonstrated in community populations. Since distinction requires laboratory testing, the two variants are most often characterized by their operational definitions, as found in Section II, based on the surveillance epidemiologic criteria for the infection.

B. Vancomycin-Resistant Enterococci (VRE)

Enterococcus species are known to be naturally resistant to several antibiotics; over the last three decades, resistance to vancomycin has increased. According to the National Healthcare Safety Network (NHSN), in 2006-2007, approximately 33% of all enterococci were resistant to vancomycin (Hidron et al., 2008). Additionally, a recent analysis of NHSN data from 2014 reports that if all *Enterococcus* species were analyzed within their genus group, they would be considered the second-most common group of pathogens across all HAI types, and the single-most common group of pathogens among central line-associated bloodstream infections (CLABSI) (Weiner et al., 2016).

The increase in resistant enterococci species prevalence poses several problems in health care settings, including the lack of available antimicrobials for therapy, since most VRE are also resistant to multiple other drugs (e.g., aminoglycosides and ampicillin) previously used for the treatment of infections due to these organisms. Many VRE are resistant to all presently available antibiotics. Several case-control and historical cohort studies show that the risk of death associated with antibiotic-resistant enterococcal bacteremia is several times higher than the risk of death associated with susceptible enterococcal bacteremia.

Also, evidence suggests the vancomycin-resistant gene (VAN A gene) present in VRE may be transmitted to gram-positive organisms, such as *S. aureus.* Though VRE is neither more infectious nor more virulent than vancomycin susceptible enterococci, it poses a greater challenge because treatment options are limited to combinations of antimicrobials or experimental compounds with unproven efficacy.

C. *Clostridium difficile*

Clostridium difficile is the most common cause of infectious health care-associated diarrhea in the United States. *Clostridium difficile* infections (CDI) have risen in hospitals across the U.S. and Canada, including Florida. As of 2014, 191 hospitals in Florida reported laboratory-identified hospital-onset CDI to NHSN. The observed-to-expected ratio of CDI cases as reported to the Centers for Medicare and Medicaid Services (CMS) in 2014 was 0.88, whereas in 2015 the ratio was 0.95.

One reason for the increase in North America may be attributable to an epidemic strain of *C. difficile* described. This epidemic strain produces a greater volume of toxin than previously known strains, and is the probable cause of more severe disease. In 2005, this strain was identified in Florida.

C. difficile is a spore-forming organism that can spread easily in the environment, as many of the common disinfectants used in health care settings will kill the vegetative organism but not the spores. The epidemic strain also appears to produce greater quantities of spores than non-epidemic strains, leading to greater environmental contamination. The change from non-chlorinated cleaning agents to chlorinated cleaning agents has been implemented in many health care facilities to eliminate the environmental spores and stop the spread of the disease. Also, alcohol-based hand hygiene products are less effective than soap and water for eliminating spores from the hands.

D. Multidrug-Resistant Gram-Negative Bacilli (MDR-GNB)

Gram-negative bacilli have been a source of health care-associated infections for many years and may be found in patients in virtually all health care settings as either infection or colonization. In recent years, multidrug-resistant gram-negative organisms have increased in nearly all health care settings. Though resistance to any class of antibiotic can occur, it occurs mainly in the extended spectrum beta-lactam antimicrobial agents. The ability of these organisms to produce extended spectrum beta-lactamase enzymes (ESBLs) makes them highly resistant to many of the extended spectrum beta-lactam agents such as the penicillins, cephalosporins, and monobactams. This group includes primarily *Klebsiella, E. coli, P. aeruginosa,* and other Enterobacteriaceae, though numerous other drug-resistant gram-negative bacterial strains have also been reported.

ESBL-producing gram-negative organisms and carbapenemase-producing Enterobacteriaceae are a group of emerging infectious pathogens that warrant inclusion in institutional infection control policies. The HICPAC/CDC MDRO 2006 Guidelines recommend contact precautions and tier 2 environmental measures, as well as intensified control efforts, when cases of MDR-GNB are identified. Two of the significant MDR-GNB include:

1. *Acinetobacter baumannii*

A*. baumannii* is a ubiquitous gram-negative bacillus found in soil, water, animals, and humans. In the clinical setting, individuals may be infected or colonized, and environmental surfaces may be contaminated by *A. baumannii,* where its ability to persist may contribute to transmission between patients and to long-term outbreaks.

In recent years, multidrug-resistant *A. baumannii* (MDRAb) has increased in prominence as a health care-associated pathogen. Primarily affecting hospital intensive care units (ICUs) and health care facilities housing very ill patients (CDC, 2010), *A. baumannii* is associated with longer hospitalizations, greater economic cost, and increased morbidity. Infection due to MDRAb can occur sporadically but is more commonly associated with outbreaks. MDRAb infections typically manifest as respiratory ventilator-associated pneumonia, urinary tract, and wound infections (including burn wounds). High rates of bacteremia have also been reported in military service members injured in the Middle East. MDRAb is an ESBL-producing gram-negative bacillius that routinely exhibits resistance to multiple classes or even all classes of antimicrobial drugs, leading to greater difficulty in treatment.

Primarily associated with acute-care and long-term acute-care facilities, it is now encountered in LTC facilities with increasing frequency. The epidemiology of MDRAb indicates that this is an emerging pathogen and all types of health care facilities should be knowledgeable of this pathogen and recommended control measures.

2. Carbapenem-Resistant Enterobacteriaceae (CRE)

In 2013, the CDC published a report outlining the top 18 drug-resistant threats in the United States. These threats were categorized based on the level of concern: urgent, serious, and concerning. The CDC identified CRE as an immediate public health threat which requires urgent and aggressive action. Untreatable and hard-to-treat infections from CRE are rising steadily in the United States. The CDC reports that up to half of all bloodstream infections caused by CRE result in death.

Klebsiella pneumoniae and other gram-negative bacilli have been increasing in clinical importance. While ESBL production among the gram-negative organisms has been an infection control issue for many years, more recently strains of enteric bacilli and other gram-negative organisms have demonstrated production of carbapenemases (beta-lactamase enzymes mediating resistance to the extended-spectrum cephalosporins and carbapenem antibiotics, e.g., imipenem, ertapenem, and meropenem).

In the U.S., a type of carbapenemase referred to as *Klebsiella pneumoniae* carbapenemase (KPC) has been detected in several species of enteric bacilli but is most commonly found in strains of *K. pneumoniae.* A KPC-producing strain of *K. pneumoniae* was first reported in North Carolina in 2001, and another was later discovered as part of an outbreak in New York that began in 2000. KPC-producing strains have also been reported sporadically from various parts of the U.S., particularly the east coast, including Florida.

In addition to the high level of resistance commonly found in the KPC-producing strains, the inability of most laboratories to detect or confirm the KPC enzyme through routine testing poses additional concern since KPC production may not be detected through standard susceptibility testing. Additional information about KPC or carbapenemase-producing organisms can be found on the Florida Department of Health website at http://www.floridahealth.gov/diseases-and-conditions/carbapenem-resistant-enterobacteriaceae/index.html. The CDC Guidance for Control of Carbapenem-Resistant Enterobacteriaceae toolkit can be found at https://www.cdc.gov/hai/pdfs/cre/cre-guidance-508.pdf.

V. Colonization vs. Infection

A. Colonization

Colonization is the presence of microorganisms on skin, on mucous membranes, in open wounds, or in excretions or secretions but without adverse clinical signs or symptoms.

1. *C. difficile*

Commonly found in the gastrointestinal tract, this organism, including drug-resistant and epidemic strains, can asymptomatically colonize the bowel of

individuals. Though no symptoms may be evident, the colonized patient may test positive for the organism or its toxin(s). Colonized patients receiving antimicrobial therapy may be especially susceptible to developing CDI. There are more asymptomatic carriers than CDI patients.

2. Enterococci

Normally found in the bowel, the female genital tract, and the mouth. Strains resistant to vancomycin (VRE) may survive antibiotic treatment and multiply, resulting in a colonization of the bowel.

3. Methicillin-Resistant *Staphylococcus aureus* (MRSA)

Colonization may occur in the nares, axillae, chronic wounds or decubitus ulcer surface, perineum, around gastrostomy and tracheostomy sites, in the sputum or urine, and on healthy skin. One of the most common sites of colonization in both patients and employees is the nose (anterior nares). While health care workers may become colonized with MRSA (as they may with susceptible S. aureus), they rarely develop infections.

4. Multidrug-Resistant Gram-Negative Bacilli (MDR-GNB)

Colonization may occur on the skin (healthy skin and wounds) and the respiratory tract of both health care workers and patients. Colonization may also occur in the bowel where these organisms may be present as normal intestinal flora. As with other MDROs, infection of health care workers is rare.

a. *A. baumannii* -Colonization may occur in multiple areas of the skin including the axillae and groin, as well as the respiratory tract of both patients and healthy individuals. Patients may also be colonized in wounds and occasionally the bowel. Colonization is particularly heavy during outbreaks.

b. *K. pneumoniae* and Other Enterobacteriaceae -May colonize wounds, healthy skin, the bowel, and the respiratory tract of patients and health care workers.

B. Infection

Infection refers to the invasion of bacteria into tissue with replication of the organism. Infection is characterized by isolation of the organism accompanied by clinical signs of illness such as fever, elevated white blood count, purulence (pus), and clinical expression of diseases such as pneumonia, bloodstream infections, urinary tract infections, gastrointestinal infections, and skin infections.

VI. Epidemiology

A. Health Care-Associated Methicillin-Resistant *Staphylococcus aureus* (HA-MRSA)

1. Mode of Transmission — MRSA is transmitted person-to-person primarily by direct contact with an individual who either has a purulent site of infection, a clinical infection of the respiratory, gastro-intestinal, or urinary tract or is colonized with the organism. Hands of personnel appear to be a common mode

of transmission for MRSA. Studies have demonstrated that MRSA can be present on the hands of personnel after performing such activities as wound debridement, dressing changes, tracheal suctioning, and catheter care.

2. Reservoirs ─ Colonized and infected patients are the major reservoirs of MRSA. MRSA has been isolated from environmental surfaces including floors, sinks, work areas, tourniquets used for blood drawing, and blood pressure cuffs. Although MRSA has been isolated from such surfaces, these are not the most likely source of spread. However, environmental surfaces should be disinfected routinely to reduce the bacterial load. Studies of LTC facilities indicate that colonized residents may serve as reservoirs of MRSA for acute care hospitals, just as patients from acute-care hospitals may continually reintroduce MRSA to an LTC facility.

3. Risk Factors – The risk factors associated with HA-MRSA infections are:

   a. Increased length of hospital stay

   b. Multiple hospitalizations

   c. Greater than 65 years of age

   d. Multiple invasive procedures (IV, tracheotomy, gastrostomy, Foley catheters)

   e. Wounds (non-intact skin, especially pressure ulcers)

   f. Severe underlying disease (immune suppression)

   g. Administration of broad-spectrum antibiotics

   h. Undergoing hemodialysis

   i. IV drug use

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B. Community-Associated Methicillin-Resistant *Staphylococcus aureus* (CA-MRSA)

1. Mode of Transmission — CA-MRSA is transmitted primarily by direct or indirect contact with a person who has a purulent site of infection. Individuals may become infected or colonized, even transiently, from contact with soiled items, skin-to-skin contact, and contaminated equipment.

2. Risk Factors ─ The risk factors associated with CA-MRSA infections include:

   a. Younger age

   b. Participating in contact sports

   c. Sharing towels or athletic equipment

d. Having a weakened immune system

e. Living in crowded or unsanitary conditions

f. Association with health care workers

g. IV drug use

h. Men having sex with men

C. Vancomycin-Resistant Enterococci

1. Mode of Transmission – Enterococci, including VRE, can spread patient-to-patient by direct contact via transient carriage on the hands of personnel or indirectly on contaminated environmental surfaces and patient care equipment.

2. Reservoirs of VRE ─ Enterococci are part of the normal flora of the gastrointestinal tract and female reproductive tract. Most infections with these microorganisms have been attributed to the patient's endogenous flora. However, VRE may be spread by health care workers through either inadequate hand hygiene or contact with items such as bed rails, sinks, faucets, doorknobs, and a variety of patient-care equipment such as stethoscopes and EKG cables. Enterococci can persist for weeks on environmental surfaces; thus, environmental surfaces may serve as potential reservoirs for health care-associated transmission of VRE and need to be considered when formulating institutional infection control policies. Studies of LTC facilities indicate that colonized residents may serve as reservoirs of VRE for acute care hospitals, just as patients from acute-care hospitals may continually reintroduce VRE to LTC facilities.

3. Risk Factors — The epidemiology of VRE has not been completely described. However, certain patient populations have been found to be at increased risk for VRE infection or colonization. These include patients who:

   a. Are critically ill

   b. Have severe underlying disease or immune suppression (such as ICU patients or patients in oncology or transplant wards)

   c. Have renal insufficiency

   d. Are undergoing hemodialysis

   e. Have had an intra-abdominal or cardio-thoracic surgical procedure

   f. Receive enteral tube feedings

   g. Have an indwelling urinary or central venous catheter

   h. Have had a prolonged hospital stay

i. Are undergoing broad-spectrum antimicrobial therapy

j. Have received administration of oral and, to a lesser extent, intravenous (IV) vancomycin

k. Use rectal thermometers

D. *Clostridium difficile*

1. Mode of Transmission — Infection or colonization usually occurs through the fecal/oral route in which the spores are carried patient-to-patient on the hands of health care workers who become contaminated following contact with an infected individual. Indirect transmission may also occur via contact with contaminated environmental surfaces and patient-care equipment that has not been properly disinfected. Contaminated surfaces may include bed rails, door handles, patient-care items such as rectal thermometers, or any surface which may become contaminated with feces.

2. Reservoirs — Infected individuals are the major reservoir for C. difficile. Fecal matter from patients incontinent of stool and incomplete or ineffective cleaning and decontamination may lead to heavy environmental contamination. Environmental contamination may also serve as a major reservoir since the spores resist many common disinfectants, as well as drying, and may persist for long periods on solid surfaces.

3. Risk Factors — Risk factors may vary according to the patient population. However, the major factors for CDI and colonization are:

   a. Recent or ongoing antimicrobial therapy. In certain circumstances, the onset of infection may occur after as little as one dose.

   b. Staying in a health care facility

   c. Procedures that involve the gastrointestinal tract

   d. Serious underlying illness

   e. Advanced age

   f. Administration of certain chemotherapeutic agents

   g. Use of rectal thermometers

E. Multidrug-Resistant Gram-Negative Bacilli (MDR-GNB)

1. Mode of Transmission — As with other MDROs, the primary mode of transmission is patient-to-patient via hand carriage from contaminated health care workers. Indirect transmission may also occur from contact with contaminated environmental surfaces and equipment.

2. Reservoirs — Infected and colonized individuals serve as the main reservoirs for multidrug-resistant gram-negative organisms. Colonization can be widespread as many of these organisms can be part of the normal intestinal flora of patients and healthy individuals alike. Studies indicate that contaminated environmental surfaces and equipment may also be significant reservoirs, particularly of *A. baumannii*, which has demonstrated an ability to persist for weeks and remain viable after drying. Shared treatment areas and equipment such as hydrotherapy rooms, endoscopy suites, and mechanical ventilation equipment are a major concern.

3. Risk Factors — Similar to those of other MDROs and may include:

    a. Prolonged hospital stays

    b. Exposure to invasive medical procedures

    c. Indwelling medical devices (catheters)

    d. Broad-spectrum antibiotic use

    e. Severe underlying illness

    f. Mechanical ventilation (*A. baumannii*)

F. Carbapenem-Resistant Enterobacteriaceae

1. Modes of Transmission — In health care settings, CRE are usually transmitted from person to person via the hands of health care personnel or contaminated medical equipment. As Enterobacteriaceae can commonly be found in stool or wounds, contact with these might be particularly concerning. Ensuring the use of personal protective equipment during patient contact and good hand hygiene following exposure to the patient's immediate environment, especially when cleaning up stools or changing wound dressings, is very important. The role of transmission directly from the environment to patients is controversial and requires further investigation.

2. Reservoirs — Infected and colonized individuals serve as the main reservoirs for multidrug-resistant gram-negative organisms. Colonization can be widespread as many of these organisms can be part of the normal intestinal flora of patients and healthy individuals alike. Studies indicate that contaminated environmental surfaces and equipment may also be significant reservoirs.

3. Risk Factors

    a. Exposure to health care settings

    b. Exposure to antimicrobials

    c. Poor functional status

d. Exposure to an intensive care unit

e. Mechanical ventilation

f. Indwelling urinary or intravenous catheters

g. Compromised immune system

VII. Control Measures

A. General Control Measures

1. Infection Control Plan

Every facility should develop a comprehensive, institution-specific strategic plan to detect, prevent, and control infection and colonization with multiple-antibiotic-resistant organisms. The plan should include controls to minimize prescribing of unnecessary antibiotics for patients, including, but not limited to, vancomycin. Methods to ensure the prudent use of vancomycin for appropriate indications should be in place and strictly enforced.

2. Hand Hygiene

It has been over 150 years since the landmark publications of Ignaz Semmelweis and Oliver Wendell Holmes that established hand washing as the basis of infection control. In 2002, the CDC published the Guideline for Hand Hygiene in Health Care Settings, Recommendations of the Health Care Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. These guidelines provide specific recommendations to promote improved hand-hygiene practices and reduce transmission of pathogenic microorganisms to both patients and personnel in health care settings. **Health care workers should be required to perform hand hygiene (hand washing for approximately 15 to 20 seconds) or use an alcohol-based cleanser before leaving a patient room whether or not gloves were worn.** It is extremely important to make sure all areas of hands get cleaned.

The indications for hand hygiene are specified in the CDC guidelines and include various antimicrobial hand-hygiene products, including waterless, alcohol-based antiseptic agents. Though alcohol-based hand rubs have been shown to be effective in reducing hand transmission of infectious organisms, these agents are not intended to replace frequent hand washing. Facilities should communicate to their staff the importance of hand hygiene, including hand washing, particularly when treating suspected or confirmed cases of CDI, since the spores of this bacterium are not effectively deactivated by alcohol-based hand sanitizers. The surfactant properties of soap and the friction of active scrubbing and rinsing are a more effective method of removing the spores of *C. difficile* from the hands.

Recently the CDC has launched the Clean Hands Count Campaign. The objectives of the campaign are to: improve health care provider adherence to CDC hand hygiene recommendations, address myths and misperceptions about hand hygiene, and empower patients to play a role in their care by asking or reminding health care providers to clean their hands. More information can be found at https://www.cdc.gov/handhygiene/campaign/index.html.

3. Communications to Maintain Appropriate Patient-Based Infection Control Precautions Between and Within Facilities

a. A facility (e.g., acute care, long-term acute care, and long-term care facilities) transferring a patient is responsible for informing the receiving facility and the transport team of the patient's colonization/infection history and status prior to treatment or transfer.

b. A receiving facility that finds a patient admitted from another institution is infected or colonized with an MDRO within 48 hours of admission should inform the transferring institution as soon as possible.

c. Health care workers who may have direct contact with patients on transmission-based precautions must be made aware of appropriate control measures (e.g., protective garments/barriers) prior to room entry. Traditionally, this has been accomplished by placing instructional cards on the patient's door and a label on the patient care record.

d. If transmission-based precautions are used for patients colonized/infected with an MDRO, identifying such patients at the time of readmission to the facility makes it possible for the admissions department and nursing personnel to implement appropriate infection control precautions promptly. This measure requires some indication in the patient's medical record and computer files, which are accessed at the time of admission. Use of a system that maintains patient confidentiality is essential.

4. Standard Precautions

Standard Precautions should be practiced for contact with every patient. The term Standard Precautions is defined in the publication Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Health Care Settings 2007. Though Standard Precautions incorporate features of "universal precautions," these two infection-prevention standards are not equivalent and should not be considered interchangeable. Refer to current guidelines for Standard Precautions in Appendix A.

5. Contact Precautions

Contact precautions are not routinely considered a general infection-control measure; however, there are circumstances in which contact precautions should be part of the standard of care for individuals with MDROs. These would include cases infected with MRSA, VRE, C. difficile, CRE, or infection with other drug-resistant

organisms in which the individual may be considered a high risk for transmission. For further guidelines on contact precautions, refer to Appendix B.

6. Education

a. Health Care Workers — Continuing education programs for employees who have direct patient contact or who are responsible for decision making regarding patient care should include a thorough review of basic infection control and the information presented in this guideline.

b. Patient Education — Patient education is essential to control the transmission of infections. It should be emphasized that hands should be washed after contact with secretions or excretions and before touching other objects; for example, immediately after coughing. Patients should not share drinks or food. Personal items such as games, books, or computers should be cleaned with an EPA-approved disinfectant (used as directed) before sharing with another patient. Patients on isolation precautions and their families need additional education, including the reason for isolation, control measures, and expectations during the isolation period. Handouts such as the Patient Information Sheet provided by the CDC may assist in educating the colonized/infected patient and family.

7. Visitors

Visitors should be instructed that items should not be shared with patients unless they can be appropriately cleaned. When visiting patients on contact precautions, visitors should be instructed regarding control measures with special emphasis on hand hygiene. For additional visitor education materials go to the Association of Practitioners of Infection Control and Epidemiology (APIC) Visitor Information: http://consumers.site.apic.org/infection-prevention-basics/how-to-be-a-good-visitor/.

8. Surveillance

Culture and susceptibility data should be reviewed routinely to detect MRSA, VRE, CRE, and other MDROs, and a line listing of cases (infection or colonization) should be maintained. It should be recorded whether cases are health care-associated, community-associated, or relocated from another facility. This information may be used to establish a baseline or endemic rate for the facility. If continual cross-transmission occurs or an outbreak is recognized, additional surveillance and control techniques may be appropriate. An outbreak is defined as an excess number of cases over the expected (usual) level of a disease within a geographic area (e.g., hospital, long-term care facility).

Active surveillance culturing (ASC) is the culturing of patients usually at the time of admission to determine MRSA status. This surveillance is a controversial method with divergent conclusions among HICPAC, APIC, and the Society for Health Care Epidemiology of America (SHEA) concerning its use. Both the APIC and SHEA guidelines recommend ASC as a standard control measure for MRSA, while the HICPAC/CDC MDRO Guidelines 2006 recommend ASC only as the second tier,

intensified intervention implemented when well-monitored general control measures have proven insufficient. Studies have not definitively determined the effectiveness of ASC, though it has garnered much attention in the area of health care politics with some states mandating ASC as a routine hospital control measure for MRSA. ASC may be thoughtfully considered as an intensified intervention when other control measures have been demonstrated as inadequate, but it is not at this time a recommended general control measure for health care institutions in Florida.

9. Environmental Measures

Studies have implicated environmental reservoirs as sources of MDRO infection and colonization. Policies for cleaning and disinfection of the patient environment should be established as outlined in Standard Precautions (Appendix A). These policies should include attention to training and competency of environmental and housekeeping staff as well as a review of cleaning and disinfection products used.

Disinfectants used should be EPA-registered products that show proven efficacy against the target organisms. A list of EPA-registered products active against MRSA, VRE, and other MDROs can be found in EPA's Registered Disinfectants at https://www.epa.gov/pesticide-registration/selected-epa-registered-disinfectants. These products should be used according to the manufacturer's directions.

Facilities in which CDI may be likely should also be aware that many common disinfectants are non-sporicidal and not effective at deactivating the spores of *C. difficile*. Current CDC recommendations include meticulous cleaning of the patient environment such as surfaces (floors, bed rails, toilets), and patient care items (rectal thermometers, other equipment) that may become contaminated with feces. A thorough cleaning should be followed by disinfection with a 10% hypochlorite solution (bleach), by the CDC's, Guidelines for Environmental Infection Control in Healthcare Facilities, 2003. Fresh hypochlorite solution should be mixed daily, or a commercially available product should be used, and need only be used in the rooms of known or suspected CDI patients.

In a situation such as frequent or recurrent outbreaks, it may be appropriate or necessary to monitor personnel for adherence to housekeeping policies. The use of cleaning checklists for personnel or even direct observation may be necessary to document compliance. Routine environmental culturing (bacterial culturing of swabbed surfaces) for contamination is not recommended for any MDROs.

Dedication of noncritical patient-care equipment to individuals or cohorting patients with the same pathogen may also be useful in preventing the spread of the organism. Institutions considering these measures need to determine if they possess adequate resources (equipment and staff) to implement these measures without compromising standard medical care for their patient population. If not, meticulous cleaning and disinfection of equipment between uses are critical in preventing transmission.

10. Administrative Support

Administrative support should be included as a control measure in any

multifaceted infection control program. Interventions that require fiscal or human resources such as the addition of alcohol rub stations, availability of appropriate PPE (gloves, gowns, masks) or additional staffing must have institutional leadership support. As data indicate an increasing financial burden associated with MDRO infection, institutional leadership becomes an important stakeholder in the infection control program.

11. Antimicrobial Stewardship

The overuse or misuse of antimicrobial agents is one of the major factors in the development of drug resistance in organisms, as well as colonization and infection by drug-resistant organisms. Colonization or infection by a drug-resistant organism may occur when an individual's normal flora (e.g., respiratory, gastrointestinal) is reduced by antibiotic therapy, allowing a drug-resistant strain to flourish. Antimicrobial drugs, therefore, must be used appropriately to treat diagnosed infections and not for colonization or contamination. Facilities should obtain previous culture reports on transferred patients and know what drug-resistant organisms are endemic in their patient population. **Chronic or long-term prophylaxis should be avoided, and the use of broad-spectrum antibiotics and vancomycin limited, whenever possible**. Therapy regimens should be based on the antibiogram when available and empiric therapy should be followed up by culture and susceptibility testing so that treatment may be adjusted accordingly, and therapy stopped when the infection has resolved. The facility consulting pharmacist or pharmacy service may be consulted for assistance in establishing these measures. The CDC's "Get Smart About Antibiotics" includes several resources and tools for the use and control of antimicrobials.

Get Smart Campaign ─ The CDC has a new program, Get Smart for Health Care, to foster collaboration within facilities and is “focused on improving antibiotic use in inpatient health care settings such as acute-care facilities through the implementation of antibiotic stewardship programs designed to ensure that hospitalized patients receive the right antibiotic, at the right dose, at the right time, and for the right duration.” This plan is outlined in Appendix D and explained in detail on the CDC website at https://www.cdc.gov/getsmart/healthcare/.

VIII. Decolonization Therapy

Decolonization therapy is the use of antibiotics to treat MRSA-colonized patients to reduce the magnitude of the colonization or eliminate the reservoir. **Routine decolonization for MRSA is not recommended** but may be considered under certain circumstances, such as when a patient is determined to benefit clinically from the regimen or when a MRSA transmission problem has been identified in a specific patient group or cohort.

Medical expertise in infectious diseases should be sought before decolonization therapy is undertaken. Individuals should be cultured and susceptibilities performed to determine positive colonization and efficacy of antibiotic agents considered for use before therapy begins. During the intervention, monitoring is necessary to determine the transmission rate of MRSA in the treatment group and any developing resistance to mupirocin. A successful intervention will eliminate transmission and avoid development of mupirocin resistance.

However, since mupirocin lacks clinical standards for in-vitro testing and interpretation, the development of resistance is difficult to monitor and may be recognized only by the clinical failure of the therapy.

Decolonization therapy should be discontinued when transmission rates decrease significantly, therapy failures increase, or mupirocin resistance develops. Repeat or continuous decolonization therapy should be avoided as decolonization failures tend to increase over time. There are no studies that indicate long-term decolonization is effective.

A. Patients

HA-MRSA – The need for decolonization should be based on the patient's medical condition and expected outcome. For example, recent studies indicate there may be a benefit for decolonization of certain patients undergoing surgical procedures such as cardiovascular, joint replacement, or neurosurgical procedures. Typical decolonization regimens are outlined in the APIC MRSA Guidelines 2007. These include topical mupirocin for nasal decolonization and oral or systemic antibiotics, including rifampin with trimethoprim-sulfamethoxazole, rifampin with doxycycline, rifampin with minocycline, or ciprofloxacin. Rifampin should not be used as monotherapy for decolonization or treatment of infection. Skin asepsis, including antimicrobial baths or showers, may also be added as an additional measure. Mupirocin should not be used alone, as many colonized individuals harbor MRSA in multiple body sites. Nasal decolonization alone will not lead to successful elimination. Vancomycin is not indicated for decolonization therapy, as it is ineffective for this purpose. Routine decolonization of patients transferred to long-term care facilities is not recommended.

1. **CA-MRSA – Decolonization therapy for CA-MRSA is not a recommended control measure** for either individuals or outbreaks. Circumstances in which it may be considered include recurrent infection in an individual by the same MRSA strain or as an intensive intervention in a closed setting where closely monitored general control measures have not decreased transmission.

2. **VRE** – Decolonization is not recommended, as there is no clinically proven decolonization regimen for these organisms.

3. ***C. difficile*** – Once a case of CDI has resolved, the patient may remain colonized and continue to test positive for *C. difficile* either by culture or by the enzyme-linked immunosorbent assay (EIA) *C. difficile* toxin A and B assay. Neither decolonization therapy nor testing for cure is appropriate for asymptomatic patients.

4. **Multidrug-Resistant Gram-Negative Bacilli** – There is no clinical evidence supporting decolonization therapy for MDR-GNB. It is, therefore, not recommended.

B. Health Care Workers

1. **MRSA** – Health care personnel should be cultured only if epidemiologic data implicate them (e.g., by geographic location or patient care team) as a possible source of dissemination of MRSA. Supervisors should be watchful for employees with visible signs of infection, and all health care workers should be encouraged to report symptoms of infection without fear of reprisal. Identified infected personnel with hand or other skin lesions should be evaluated by the employee health officer or other responsible authority

and referred for appropriate treatment. Infection control should be notified of the employee's status. The individual should be removed from patient contact duties until drainage has resolved and the individual has been cleared by the employee health officer or responsible authority to return to regular duties.

Decolonization should be considered only for those employees with persistent MRSA nasal carriage (e.g., chronic sinusitis), and only if the health care worker had contact with patients who were subsequently found to be positive for the same strain. Intranasal mupirocin appears to be the most effective agent for eradicating nasal carriage of MRSA, though prolonged therapy should be discouraged to prevent the development of mupirocin resistance.

Restriction from patient-care activities or food handling is indicated for personnel who have draining skin lesions that are infected with *S. aureus* until they have received appropriate therapy and the infection has resolved.

No work restrictions are necessary for personnel who are colonized with *S. aureus* unless they have been epidemiologically implicated in *S. aureus* transmission within the facility. Refer to section XI of this guide, "The Infected or Colonized Health Care Worker."

2. **VRE** – To date, carriers of enterococci have rarely been implicated in the transmission of this organism. Facilities with continued VRE cross-transmission should review adherence to standard and contact precautions. VRE decolonization of health care workers has not been demonstrated as an effective infection control measure.

3. **Other MDROs** – Regimens for decolonization have proven unsuccessful and are not recommended.

IX. Prevention

A. Institution-Specific Control Measures

The guidelines presented in this section cannot address all the infection control requirements of the various settings and types of facilities discussed. Type of institution, differences in patient population, the form of health care rendered, and numerous other factors may influence the type of drug-resistant organisms encountered as well as the risk of transmission and opportunities for control. Facilities should develop infection control plans including specific measures based on their unique circumstances and needs.

Recommendations are included for several settings other than acute care facilities to describe appropriate measures meeting specific needs and circumstances of other facility types.

Access to health care must not be denied or limited by MDRO status. It is inappropriate to deny admission or refuse service to any individual who may be infected or colonized with MRSA, VRE, *C. difficile, A. baumannii,* CRE, or any other drug-resistant organism. Policies to this effect are often based

on misinformation about the organisms and may be discriminatory to the patient. Facilities should take steps to learn a patient's MDRO status and must be prepared to implement appropriate infection control measures when necessary.

1. Acute-Care Facilities

Acute-care facilities should follow the CDC's Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Health Care Settings 2007 with consideration of what is possible, practical, and prudent.

For additional strategies regarding the control of MDROs including MRSA, CRE, and VRE, consult:

- Healthcare Infection Control Practices Advisory Committee (HICPAC) Management of Multidrug-Resistant Organisms in Healthcare Settings 2006
- SHEA Strategies to Prevent Methicillin-Resistant *Staphylococcus aureus* Transmission and Infection in Acute Care Hospitals: 2014 Update
- SHEA Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals: 2014 Update
- Guide to the Elimination of Methicillin-Resistant *Staphylococcus aureus* (MRSA) Transmission in Hospital Settings. Second Edition. 2010. Association for Professionals in Infection Control and Epidemiology. Currently available from APIC (www.apic.org)
- Guide to the Elimination of *Clostridium difficile* in Healthcare Settings. Association for Professionals in Infection Control and Epidemiology. Currently available from APIC (www.apic.org)
- Guidance for Control of Infections With Carbapenem-Resistant or Carbapenemase- Producing Enterobacteriaceae in Acute Care Facilities
- Facility Guidance for Control of Carbapenem-Resistant Enterobacteriaceae (CRE) Toolkit

2. Long-Term Care Facilities

1. **Admission to licensed facilities should not be denied for** infection or colonization with multidrug-resistant organisms. This includes MRSA, VRE, *C. difficile*, CRE, *A. baumannii* and other MDROs.

2. **Activities** ─ In general, residents colonized or infected with multidrug-resistant organisms may use common living areas, recreational areas, and dining facilities. Patients leaving their rooms for activities should have clean, dry dressings and wear clean clothes or a clean cover gown. All residents should perform hand hygiene immediately before leaving their rooms. If necessary, patients' hands should be cleansed for them if they are unable to perform this for themselves. Hands should also be cleansed whenever they may become contaminated. In addition to the above requirements, the VRE- or *C. difficile*-colonized or infected patient should be continent (stool and urine) or have bodily fluids well contained. These requirements may also be applied to residents in contact isolation. An individual's risk for transmission must be evaluated on a case-by-case basis and the resident allowed to socialize if the precautions can be met. Contact isolation is for the infection, not the individual.

3. **Precautions** – The implementation of contact precautions in addition to Standard Precautions should be based on the site and severity of the infection. Other factors to consider include the resident's mental status, reliability, personal hygiene, ability to contain wound drainage, and whether or not the patient who is colonized in the respiratory tract has a cough.

4. **Standard Precautions** (Appendix A) are indicated for:

    a. The patient who is nasally or superficially colonized with MRSA or other MDRO (e.g., identified from sputum culture, but without purulence). Patients with non-purulent cough may be kept under Standard Precautions; refer to Appendix A Section III.A.1.a. Respiratory Hygiene/Cough Etiquette.

    b. The VRE or *C. difficile* positive patient who is colonized in the gastrointestinal tract and continent of stool and capable of maintaining hygienic practices (e.g., hand hygiene).

5. **Contact Precautions** (Appendix B) are indicated for:

    a. Patients who have indwelling urinary catheter-associated MRSA, VRE, CRE, or other MDRO urinary tract infection or colonization. This can be based on facility protocol.

    b. Patients who have wounds or other body sites heavily colonized or infected with MRSA, VRE, CRE, or other MDRO.

    c. Patients who have tracheostomies with colonized or infected respiratory tracts and who are unable to handle secretions.

    d. All identified cases of an MDRO when a cluster of institution-acquired infections are recognized.

    e. Patients with active gastrointestinal VRE or CDI, particularly those who are incontinent of stool.

    The HICPAC/CDC 2006 MDRO Guideline recommends that "LTCFs modify contact precautions to allow MDRO colonized/infected patients whose site of colonization or infection can be appropriately contained and who can observe good hand hygiene practices to use common areas and participate in group activities."

6. **Room Placement for Patient on Contact Precautions**

    a. Ideally, the patient on contact precautions should be placed in a private room.

    b. When a private room is not available, the patient may be placed in a room with a patient(s) with the same microorganism, but no other known infection or colonization with a different MDRO. This practice is known as cohorting.

c. If a private room is unavailable and cohorting cannot be accomplished, the patient may be placed in a room with another patient. The best roommate for a person with MRSA or VRE is a patient who:

(a) Has intact skin.

(b) Has no invasive devices (e.g., nasogastric tubes, tracheostomy or tracheal tube, IV lines, indwelling urinary catheters, surgical wound sites).

(c) Is not significantly immune-compromised (e.g., neutropenic, on oral steroids, or on chemotherapy).

(d) Is bed-ridden.

7. **Gloves**

a. In addition to wearing gloves as outlined under Standard Precautions, wear gloves (clean, single-use, nonsterile gloves are adequate) when providing direct patient care or handling items potentially contaminated by the patient on contact precautions.

b. While providing care to a patient, change gloves after having contact with infected material that may contain high concentrations of micro-organisms (e.g., fecal material and wound drainage). Remember to perform hand hygiene in between changing of gloves.

c. Remove gloves and perform hand hygiene immediately before leaving the patient's environment. The use of alcohol gel is acceptable unless hands are visibly soiled or if the patient sheds *C. difficile*, in which case hand washing is necessary. After glove removal and hand washing, ensure hands do not touch potentially contaminated environmental surfaces or items in the patient's room to avoid transfer of micro-organisms to other patients or environments. Use clean paper towels to open doors.

8. **Gowns**

a. In addition to wearing a gown as outlined under Standard Precautions, a gown should be donned:

(a) When performing direct patient care for the patient on contact precautions. Gowns should be put on before entering the patient's room.

(b) If you anticipate that your clothing will have substantial contact with the patient, environmental surfaces, or items in the patient's room.

(c) If the patient is incontinent or has diarrhea, an ileostomy, a colostomy, or wound drainage not contained by a dressing.

b. Remove the gown before leaving the patient environment. To avoid transfer of microorganisms to other patients or environments, ensure that clothing does not contact potentially contaminated environmental surfaces after gown removal (Appendix C).

9. **Masks** should be worn as specified in Standard Precautions and when treating patients colonized/infected with MRSA or other MDRO in the respiratory tract or where droplet exposure is possible.

10. **Patient Care Equipment**

a. When possible, dedicate the use of noncritical patient-care equipment (equipment which comes into contact only with intact skin) to a single patient (or infected cohort or colonized patients) to avoid sharing between patients.

b. Electronic thermometers used with a VRE or *C. difficile* carrying patient should not be shared with other patients. Dedicate a thermometer for single patient use for the individual's duration of contact precautions or use a disposable thermometer.

c. If the use of common equipment or items is unavoidable, then adequately clean and disinfect with an EPA-approved disinfectant (used as directed) or, if the organism is *C. difficile*, 10% hypochlorite solution before use on another patient.

11. **Linen and Laundry** — Special handling (i.e., double bagging) of isolation linens is not recommended. Care should be taken when handling linen to avoid contact with health care worker clothing. (See Appendix C for further information).

12. **Isolation Room Solid Waste** — Special handling (i.e., double bagging) of isolation room solid waste is not recommended. Follow your institutional policy and state regulations for waste management.

13. **Dishes, Glasses, Cups, and Eating Utensils** — No special precautions are needed for dishes, glasses, cups, or eating utensils. The combination of hot water and detergents used in institutional dishwashers is sufficient to decontaminate these items.

14. **Routine and Terminal Cleaning** — The room and bedside equipment of patients on contact precautions are cleaned using the same procedures used for all patients on Standard Precautions. Multiple antibiotic-resistant organisms are susceptible to disinfectants, as are antibiotic-sensitive strains, except *C. difficile*. The environment of a patient with CDI should be cleaned and disinfected using a 1:10 hypochlorite solution as recommended in the CDC's Guidelines for Environmental Infection Control in Healthcare Facilities. During any routine or

terminal cleaning procedure, it is important that attention is paid to the contact time the cleaning product must have with the surface to achieve effective disinfection.

15. **Termination of Contact Precautions**

a. **MRSA** ─ For the MRSA patient, there is no effective, evidence-based strategy for the termination of contact precautions, and in many facilities, known MRSA patients remain on contact precautions for the duration of their stay. Though the HICPAC/CDC MDRO Guidelines 2006 do consider multiple negative cultures over the course of one to two weeks to be reasonable criteria for termination of contact precautions, the application of this strategy is not generally practical, as MRSA patients are often colonized in multiple body sites and colonization may persist long-term, requiring multiple cultures over an extended period. Nasal culturing alone, which is often done to detect colonization, is by itself insufficient to determine colonization status. The false sense of security this strategy brings can be problematic when control measures are inappropriately discontinued. The decision to discontinue contact precautions should be based on best practices for MRSA control and what is reasonable for the facility given its patient population.

b. **VRE** ─ For patients colonized/infected with VRE, there is no recommended strategy for discontinuing contact precautions. The HICPAC/CDC MDRO Guidelines 2006 discuss the following as reasonable criteria for discontinuing contact precautions. Three successive negative cultures (stool/rectal cultures and initial site of infection/colonization) obtained at least one week apart and taken at least 48-72 hours after antibiotics used for any treatment have been discontinued. Studies have indicated, however, that VRE colonization may persist long-term as well as recur in patients who previously tested negative after subsequent antimicrobial therapy. Facilities should establish criteria for discontinuation of contact precautions based on accepted infection control principles.

c. ***C. difficile*** ─ A resident with CDI generally can be removed from contact precautions when symptoms of diarrhea have resolved. Cleanliness and hygiene should remain a high priority since the patient may continue to shed spores after the symptoms have resolved.

d. **Multidrug-Resistant Gram-Negative Bacilli (MDR-GNB)** ─ Currently, there is insufficient evidence for establishing criteria or recommendations for the discontinuation of contact precautions for patients with MDR-GNB, including carbapenemase-producing Enterobacteriaceae.

3. Home Health Care/Hospice

In addition to Standard Precautions, health care personnel providing care in the home should follow the recommended practices for contact precautions when indicated as described by the HICPAC/CDC Isolation Guideline for acute care facilities. Specifically,

home health care workers should focus on preventing cross-transmission via the clinical bag, clothing, and equipment, which is carried to and from the patient's home (McGoldrick, 2014). Alternatively, the clinical bag may be left in the vehicle, and only the disposable items used for the patient carried into the home. Reusable equipment must be cleaned either in the patient's home or bagged before returning to the clinician's vehicle or facility for disinfection. Hands should be washed or disinfected with a waterless antiseptic agent before leaving the patient's home.

4. Doctors' Offices/Outpatient Clinics

Standard Precautions should be used for all patients. Waiting areas should be screened for patients with productive coughs, draining wounds, or other signs and symptoms of infection. Those identified with suspected respiratory illness should be educated about respiratory hygiene and cough etiquette. These patients should be offered a mask if an infectious respiratory illness is suspected. Patients exhibiting any of the symptoms above should be moved from the waiting area to an exam room as soon as possible. Once a patient has been identified with multiple antibiotic-resistant organisms, subsequent visits to the office/clinic should be managed carefully. Any surfaces which may have had contact with the patient (e.g., blood pressure cuffs, examination table, and stethoscopes) should be cleaned and disinfected with an EPA-registered disinfectant (used as directed) before use for another patient. Refer to CDC Standard Precautions and contact precautions regarding the proper use of gloves, gowns, handling linen, laundry, and isolation room solid waste. (https://www.cdc.gov/infectioncontrol/guidelines/index.html)

5. Dialysis Settings

Standard Precautions as outlined in Appendix A, including gloves, gowns, and masks when appropriate, should be used for all patients. Hand hygiene should be emphasized, including frequent glove changes, hand washing and the use of alcohol-based rubs. Contact precautions are not recommended for several reasons, including the recommended use of additional infection control practices beyond Standard Precautions for all hemodialysis patients.

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

1. Restricted use of common medical supplies and equipment. Items taken to a dialysis station should be disposed of, or cleaned and disinfected with an EPA- registered disinfectant (used as directed) before returning to common clean areas.

2. Medications should be prepared in dedicated clean areas. Unused swabs, syringes, medication, and other patient care items taken to dialysis stations should be dedicated for use by that patient and not returned to common clean areas.

3. Personnel should not carry common medical supplies or medications in their pockets.

4. Clean areas should be designated for storage and preparation of

medications, medical supplies, and equipment. Designated clean areas should not be located adjacent to contaminated areas.

5. Dialyzers and other equipment, including environmental surfaces, should be properly maintained, cleaned, and disinfected between patients.

Studies have also suggested regular use of vancomycin, common in hemodialysis units, to be a risk factor for VRE. Review of vancomycin use and policies may be appropriate. The Centers for Disease Control and Prevention 2016 Update to the 2001 Recommendations for Preventing Transmission of Infections Among Chronic Hemodialysis Patients updates selected information and recommendations in the 2001 Guideline, Recommendations for Preventing Transmission of Infections Among Chronic Hemodialysis Patients. These updates can be found at https://www.cdc.gov/dialysis/guidelines/. This document provides detailed guidelines for the prevention of infections, including MDROs and non-bacterial infectious diseases.

6. Schools for the Physically and Mentally Challenged

In addition to Standard Precautions, these facilities should follow the recommendations for long-term care facilities in this guideline. Students identified with multidrug-resistant organisms should be instructed on how to prevent contamination of school materials that are to be reused by others (e.g., cover cough and wash hands before using school materials). Shared items such as books and computer keyboards must be cleaned and disinfected with an EPA-registered disinfectant (used as directed) before use by another individual. When possible, these items should be assigned to the individual student who is MDRO-infected as long as the person requires the item. These items must then be cleaned and disinfected before reuse by another student. Students must have ready access to hand-hygiene supplies and should be encouraged to cleanse hands often.

7. Assisted Living Facilities/Rest Homes/Retirement Centers

Admission should not be denied based on colonization with multidrug-resistant organisms. These patients are usually ambulatory and not bedridden. Since these patients require minimal assistance with activities of daily living and have few invasive devices (e.g., indwelling urinary catheters), additional precautions beyond Standard Precautions are usually unnecessary unless a cluster of facility-acquired infections is recognized. Hand-hygiene should be emphasized in employee and patient education efforts.

8. Rehabilitation Hospitals

This patient population is usually not immune compromised; thus, the risk of colonization with multidrug-resistant organisms progressing to infection is less than for patients in acute-care facilities. These patients are unique in that they are learning to manage their care (e.g., wound, indwelling urinary catheters). Hand hygiene and the use of barrier techniques should be included in patient education. In addition to Standard Precautions, the recommendations for long-term care facilities in this guideline should be followed.

9. Psychiatric Hospitals

These patients typically have no underlying medical conditions increasing their risk of infection. These facilities are unique in that the patients are encouraged to join group activities, and they may eat in a common dining room. All these activities are important for their treatment regimen. To isolate or cohort ambulatory patients with MRSA or other MDROs would be contrary to the philosophy and policy of most of these facilities. However, patients with MRSA, MDROs, or other underlying medical conditions should be evaluated on a case-by-case basis for the risks associated with person-to-person transmission and contamination of the environment.

10. Correctional Facilities

The corrections setting is one of the more difficult environments to implement effective infection control measures. In these facilities, security of inmates and staff is of primary concern when taking infection control measures into consideration. In addition to facilities frequently being overcrowded, inmates may engage in risky behavior or have poor hygiene adding to the difficulty in controlling infectious diseases, including antibiotic-resistant organisms such as MRSA. Guidelines for the control of MRSA in correctional facilities have been developed and published by the Federal Bureau of Prisons and can be found at https://www.bop.gov/resources/pdfs/mrsa.pdf. These comprehensive guidelines include screening, surveillance, diagnosis, treatment, infection control, and outbreak control.

11. Patients Discharged to Their Homes

Patients colonized or infected with MDROs **require no special control measures** beyond regular cleaning of all surfaces contaminated by secretions or touched by hands. Family members should inform health care facilities or providers of a patient's prior colonization/infection with an MDRO when the patient arrives for treatment. Family members should wash their hands with soap and water for a minimum of 15 to 20 seconds after direct contact with the patient or any items the patient has touched, before preparing food, and before eating. The patient and caregiver should wash their hands after using the toilet**.**

12. Emergency Medical Services (EMS) and Non-Emergent Transport

1. EMS and non-emergent transport personnel should be advised if any patient has infectious MRSA, VRE, CRE, CDI, or other MDRO, as well as any specific precautions required other than Standard Precautions.

2. Standard Precautions (Appendix A) should be based on the site and severity of infection and whether a patient who is colonized in the respiratory tract has a cough. If the infection includes respiratory symptoms such as coughing, additional measures such as respiratory hygiene/cough etiquette and droplet precautions, in addition to Standard Precautions, may be indicated.

3. Standard Precautions (Appendix A) are indicated for:

    a. The patient who is nasally colonized with MRSA.

b. The VRE or *C. difficile* infected patient who is colonized in the gastrointestinal tract and continent of stool.

4. Contact precautions (Appendix B) are indicated for:

   a. The patient who has an indwelling urinary catheter-associated MRSA or VRE infection or colonization.

   b. The patient who has wounds heavily colonized or infected with MRSA, VRE, or other MDRO that are not adequately covered and contained by a dressing or bandage.

   c. The patient who has a tracheostomy with a colonized or infected respiratory tract and who is unable to contain secretions.

   d. The VRE or *C. difficile* infected patient with a colostomy/ileostomy when secretions are not contained or contamination is likely.

   e. The patient colonized or infected with CRE who is ventilator dependent.

5. Gowns should be worn:

   a. When providing direct patient care if there is an anticipation of substantial contact with the patient.

   b. If the patient is incontinent or has diarrhea, an ileostomy, a colostomy, or wound drainage not contained by a dressing.

6. Masks should be worn as specified in Standard Precautions and transmission-based precautions with patients colonized/infected in the respiratory tract exhibiting symptoms of coughing and purulence or when performing splash-generating procedures.

7. Patient Care Equipment

   a. Equipment should be adequately cleaned and disinfected with an EPA-registered disinfectant (used as directed) before use with another patient.

   b. All linen should be properly placed in laundry bags at the receiving facility. Care should be used to avoid contact with health care worker clothing.

   c. Using Standard Precautions, vehicles used for the transportation of patients and equipment should be cleaned and disinfected routinely with an EPA-registered disinfectant (used as directed).

X. Outbreak Control

An outbreak is defined as an excess of the expected (usual) level of disease within a population or region. For health care facilities, an outbreak may occur within a wing, ward, unit or may be facility-wide. Outbreaks of MDROs can occur in different settings. For this document, an outbreak is defined as cases of the same MDRO with more than normal occurrence. Prompt detection of an increase in an MDRO, particularly MRSA, VRE, CRE, or KPC, is important in control of outbreaks and is dependent on having a good surveillance system. When an outbreak is recognized, administration and staff must work diligently to contain further spread of the infection. Facilities will have different expertise in their ability to investigate potential outbreaks. Standard and contact precautions, as well as compliance with additional infection control measures, should be reviewed and reinforced. Initiation of more intensified interventions, such as cohorting and increased isolation precautions, may be appropriate. **An active outbreak is not a reason to deny admission or to close a facility.**

When an outbreak is discovered, the following should apply to health care personnel working within the outbreak setting:

- Perform cultures only on personnel who are linked epidemiologically to an outbreak.
- If cultures are positive, exclude personnel from patient contact until the carriage is eradicated or the risk of disease transmission is eliminated.
- Do not perform routine surveillance cultures of health care personnel in the absence of a cluster or outbreak in which personnel are implicated.
- Do not exclude personnel from duty who are colonized but not epidemiologically linked to an increase in infections.

Additional recommendations for outbreaks:

- All suspected outbreaks, whether they are health care associated, community-associated, or from another facility, should be reported to the local county health department (CHD) as required by Florida statute.
    - Disease reporting information for health care providers and laboratories: http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/index.html
    - Local CHD Reporting Contact Information: http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/surveillance-and-investigation-guidance/_documents/chd-epi-contacts.pdf
- The Florida Department of Health (Department) can provide guidance and laboratory support, if needed, to control an outbreak.
- After consulting the Department, consider sending representative VRE, CRE, KPC, or MRSA isolates to the state laboratory for strain typing by pulsed-field gel electrophoresis or other suitable techniques to aid in defining reservoirs and patterns

of transmission during outbreaks.

Under Florida's reportable disease requirements, a grouping of patients having similar disease, symptoms, or syndromes that may indicate the presence of a disease outbreak is reportable to your local CHD.

XI. The Infected or Colonized Health Care Worker

Health care workers (HCW) infected or colonized with MRSA, VRE, CRE, *C. difficile* or other MDRO may serve as reservoirs and disseminators of infection. MRSA, specifically, is known to colonize various areas of the body including the anterior nares, axilla, groin, and skin. Spread of infection by colonized individuals may be minimized through adherence to good infection control practices.

Work restrictions should not be placed on a colonized HCW unless the individual has been epidemiologically linked to patient transmission. HCWs with indications of active infection should be referred for diagnosis and clinical management of the infection, including treatment if necessary. Work restrictions or alternate assignment may be considered for individuals with diagnosed active infection which prevents or limits the practice of infection control hygiene (draining lesions on hands or other exposed skin) until the infection has resolved. HCWs need not test negative for nasal cultures before returning to normal duties unless the individual has been linked to patient transmission.

Routine screening of health care staff for MRSA is not a cost-effective control measure and is not recommended. Decolonization therapy is also not recommended as a general control measure but may be considered for HCWs linked to patient transmission, only after general infection control policies have been reviewed and monitored closely (see Section VIII, Decolonization Therapy).

XII. Antibiotic Resistance in Animals

Strains of MRSA, including human strains, have been found to colonize and infect various species of animals, including dogs, cats, horses, and pigs. Recent studies have suggested that domesticated animals (house pets), may serve as reservoirs of MRSA (Guardabassi, 2004).

In health care settings, animals (usually dogs) are encountered in pet therapy or as service animals trained to assist their owners in various daily activities. The risk of transmission of MRSA or other organisms to and from these animals to patients has not been determined, but may be affected by factors such as the health and hygiene of the animal, behavior of the animal, environment, and amount of contact with patients. Risk can be reduced by simple preventive measures, such as hand washing after contact with the animal and preventing the animal from contact with the non-intact skin of the patient (e.g., surgical wounds and tube entry sites). Service animals should also be restricted to contact with only their owners and handlers. Institutions must determine their policies for animal intervention based on demonstrable risk factors while considering that service animals must be accommodated under the Americans With Disabilities Act and the considerable evidence

that companion pets, whether service animals or pet therapy animals, have a positive effect on patients.

In the community, pet owners infected or colonized with MRSA should practice good personal hygiene as a first means of reducing risk. In addition, colonized or infected pet owners and their health care team may consider:

- Including pet ownership, MRSA status of the owner, pet, or both in the patient history which may assist in identifying patient risk.
- Pet screening, but only in cases of recurrent infection and only after reinforcement of hygiene practices. Consult with your local CHD before deciding to screen a pet.
- Treatment of colonized pets is not recommended. Colonization is usually short term, and decolonization has not been demonstrated to be effective.
- Removal of the pet from the household, but only in exceptional circumstances. This would include serious and recurrent infection in which the animal is implicated as a source. Then, removal should only be temporary.

XIII. Control of MRSA in Community Settings

Community-associated MRSA emerged in the general population as a frequent cause of skin infections (boils, abscesses, furuncles), and occasionally more invasive infections in healthy individuals lacking the usual risk factors for bacterial infection. Outbreaks of CA-MRSA have been described in numerous community settings such as schools, daycare facilities, dormitories, military barracks, and correctional facilities and among varied populations. The National Institute for Occupational Safety and Health (NIOSH) makes a note of MRSA skin infections being most frequently transmitted when the following conditions, characterized as the 5 Cs, are present:

1. Crowding many people in close quarters or proximity for periods of time.
2. Contact (skin-to-skin contact), such as sports activities.
3. Compromised skin (cuts or abrasions).
4. Contaminated items or surfaces.
5. Lack of Cleanliness.

The prevalence of CA-MRSA calls for awareness, education, and control measures in a variety of community settings.

A. Personal Hygiene

1. Individuals, as a general rule, should practice good personal hygiene, including frequent hand washing and sanitation (alcohol rubs), and regular bathing or showering with soap.

2. Individuals should refrain from picking at pimples, scabs, and other non-intact areas of skin.

3. Wounds or lesions should be covered and contained; dressings should be kept dry and frequently changed until the infection has resolved.

4. Avoid contact with other people's wounds or bandages.

5. Towels and other hygiene and toiletry items, such as soap, razors, and cosmetics should not be shared.

6. Medical attention should be sought for cuts, abrasions, or lesions which appear to be infected.

B. Control Measures for Health Care Practitioners

1. Educate CA-MRSA-positive patients and family or caretakers on methods to limit the spread of infection in the home. Methods such as wound care and hygiene for infected and colonized individuals should be part of an educational program.

2. Inquire if similar infection is apparent in household members or other close contacts. If so, take appropriate steps to prevent a possible outbreak situation including contacting the local CHD.

3. Practice Standard Precautions (Appendix A) when treating possible or known infections.

4. Treat wounds appropriately and use antibiotics judiciously. When possible, treat based on the antibiogram; avoid fluoroquinolones, to which CA-MRSA can develop resistance quite readily, and macrolide/azalide drugs, to which MRSA strains are frequently resistant.

5. Decolonization therapy for individuals, households, or other cohorts is not recommended.

6. The CDC flowchart, "Outpatient management of skin and soft tissue infections in the era of community-associated MRSA," can be found on the following webpage (https://www.cdc.gov/mrsa/community/clinicians/index.html) and provides additional information to assist clinicians with diagnosis and treatment of CA-MRSA infection. As noted previously, clinicians should be cognizant that CA-MRSA strains can also be found in health care facilities. Another useful resource for the treatment of MRSA in adults and children by the Infectious Disease Society of America can be found at the following link: https://academic.oup.com/cid/article-lookup/doi/10.1093/cid/ciq146.

C. Households

CA-MRSA may be introduced to the household setting either by a community-associated infection or by an infected or colonized individual returning from a health care setting. Households with CA-MRSA patients should practice good personal hygiene, wound care,

and household control measures, which may include regular and thorough cleaning of the home environment and disinfection with an EPA-approved disinfectant (used as directed), paying special attention to frequently touched items and areas such as telephones, light switches, and doorknobs. Dishwashing and laundering of clothes and linens may be done as usual; the cleansing process, including detergent, water, and a hot dryer is usually enough to remove the bacteria. Items soiled with blood or other potentially infectious body fluids should be washed immediately.

Individuals who are positive for CA-MRSA and those living in households or having frequent close contact with CA-MRSA-positive individuals should notify their health care provider at the time of contact (doctor's appointment or return to a health care facility).

D. Schools

Although CA-MRSA has been reported in school settings, school age children are not a high-risk population and classrooms are not a high-risk environment for the spread of CA-MRSA. In Florida schools, reported CA-MRSA infections generally occur in settings where the 5Cs are present. These settings are generally sports-related and involve members of contact sports teams, such as football. Precautionary recommendations for schools include:

1. Education of students and staff on the transmission (person-to-person contact) of CA-MRSA and individual precautions emphasizing hand hygiene to reduce the likelihood of transmission.

2. Do not exclude colonized individuals from routine activities. Many people are asymptomatic carriers of CA-MRSA. Focusing on carriers will not decrease transmission.

3. Teachers, coaches, and staff are encouraged to look for signs and symptoms of infection and refer the individuals to their health care providers and outbreaks to the local CHD.

4. Regular housekeeping and cleaning regimens should be applied. Locker rooms and sports equipment should be cleaned and frequently disinfected with an EPA-approved disinfectant (used as directed).

5. Laundry (uniforms, towels, linen) should be routinely washed. Bleaching is not necessary. Items should be thoroughly dried on high heat (>160°F) and not allowed to air dry.

6. Individuals with active infection should keep wounds covered with clean, dry bandages and contain any wound drainage. Infected individuals need not be isolated or excluded from school activities unless wound drainage or other contaminated body fluids cannot be contained.

7. Infected individuals may be excluded from activities that increase the chance of spreading the infection (e.g., physical education, sports activities) until lesions have resolved or can be adequately covered and contained.

The Florida CHDs are available as resources for education and infection control plans.

The Department does not recommend closing schools for cleaning. Recommendations are that schools emphasize good hand hygiene among students and staff, making sure hand-washing facilities with soap, water, and towels or hand sanitizers (alcohol rubs) are made readily available. Schools should also have a scheduled housekeeping program using an EPA-approved disinfectant (used as directed) and emphasizing likely areas of contamination, such as locker rooms, sports equipment, and other shared items or facilities. Resources for prevention and control of CA-MRSA in Florida schools can be accessed at:

- Florida Department of Health, Bureau of Epidemiology: Antibiotic Resistance and Methicillin-Resistant *Staphylococcus aureus* (MRSA): http://www.floridahealth.gov/diseases-and-conditions/methicillin-resistant-staphylococcus-aureus/index.html

- Centers for Disease Control and Prevention: Methicillin-Resistant *Staphylococcus aureus* (MRSA) in Schools: https://www.cdc.gov/mrsa/community/schools/index.html

E. Daycare Settings

Recommendations for prevention of CA-MRSA in child and daycare settings are the same as those for infection control, in general. Hand hygiene products (soap and water, or alcohol-based hand sanitizers) should be readily available at all times. Hand hygiene should be enforced before and after using the bathroom, as well as before and after eating.

In addition to regular facility cleaning with an EPA-registered disinfectant (used as directed), toys and shared equipment, such as desks, chairs, mats, and other items that may contact skin should be disinfected after use by a child with a known active infection and before others are allowed to use the items. Stuffed animals and other toys that cannot be disinfected should not be shared. Administrators may also wish to educate parents and caretakers on CA-MRSA prevention and establish policies to inform the facility if their child has any active infection.

It is recommended that CA-MRSA-infected individuals should not be excluded from daycare unless draining lesions cannot be adequately covered and contained, with bandages maintained. The decision to exclude an infected child from daycare should be made on an individual case-by-case basis and take into account the child's needs and characteristics of the facility, including class size, staffing, and the ability of the facility to implement precautionary measures to minimize the risk of transmission.

F. Athletic Settings

CA-MRSA infection has been reported in athletes and participants in contact sports at all levels. Preventive measures to reduce infection and transmission of CA-MRSA in athletes and sports facilities should include:

1. Encouraging personal hygiene among patrons and staff.

2. Not allowing infected individuals with lesions that cannot be adequately covered to

participate.

3. Making products available (alcohol hand sanitizers, disinfectant spray bottles, and paper towels) that allow hand hygiene and disinfection of equipment to be performed in activity areas.

4. Encouraging showering at the end of activities.

5. Thorough cleaning of facilities on a scheduled basis. Shared equipment and facilities, such as exercise machines and saunas, should be cleaned and disinfected daily with an EPA-registered disinfectant (used as directed).

6. If laundry services are provided, washing linens, towels, and clothing and drying thoroughly at high heat (>160°F) before use. Items should not be air dried.

G. Workplace

Most work environments are not high risk for the spread of CA-MRSA. In the workplace, prevention measures include:

1. Using good personal hygiene practices (e.g., frequent hand washing or use of alcohol-based hand sanitizers). This is appropriate for family and close contacts as well.

2. Keeping wounds or lesions covered and dry.

3. Not sharing personal items such as uniforms, personal protective equipment (PPE), clothing, and hygiene items.

4. Educating workers in general safety and health measures, including education on CA-MRSA prevention in the workplace, when appropriate.

5. Making facilities and supplies available that encourage the practice of good hand hygiene.

6. Ensuring that routine housekeeping and cleaning of the workplace is completed on a regular schedule and that contaminated equipment and facilities are cleaned and disinfected with an EPA-registered disinfectant (used as directed). Liquid soap dispensers should not be topped off since contamination of the reservoir may occur.

H. Correctional Facilities

CA-MRSA infections and outbreaks have been observed in correctional facilities around the country, including Florida. Facilities that house inmates in closely confined quarters provide suitable conditions for the spread of infections, including MRSA. Basic prevention and control measures for correctional facilities should include:

1. Encouraging personal hygiene, with an emphasis on hand washing and regular showering.

2. Educating staff and inmates on methods of transmission, prevention, treatment, and

containment of MRSA in the facility.

3. Encouraging inmates to seek medical assistance for skin conditions indicative of infection or that may lead to infection.

4. Housing individuals who have poor hygiene or draining lesions that cannot be contained separately from other inmates, if possible, until the infection has resolved or is contained.

5. Maintaining scheduled cleaning of residential quarters and medical facilities, including disinfection of shared equipment and facilities. This includes medical equipment, exercise equipment, sinks, showers, and toilets. Areas should be cleaned and disinfected using an EPA-registered disinfectant (used as directed).

6. Developing and following a facility-wide infection control plan.

Comprehensive guidelines for the control of MRSA in correctional facilities can be found at Management of Methicillin-Resistant *Staphylococcus aureus* (MRSA) Infections April 2012. (Federal Bureau of Prisons -Clinical Practice Guidelines)
https://www.bop.gov/resources/pdfs/mrsa.pdf

XIV. Vancomycin Non-Susceptible *Staphylococcus* – an Emerging Pathogen

Vancomycin is the antibiotic of choice for multidrug-resistant MRSA. With the recent development of increased resistance to vancomycin, many infections could be made untreatable with currently available antibiotics. The first culture of *S. aureus* with reduced susceptibility to vancomycin was identified in Japan in 1996. In 1997, two patients were identified with vancomycin-intermediate *S. aureus* (VISA) also referred to as glycopeptide-intermediate *S. aureus* (GISA) in the U.S. Since that time, several other cases of GISA were identified in the U.S. In 2002, the first two vancomycin-resistant *S. aureus* (VRSA) cases were identified in the U.S. Four additional cases of VRSA have been identified as of July 2006. In response to this threat, the CDC has published Investigation and Control of Vancomycin-Intermediate/Resistant Staphylococcus aureus (VISA/VRSA): A Guide for Health Departments and Infection Control Personnel. Atlanta 2006, which has since been updated: Investigation and Control of Vancomycin-Resistant *Staphylococcus aureus*: A Guide for Health Departments and Infection Control Personnel. Atlanta, GA 2015. Available at:
http://www.cdc.gov/hai/pdfs/VRSA-Investigation-Guide-05_12_2015.pdf.

To decrease the likelihood that additional strains of vancomycin-resistant *S. aureus* will develop, it is important to reduce the overuse and misuse of all antimicrobial agents, especially vancomycin. Establishment of active surveillance for early detection and control of staphylococci with decreased susceptibility to vancomycin is essential for early recognition and control.

Both VISA and VRSA are reportable to the Department. Any laboratory or clinician that believes he or she has identified a patient infected with staphylococci with decreased susceptibility to vancomycin should immediately contact the local CHD epidemiology

program or the Florida Department of Health, Bureau of Epidemiology by phone. Florida Administrative Code also requires that cultures be saved and made available for confirmatory testing by the Florida Department of Health Bureau of Public Health Laboratories and CDC.

- Reportable Diseases and Conditions in Florida for Practitioners and Laboratories: http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/index.html
- Local CHD Reporting Contact Information: http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/surveillance-and-investigation-guidance/_documents/chd-epi-contacts.pdf

As soon as a patient has been identified with laboratory-confirmed VISA or VRSA, it is essential that measures be taken immediately to prevent transmission to others and the extent of transmission of the organisms be assessed rapidly. The patient should be isolated in a private room and contact precautions (gown, mask, gloves, and antibacterial soap for hand washing or alcohol-based hand sanitizer) implemented as recommended in the 2007 CDC Guideline for Isolation Precautions. The number of people with access to the patient should be limited; dedicated health care workers should provide one-on-one care.

When a patient is identified with VISA or VRSA, transmission to others must be assessed immediately, including health care workers and patients. The local CHD must be notified immediately when a culture is positive for VISA or VRSA. The Department will aid the facility, as needed, with the investigation of possible transmission of VISA or VRSA to others.

In summary, the precautionary measures are to:

A. Isolate the patient in a private room.

B. Minimize the number of persons caring for the patient.

C. Implement the appropriate infection control precautions during patient care.

    1. Use standard and contact precautions (gown and gloves) to enter the room.

    2. Wear mask/eye protection if performing procedures that are likely to generate splash or splatter of contaminated material.

    3. Perform hand hygiene using antimicrobial soap or alcohol-based hand sanitizer before and after contact with the patient and after contact with any patient-care equipment that has been in the patient's room or used on the patient.

    4. Dedicate non-disposable items that cannot be cleaned and disinfected between patients for use only on this patient.

    5. Monitor and strictly enforce compliance with contact precautions.

D. Initiate epidemiologic and laboratory investigations with the assistance of the CHD and the Department.

E. Educate appropriate personnel regarding the patient with VISA/VRSA and the importance of adherence to contact precautions.

F. Perform baseline cultures from hands and nares of those in contact with the patient based on the risk assessment described earlier.

G. Consult with the CHD before transferring the patient to another facility or discharging the patient.

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XVI. Resources

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Centers for Disease Control and Prevention. "Personal Protective Equipment (PPE) in Healthcare Settings." https://www.cdc.gov/hai/prevent/ppe_train.html

Additional Resources:

Society for Healthcare Epidemiology of America (SHEA). An organization for the infection control professional. The SHEA web site includes numerous science-based publications on infection control epidemiology. http://www.shea-online.org/index.php/policy/positions-statements

SHEA compendium of strategies to prevent healthcare-associated infection in acute care hospitals: 2014 update. You can access this compendium at: http://www.shea-online.org/index.php/practice-resources/41-current-guidelines/417 compendium-of-strategies-to-prevent-healthcare-associated-infections-in-acute-care-hospitals-2014-update.

Association for Professionals in Infection Control and Epidemiology (APIC). Worldwide organization of infection control and epidemiology professionals with chapters nationwide. APIC presents evidence-based guideline publications for infection control epidemiology. http://www.apic.org/Professional-Practice/Implementation-guides Education Resources located at: http://www.apic.org/Education-and-Events/Overview

XVII. Reportable Diseases in Florida

A list of reportable diseases in Florida along with other reporting information can be found on the Bureau of Epidemiology web site:
For Practitioners: http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/_documents/reportable-diseases/_documents/reportable-diseases-list-practitioners.pdf.

For Laboratories: http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/_documents/reportable-diseases/_documents/reportable-diseases-list-laboratories.pdf

Appendix A

Excerpt taken from the Centers for Disease Control and Prevention. Standard Precautions. Excerpt from “Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007”.
https://www.cdc.gov/infectioncontrol/guidelines/isolation/index.html

Standard Precautions

Standard Precautions are a group of infection prevention practices that should be applied to all patients regardless of their disease status. These practices are applicable to all health care settings though the extent may vary by the type of facility and type of health care provided. The following excerpt provides comprehensive details of the measures included as Standard Precautions. It is the responsibility of individual facilities to determine the utilization of these practices within their own patient population and health care environment.

Background

III.A. Standard Precautions

Standard Precautions combine the major features of universal precautions (UP) and body substance isolation (BSI) and are based on the principle that all blood, body fluids, secretions, excretions except sweat, non-intact skin, and mucous membranes may contain transmissible infectious agents. Standard Precautions include a group of infection prevention practices that apply to all patients, regardless of suspected or confirmed infection status, in any setting in which health care is delivered. These include: hand hygiene; use of gloves, gown, mask, eye protection, or face shield, depending on the anticipated exposure; and safe injection practices. Also, equipment or items in the patient environment likely to have been contaminated with infectious body fluids must be handled in a manner to prevent transmission of infectious agents (e.g., wear gloves for direct contact, contain heavily soiled equipment, properly clean and disinfect or sterilize reusable equipment before use on another patient).

The application of Standard Precautions during patient care is determined by the nature of the health care worker (HCW)-patient interaction and the extent of anticipated blood, body fluid, or pathogen exposure. For some interactions (e.g., performing venipuncture), only gloves may be needed; during other interactions (e.g., intubation), use of gloves, gown,

and face shield or mask and goggles is necessary. Education and training on the principles and rationale for recommended practices are critical elements of Standard Precautions because they facilitate appropriate decision-making and promote adherence when HCWs are faced with new circumstances. An example of the importance of the use of Standard Precautions is intubation, especially under emergency circumstances when infectious agents may not be suspected, but later are identified (e.g., SARS-CoV, *Neisseria meningitidis*).

Standard Precautions are also intended to protect patients by ensuring that health care personnel do not carry infectious agents to patients on their hands or via equipment used during patient care.

III.A.1. New Elements of Standard Precautions

Infection control problems that are identified in the course of outbreak investigations often indicate the need for new recommendations or reinforcement of existing infection control recommendations to protect patients. Because such recommendations are considered a standard of care and may not be included in other guidelines, they are added here to Standard Precautions. Three such areas of practice that have been added are: respiratory hygiene/cough etiquette, safe injection practices, and use of masks for insertion of catheters or injection of material into spinal or epidural spaces via lumbar puncture procedures (e.g., myelogram, spinal or epidural anesthesia). While most elements of Standard Precautions evolved from universal precautions that were developed for protection of health care personnel, these new elements of Standard Precautions focus on protection of patients.

III.A.1.a. Respiratory Hygiene/Cough Etiquette

The transmission of SARS-CoV in emergency departments by patients and their family members during the widespread SARS outbreaks in 2003 highlighted the need for vigilance and prompt implementation of infection control measures at the first point of encounter within a health care setting (e.g., reception and triage areas in emergency departments, outpatient clinics, and physician offices). The strategy proposed has been termed respiratory hygiene/cough etiquette and is intended to be incorporated into infection control practices as a new component of Standard Precautions. The strategy is targeted at patients and accompanying family members and friends with undiagnosed transmissible respiratory infections, and applies to any person with signs of illness including cough, congestion, rhinorrhea, or increased production of respiratory secretions when entering a health care facility. The term *cough etiquette* is derived from recommended source control measures for *Mycobacterium tuberculosis*.

The elements of respiratory hygiene/cough etiquette include:

- Education of health care facility staff, patients, and visitors.
- Posted signs, in language(s) appropriate to the population served, with instructions to patients and accompanying family members or friends.
- Source control measures (e.g., covering the mouth/nose with a tissue when coughing and prompt disposal of used tissues, using surgical masks on the coughing person when tolerated and appropriate).
- Hand hygiene after contact with respiratory secretions.

- Spatial separation, ideally >3 feet, of persons with respiratory infections in common waiting areas when possible.

Covering sneezes and coughs and placing masks on coughing patients are proven means of source containment that prevent infected persons from dispersing respiratory secretions into the air. Masking may be difficult in some settings, (e.g., pediatrics, in which case, the emphasis by necessity may be on cough etiquette). Physical proximity of <3 feet has been associated with an increased risk for transmission of infections via the droplet route (e.g., *N. meningitidis* and group A S*treptococcus* and therefore supports the practice of distancing infected persons from others who are not infected. The effectiveness of good hygiene practices, especially hand hygiene, in preventing transmission of viruses and reducing the incidence of respiratory infections both within and outside health care settings is summarized in several reviews.

These measures should be effective in decreasing the risk of transmission of pathogens contained in large respiratory droplets (e.g., influenza virus, adenovirus, *Bordetella pertussis* and *Mycoplasma pneumoniae*). Although fever will be present in many respiratory infections, patients with pertussis and mild upper respiratory tract infections are often afebrile. Therefore, the absence of fever does not always exclude a respiratory infection. Patients who have asthma, allergic rhinitis, or chronic obstructive lung disease also may be coughing and sneezing. While these patients often are not infectious, cough etiquette measures are prudent.

Health care personnel are advised to observe droplet precautions (i.e., wear a mask) and hand hygiene when examining and caring for patients with signs and symptoms of a respiratory infection. Health care personnel who have a respiratory infection are advised to avoid direct patient contact, especially with high-risk patients. If this is not possible, then a mask should be worn while providing patient care.

Recommendations

IV. Standard Precautions

Assume that every person is potentially infected or colonized with an organism that could be transmitted in the health care setting and apply the following infection control practices during the delivery of health care.

These recommendations are designed to prevent transmission of infectious agents among patients and healthcare personnel inpatients with suspected or proven SARS all settings where healthcare is delivered. As in other CDC/HICPAC guidelines, each recommendation is categorized on the basis of existing scientific data, theoretical rationale, applicability, and when possible, economic impact. The CDC/HICPAC system for categorizing recommendations is as follows:

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

Category IB Strongly recommended for implementation and supported by some experimental, clinical, or epidemiologic studies and a strong theoretical rationale.

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 a theoretical rationale.

No recommendation; unresolved issue. Practices for which insufficient evidence or no consensus regarding efficacy exists.

IV.A. Hand Hygiene

IV.A.1. During the delivery of health care, avoid unnecessary touching of surfaces in close proximity to the patient to prevent both contamination of clean hands from environmental surfaces and transmission of pathogens from contaminated hands to surfaces. *(Category IB/IB)*

IV.A.2. When hands are visibly dirty, contaminated with proteinaceous material, or visibly soiled with blood or body fluids, wash hands with either a non-antimicrobial soap and water or an antimicrobial soap and water. *(Category IA)*

IV.A.3. If hands are not visibly soiled, or after removing visible material with non-antimicrobial soap and water, decontaminate hands in the clinical situations described in IV.A.3.a-f. The preferred method of hand decontamination is with an alcohol-based hand rub. Alternatively, hands may be washed with an antimicrobial soap and water. Frequent use of alcohol-based hand rub immediately following hand washing with non-antimicrobial soap may increase the frequency of dermatitis. *(Category IB)*

Perform hand hygiene in the following clinical situations:

IV.A.3.a. Before having direct contact with patients. *(Category IB)*

IV.A.3.b. After contact with blood, body fluids or excretions, mucous membranes, nonintact skin, or wound dressings. *(Category IA)*

IV.A.3.c. After contact with a patient's intact skin (e.g., when taking a pulse or blood pressure or lifting a patient). *(Category IB)*

IV.A.3.d. If hands will be moving from a contaminated-body site to a clean-body site during patient care. *(Category II)*

IV.A.3.e. After contact with inanimate objects (including medical equipment) in the immediate vicinity of the patient. *(Category II)*

IV.A.3.f. After removing gloves. *(Category IB)*

IV.A.4. Wash hands with non-antimicrobial soap and water or with antimicrobial soap and water if contact with spores (e.g., *C. difficile* or *Bacillus anthracis*) is likely to have occurred. The physical action of washing and rinsing hands under such circumstances is recommended because alcohols, chlorhexidine, iodophors, and other antiseptic agents have poor activity against spores. *(Category II)*

IV.A.5. Do not wear artificial fingernails or extenders if duties include direct contact with patients at high risk for infection and associated adverse outcomes (e.g., those in ICUs or operating rooms). *(Category IA)*

IV.A.5.a. Develop an organizational policy on the wearing of non-natural nails by health care personnel who have direct contact with patients outside of the groups specified above. *(Category II)*

IV.B. Personal Protective Equipment (PPE)

IV.B.1. Observe the following principles of use:

IV.B.1.a. Wear PPE, as described in IV.B.2-4, when the nature of the anticipated patient interaction indicates that contact with blood or body fluids may occur. *(Category IB/IB)*

IV.B.1.b. Prevent contamination of clothing and skin during the process of removing

PPE. *(Category II)*

IV.B.1.c. Before leaving the patient's room or cubicle, remove and discard PPE. *(Category IB/IB)*

IV.B.2. Gloves

IV.B.2.a. Wear gloves when it can be reasonably anticipated that contact with blood or other potentially infectious materials, mucous membranes, nonintact skin, or potentially contaminated intact skin (e.g., of a patient incontinent of stool or urine) could occur. *(Category IB/IB)*

IV.B.2.b. Wear gloves with fit and durability appropriate to the task. *(Category IB)*

IV.B.2.b.i. Wear disposable medical examination gloves for providing direct patient care.

IV.B.2.b.ii. Wear disposable medical examination gloves or reusable utility gloves for cleaning the environment or medical equipment.

IV.B.2.c. Remove gloves after contact with a patient and/or the surrounding environment (including medical equipment) using proper technique to prevent hand contamination. Do not wear the same pair of gloves for the care of more than one patient. Do not wash gloves for the purpose of reuse since this practice has been associated with transmission of pathogens. *(Category IB)*

Perform hand asepsis immediately after removing gloves. (This is a preferred strategy of the review panel and not a recommendation of the actual CDC guideline).

IV.B.2.d. Change gloves during patient care if the hands will move from a contaminated body site (e.g., perineal area) to a clean body site (e.g., face). *(Category II)*

IV.B.3. Gowns

IV.B.3.a. Wear a gown that is appropriate to the task to protect skin and prevent soiling or contamination of clothing during procedures and patient-care activities when contact with blood, body fluids, secretions, or excretions is anticipated. *(Category IB/IC)*

IV.B.3.a.i. Wear a gown for direct patient contact if the patient has uncontained secretions or excretions. *(Category IB/IC)*

IV.B.3.a.ii. Remove gown and perform hand hygiene before leaving the patient's environment. *(Category IB/IC)*

IV.B.3.b. Do not reuse gowns, even for repeated contacts with the same patient. *(Category II)*

IV.B.3.c. Routine donning of gowns upon entrance into a high-risk unit (e.g., ICU, NICU, HSCT unit) is not indicated. *(Category IB)*

IV.B.4. Mouth, Nose, Eye Protection

IV.B.4.a. Use PPE to protect the mucous membranes of the eyes, nose and mouth during procedures and patient-care activities that are likely to generate splashes or sprays of blood, body fluids, secretions and excretions. Select masks, goggles, face shields, and combinations of each according to the need anticipated by the task performed. *(Category IB/IB)*

IV.B.5. During aerosol-generating procedures (e.g., bronchoscopy, suctioning of the respiratory tract [if not using in-line suction catheters], endotracheal intubation) in patients who are not suspected of being infected with an agent for which respiratory protection is otherwise recommended (e.g., *M. tuberculosis*, SARS or hemorrhagic fever viruses), wear one of the following: a face shield that fully covers the front and sides of the face, a mask with attached shield, or a mask and goggles (in addition to gloves and gown). *(Category IB)*

IV.C. Respiratory Hygiene/Cough Etiquette

IV.C.1. Educate health care personnel on the importance of source control measures to contain respiratory secretions to prevent droplet and fomite transmission of respiratory pathogens, especially during seasonal outbreaks of viral respiratory tract infections (e.g., influenza, RSV, adenovirus, parainfluenza virus) in communities. *(Category IB)*

IV.C.2. Implement the following measures to contain respiratory secretions in patients and accompanying individuals who have signs and symptoms of a respiratory infection, beginning at the point of initial encounter in a health care setting (e.g., triage, reception and waiting areas in emergency departments, outpatient clinics and physician offices).

IV.C.2.a. Post signs at entrances and in strategic places (e.g., elevators, cafeterias) within ambulatory and inpatient settings with instructions to patients and other persons with symptoms of a respiratory infection to cover their mouths/noses when coughing or sneezing, use and dispose of tissues, and perform hand hygiene after hands have been in contact with respiratory secretions. *(Category II)*

IV.C.2.b. Provide tissues and no-touch receptacles (e.g., foot-pedal operated lid or open, plastic-lined waste basket) for disposal of tissues. *(Category II)*

IV.C.2.c. Provide resources and instructions for performing hand hygiene in or near waiting areas in ambulatory and inpatient settings; provide conveniently located dispensers of alcohol-based hand rubs and, where sinks are available, supplies for hand washing. *(Category IB)*

IV.C.2.d. During periods of increased prevalence of respiratory infections in the community (e.g., as indicated by increased school absenteeism, increased number of patients seeking care for a respiratory infection), offer masks to coughing patients and other symptomatic persons (e.g., persons who accompany ill patients) upon entry into the facility or medical office and encourage them to maintain special separation, ideally a distance of at least 3 feet, from others in common waiting areas. *(Category IB)*

IV.C.2.d.i. Some facilities may find it logistically easier to institute this recommendation year-round as a standard of practice. *(Category II)*

IV.D. Patient Placement

IV.D.1. Include the potential for transmission of infectious agents in patient placement decisions. Place patients who pose a risk for transmission to others (e.g., uncontained secretions, excretions or wound drainage; infants with suspected viral respiratory or gastrointestinal infections) in a single-patient room when available. *(Category IB)*

IV.D.2. Determine patient placement based on the following principles: *(Category II)*

- Route(s) of transmission of the known or suspected infectious agent
- Risk factors for transmission in the infected patient
- Risk factors for adverse outcomes resulting from an HAI in other patients in the area or room being considered for patient placement

- Availability of single-patient rooms
- Patient options for room sharing (e.g., cohorting patients with the same infection)

IV.E. Patient-Care Equipment and Instruments/Devices

IV.E.1. Establish policies and procedures for containing, transporting, and handling patient-care equipment and instruments/devices that may be contaminated with blood or body fluids. *(Category IB/IB)*

IV.E.2. Remove organic material from critical and semi-critical instrument/devices, using recommended cleaning agents before high-level disinfection and sterilization to enable effective disinfection and sterilization processes. *(Category IA)*

IV.E.3. Wear PPE (e.g., gloves, gown) according to the level of anticipated contamination, when handling patient-care equipment and instruments/devices that are visibly soiled or may have been in contact with blood or body fluids. *(Category IB/IB)*

IV.F. Care of the Environment

IV.F.1. Establish policies and procedures for routine and targeted cleaning of environmental surfaces as indicated by the level of patient contact and degree of soiling. *(Category II)*

IV.F.2. Clean and disinfect surfaces that are likely to be contaminated with pathogens, including those that are in close proximity to the patient (e.g., bed rails, over-bed tables) and frequently touched surfaces in the patient care environment (e.g., door knobs, surfaces in and surrounding toilets in patients' rooms) on a more frequent schedule compared to that for other surfaces (e.g., horizontal surfaces in waiting rooms). *(Category IB)*

IV.F.3. Use EPA-registered disinfectants that have microbiocidal (i.e., killing) activity against the pathogens most likely to contaminate the patient-care environment. Use in accordance with manufacturer's instructions. *(Category IB/IB)*

IV.F.3.a. Review the efficacy of in-use disinfectants when evidence of continuing transmission of an infectious agent (e.g., rotavirus, C. difficile, norovirus) may indicate resistance to the in-use product and change to a more effective disinfectant as indicated. *(Category II)*

IV.F.4. In facilities that provide health care to pediatric patients or have waiting areas with child play toys (e.g., obstetric/gynecology offices and clinics), establish policies and procedures for cleaning and disinfecting toys at regular intervals. *(Category IB)*

IV.F.4.a. Use the following principles in developing this policy and procedures: *(Category II)*

- Select play toys that can be easily cleaned and disinfected.
- Do not permit use of stuffed furry toys if they will be shared.
- Clean and disinfect large stationary toys (e.g., climbing equipment) at least weekly and whenever visibly soiled.

- If toys are likely to be mouthed, rinse with water after disinfection; alternatively wash in a dishwasher.
- When a toy requires cleaning and disinfection, do so immediately or store in a designated labeled container separate from toys that are clean and ready for use.

IV.F.5. Include multi-use electronic equipment in policies and procedures for preventing contamination and for cleaning and disinfection, especially those items that are used by patients, those used during delivery of patient care, and mobile devices that are moved in and out of patient rooms frequently (e.g., daily). *(Category IB)*

IV.F.5.a. No recommendation for use of removable protective covers or washable keyboards.

IV.G. Textiles and Laundry

IV.G.1 Handle used textiles and fabrics with minimum agitation to avoid contamination of air, surfaces and persons. *(Category IB/IB)*

IV.G.2. If laundry chutes are used, ensure that they are properly designed, maintained, and used in a manner to minimize dispersion of aerosols from contaminated laundry. *(Category IB/IB)*

IV.H. Safe Injection Practices

The following recommendations apply to the use of needles, cannulas that replace needles, and, where applicable intravenous delivery systems:

IV.H.1. Use aseptic technique to avoid contamination of sterile injection equipment. *(Category IA)*

IV.H.2. Do not administer medications from a syringe to multiple patients, even if the needle or cannula on the syringe is changed. Needles, cannulae and syringes are sterile, single-use items; they should not be reused for another patient or to access a medication or solution that might be used for a subsequent patient. *(Category IA)*

IV.H.3. Use fluid infusion and administration sets (i.e., intravenous bags, tubing and connectors) for one patient only and dispose appropriately after use. Consider a syringe or needle/cannula contaminated once it has been used to enter or connect to a patient's intravenous infusion bag or administration set. *(Category IB)*

IV.H.4. Use single-dose vials for parenteral medications whenever possible. *(Category IA)*

IV.H.5. Do not administer medications from single-dose vials or ampules to multiple patients or combine leftover contents for later use. *(Category IA)*

IV.H.6. If multi-dose vials must be used, both the needle or cannula and syringe used to access the multi-dose vial must be sterile. *(Category IA)*

IV.H.7. Do not keep multi-dose vials in the immediate patient treatment area and store in accordance with the manufacturer's recommendations; discard if sterility is compromised or questionable. *(Category IA)*

IV.H.8. Do not use bags or bottles of intravenous solution as a common source of supply for multiple patients. *(Category IB)*

IV.I. Infection Control Practices for Special Lumbar Puncture Procedures:

Wear a surgical mask when placing a catheter or injecting material into the spinal canal or subdural space (i.e., during myelograms, lumbar puncture and spinal or epidural anesthesia). *(Category IB)*

IV.J. Worker Safety:

Adhere to federal and state requirements for protection of health care personnel from exposure to bloodborne pathogens. *(Category IB)*

Appendix B

Excerpt taken from Centers for Disease Control and Prevention. Contact Precautions. Excerpt from "Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007". https://www.cdc.gov/hicpac/pdf/isolation/Isolation2007.pdf

Contact Precautions

Contact Precautions are recommended when an increased risk of transmission is present or when additional measures beyond Standard Precautions are necessary to interrupt transmission of a drug-resistant organism. Contact precautions include intensified use of PPE, environmental control measures, and greater patient isolation. Facilities must balance the appropriateness and need for contact precautions with the privacy and well-being of the patient. Refer to the 2006 HICPA/CDC MICRO guideline (page 26) section titled "Impact of Contact Precautions on patient care and well-being."

III.B. Transmission-Based Precautions

There are three categories of transmission-based precautions: contact precautions, droplet precautions, and airborne precautions. Transmission-based precautions are used when the route(s) of transmission is (are) not completely interrupted using Standard Precautions alone. For some diseases that have multiple routes of transmission (e.g., SARS), more than one transmission-based precautions category may be used. When used either singly or in combination, they are always used in addition to Standard Precautions. See Appendix A of the HICPAC/CDC isolation guideline for recommended precautions for specific infections. When transmission-based precautions are indicated, efforts must be made to counteract possible adverse effects on patients (i.e., anxiety, depression and other mood disturbances, perceptions of stigma, reduced contact with clinical staff, and increases in preventable adverse events) in order to improve acceptance by the patients and adherence by health care personnel (HCPs).

III.B.1. Contact Precautions

Contact precautions are intended to prevent transmission of infectious agents, including epidemiologically important microorganisms, which are spread by direct or indirect contact with the patient or the patient's environment as described in I.B.3.a. The application of contact precautions for patients infected or colonized with MDROs is

described in the 2006 HICPAC/CDC MDRO guideline (PDF 234KB/74 pages). Contact precautions also apply where the presence of excessive wound drainage, fecal incontinence, or other discharges from the body suggest an increased potential for extensive environmental contamination and risk of transmission. A single patient room is preferred for patients who require contact precautions. When a single-patient room is not available, consultation with infection control personnel is recommended to assess the various risks associated with other patient placement options (e.g., cohorting, keeping the patient with an existing roommate). In multi-patient rooms, ≥3 feet spatial separation between beds is advised to reduce the opportunities for inadvertent sharing of items between the infected/colonized patient and other patients. Health care personnel caring for patients on contact precautions should wear a gown and gloves for all interactions that may involve contact with the patient or potentially contaminated areas in the patient's environment. Donning PPE before room entry and discarding before exiting the patient room is done to contain pathogens, especially those that have been implicated in transmission through environmental contamination (e.g., VRE, C. difficile, noroviruses and other intestinal tract pathogens, RSV).

Contact Precautions ─ Recommendations

V. Transmission-Based Precautions

V.A. General Principles

V.A.1. In addition to Standard Precautions, use transmission-based precautions for patients with documented or suspected infection or colonization with highly transmissible or epidemiologically important pathogens for which additional precautions are needed to prevent transmission (See Appendix A of the HICPAC/CDC isolation guideline). *(Category IA)*

V.B. Contact Precautions

V.B.1. Use contact precautions as recommended in Appendix A of the HICPAC/CDC isolation guideline for patients with known or suspected infections or evidence of syndromes that represent an increased risk for contact transmission. For specific recommendations for use of contact precautions for colonization or infection with MDROs, go to the MDRO guideline (PDF 234KB/74 pages).

V.B.2. Patient placement

V.B.2.a. In acute-care hospitals, place patients who require contact precautions in a single-patient room when available. *(Category IB)*

When single-patient rooms are in short supply, apply the following principles for making decisions on patient placement:

- Prioritize patients with conditions that may facilitate transmission (e.g., uncontained drainage, stool incontinence) for single-patient room placement. *(Category II)*

- Place together in the same room (cohort) patients who are infected or colonized with the same pathogen and are suitable roommates. *(Category IB)*

- If it becomes necessary to place a patient who requires contact precautions in a room with a patient who is not infected or colonized with

the same infectious agent:

- Avoid placing patients on contact precautions in the same room with patients who have conditions that may increase the risk of adverse outcome from infection or that may facilitate transmission (e.g., those who are immunocompromised, have open wounds, or have anticipated prolonged lengths of stay). *(Category II)*

- Ensure that patients are physically separated (i.e., >3 feet apart) from each other. Draw the privacy curtain between beds to minimize opportunities for direct contact. *(Category II)*

- Change protective attire and perform hand hygiene between contact with patients in the same room, regardless of whether one or both patients are on contact precautions. *(Category IB)*

V.B.2.b. In long-term care and other residential settings, make decisions regarding patient placement on a case-by-case basis, balancing infection risks to other patients in the room, the presence of risk factors that increase the likelihood of transmission, and the potential adverse psychological impact on the infected or colonized patient. *Contact II*

V.B.2.c. In ambulatory settings, place patients who require contact precautions in an examination room or cubicle as soon as possible. *(Category II)*

V.B.3. Use of personal protective equipment

V.B.3.a. Gloves

Wear gloves whenever touching the patient's intact skin or surfaces and articles in close proximity to the patient (e.g., medical equipment, bed rails). Don gloves upon entry into the room or cubicle. *(Category IB)*

V.B.3.b. Gowns

V.B.3.b.i. Don gown upon entry into the room or cubicle. Remove gown and observe hand hygiene before leaving the patient-care environment. *(Category IB)*

V.B.3.b.ii. After gown removal, ensure that clothing and skin do not contact potentially contaminated environmental surfaces that could result in possible transfer of microorganisms to other patients or environmental surfaces. *(Category II)*

V.B.4. Patient transport

V.B.4.a. In acute-care hospitals and long-term care and other residential settings, limit transport and movement of patients outside of the room to medically necessary purposes. *(Category II)*

V.B.4.b. When transport or movement in any health care setting is necessary, ensure that infected or colonized areas of the patient's body are contained and covered. *(Category II)*

V.B.4.c. Remove and dispose of contaminated PPE and perform hand hygiene prior to transporting patients on contact precautions. *(Category II)*

V.B.4.d. Don clean PPE to handle the patient at the transport destination. *(Category II)*

V.B.5. Patient-care equipment and instruments/devices

V.B.5.a. Handle patient-care equipment and instruments/devices

according to Standard Precautions. *(Category IB/IB)*

V.B.5.b. In acute-care hospitals and long-term care and other residential settings, use disposable noncritical patient-care equipment (e.g., blood pressure cuffs) or implement patient-dedicated use of such equipment. If common use of equipment for multiple patients is unavoidable, clean and disinfect such equipment before use on another patient. *(Category IB)*

V.B.5.c. *In home care settings*

V.B.5.c.i. Limit the amount of non-disposable patient-care equipment brought into the home of patients on contact precautions. Whenever possible, leave patient-care equipment in the home until discharge from home care services. *(Category II)*

V.B.5.c. ii. If noncritical patient-care equipment (e.g., stethoscope) cannot remain in the home, clean and disinfect items before taking them from the home using a low-to intermediate-level disinfectant. Alternatively, place contaminated reusable items in a plastic bag for transport and subsequent cleaning and disinfection. *(Category II)*

V.B.5.d. In ambulatory settings, place contaminated reusable noncritical patient-care equipment in a plastic bag for transport to a soiled utility area for reprocessing. *(Category II)*

V.B.6. Environmental measures

Ensure that rooms of patients on contact precautions are prioritized for frequent cleaning and disinfection (e.g., at least daily) with a focus on frequently touched surfaces (e.g., bed rails, overbed table, bedside commode, lavatory surfaces in patient bathrooms, doorknobs) and equipment in the immediate vicinity of the patient. *(Category IB)*

V.B.7. Discontinue contact precautions after signs and symptoms of the infection have resolved or according to pathogen-specific recommendations in Appendix A of the HICPAC/CDC isolation guideline. *(Category IB)*

Appendix C ─ Use of Personal Protective Equipment (Gowning)

Donning PPE

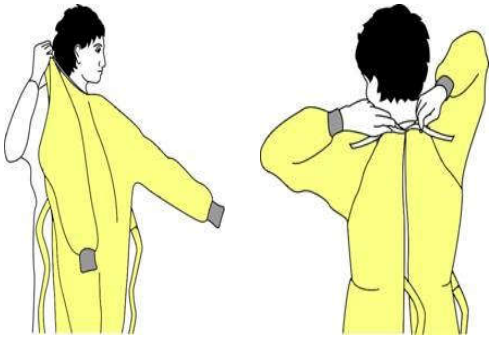
When the use of PPE other than gloves is necessary, such as when splashes or spray of blood or body fluids are possible or when attending a patient on contact precautions, it is preferable for the health care worker to don the PPE before entering the patient's room. The order for donning of PPE is as follows:

1. Gown
2. Mask
3. Eye and face protection (goggles, face shield)

4. Gloves

Donning a Gown

The health care worker needing to don a gown prior to patient care should:



1. Select the proper type and size of gown.
2. Secure the gown comfortably by tying at the neck and waist. The opening of the gown is to the back, such that the maximum protection to the individual is toward the front of the body.
3. If the proper size is not available, two gowns may be used, the first tying in the front the second tying in the back so that the contaminated area of the gown toward the front of the individual is removed first.

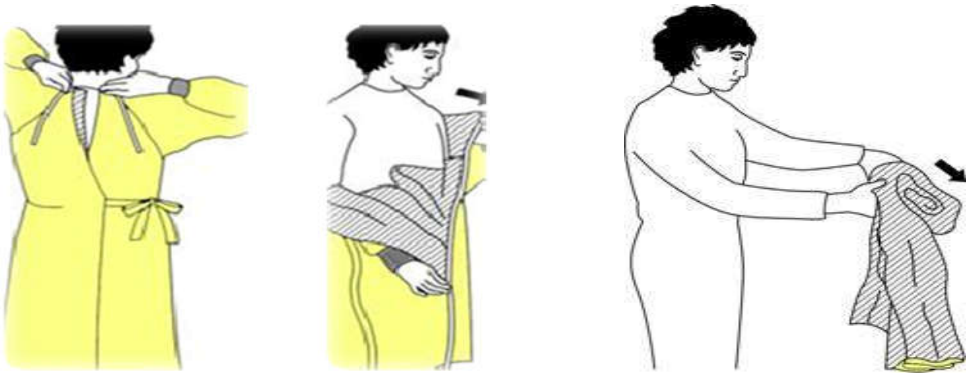
Removal of PPE

After attending a patient in which PPE was used, items should be removed and discarded before leaving the patient's room. Personnel should avoid touching equipment, environmental surfaces, and other items before PPE is removed and hand hygiene is performed. The sequence for removal of articles should be as follows:

1. Gloves
2. Eye Protection
3. Gown
4. Mask

De-Gowning

Gowns should be removed carefully to prevent contamination of the health care workers clothing, hands, and personal items. If at any time during removal, the individual's hands become visibly contaminated, hand washing should be performed before continuing to remove PPE.



To properly remove a gown:

1. Untie gown at the waist and neck.
2. Holding gown from the inside, peel away from neck and shoulders. Allow gown to turn inside out as arms are removed with the contaminated front facing inward.
3. Roll into a bundle away from the body, clean side out.
4. Discard appropriately.
5. Perform hand hygiene immediately following removal.

Taken from: Centers for Disease Control and Prevention. “Personal Protective Equipment (PPE) in Healthcare Settings” found at: https://www.cdc.gov/hai/prevent/ppe.html

This CDC link features downloadable instructional posters and training information in the proper use of all types of personal protective equipment used in the health care setting.

Appendix D — Get Smart for Healthcare

In 2009, the Centers for Disease Control and Prevention (CDC) launched the “Get Smart for Healthcare” campaign to promote improved use of antibiotics in acute-care hospitals and in 2013, the CDC highlighted the need to improve antibiotic use as one of four key strategies required to address the problem of antibiotic resistance in the U.S. Improving the use of antibiotics in health care to protect patients and reduce the threat of antibiotic resistance is a national priority. Antibiotic stewardship refers to a set of commitments and actions designed to optimize the treatment of infections while reducing the adverse events associated with antibiotic use. CDC recommends that all acute care hospitals implement an antibiotic stewardship program (ASP) and outlined the seven core elements which are necessary for implementing successful ASPs.

Summary of Core Elements of Hospital Antibiotic Stewardship Programs

- Leadership Commitment: Dedicating necessary human, financial and information technology resources.
- Accountability: Appointing a single leader responsible for program outcomes. Experience with successful programs show that a physician leader is effective.

- Drug Expertise: Appointing a single pharmacist leader responsible for working to improve antibiotic use.
- Action: Implementing at least one recommended action, such as systemic evaluation of ongoing treatment need after a set period of initial treatment (i.e. “antibiotic time out” after 48 hours).
- Tracking: Monitoring antibiotic prescribing and resistance patterns.
- Reporting: Regular reporting information on antibiotic use and resistance to doctors, nurses and relevant staff.
- Education: Educating clinicians about resistance and optimal prescribing.

More information can be found at: https://www.cdc.gov/getsmart/healthcare/

Appendix E — Florida Department of Health, Health Care-Associated Infection Prevention Program Contacts

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Appendix F — Florida Infection Control Organizations

Florida Department of Health: The Department provides the infection control community with a variety of resources. All of the 67 county health departments (CHDs) have epidemiologists and disease control professionals. In addition, the state has several epidemiologists and other resources available to assist in the prevention and control of infectious diseases including antibiotic-resistant organisms. To report a case of a notifiable disease, report an outbreak, or get consultation on a public health disease control problem, please call your local CHD or call the Bureau of Epidemiology at **850-245-4401** (24/7/365 accessibility). Contact information for all CHD epidemiologists can be found at http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/surveillance-and-investigation-guidance/_documents/chd-epi-contacts.pdf

Additional information can be found at: **Florida Department of Health, Bureau of Epidemiology, Division of Disease Control & Health Protection** http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/surveillance-and-investigation-guidance/contact.html .

Florida Professionals in Infection Control (FPIC): FPIC provides scientifically based infection control and epidemiological principles and practices through education, networking, and consultation to members, other organizations, and health care professionals to promote the well being of the community at large. FPIC has annual education conferences for the infection control community. Further information can be obtained at: http://www.flpic.com/.

Association for Professionals in Infection Control (APIC): APIC is an international infection control organization. APIC's mission is to improve health and patient safety by reducing risks of infection and other adverse outcomes. The Association's more than 11,000 members have primary responsibility for infection prevention, control and hospital epidemiology in health care settings around the globe. APIC advances its mission through education, research, collaboration, practice, and credentialing. APIC has several chapters in the state that meet on a regular schedule. Your county health department or infection control professional at most hospitals should be able to provide you with local chapter contacts. Further information can be obtained at: www.apic.org.

Florida APIC Chapters:

008 Miami-Dade County
050 Northeast Florida
054 Broward/Palm Beach Counties
055 Bay Area
091 West Central Council Florida
092 Central Florida
103 Suwannee Regional Florida

120 Southeast Triangle