

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

March 2010



REVISED SUMMER, 2009

SECTION	PAGE
I. Statement of Purpose	1
II. Definitions	2
III. Introduction	5
IV. Background	6
A. Methicillin-Resistant <i>Staphylococcus aureus</i> (MRSA)	
B. Vancomycin-Resistant Enterococci	
C. <i>Clostridium difficile</i>	
D. Multidrug-Resistant Gram-Negative Bacilli (MDR-GNB)	
1. <i>Acinetobacter baumannii</i>	
2. <i>Klebsiella pneumoniae</i> and other carbapenemase-producing <i>Enterobacteriaceae</i>	
V. Colonization vs. Infection	9
VI. Epidemiology	10
VII. Control Measures	14
VIII. Decolonization Therapy	18
IX. Prevention	20
Institution-Specific Control Measures	20
1. Acute Care Facilities	
2. Long-Term Care Facilities	
3. Home Healthcare/Hospice	
4. Doctors' Offices/Outpatient Clinics	
5. Dialysis Settings	
6. Schools for the Physically and Mentally Challenged	
7. Assisted Living Facilities/Rest Homes/Retirement Centers	
8. Rehabilitation Hospitals	
9. Psychiatric Hospitals	
10. Correctional Facilities	
11. Patients Discharged to Their Homes	
12. EMS (Emergency Medical Services) and Non-Emergent Transport	

X.	Outbreak Control	29
XI.	The Infected or Colonized Healthcare Worker	30
XII.	Antibiotic Resistance in Animals	31
XIII.	Control of MRSA in Community Settings	31
XIV.	Vancomycin Non-Susceptible <i>Staphylococcus</i> – an Emerging Pathogen	36
XV.	References	38
XVI.	Resources	43
	Reportable Diseases in Florida	45
	Appendix A – Standard Precautions	46
	Appendix B – Contact Precautions	52
	Appendix C – Use of Personal Protective Equipment (Gowning)	55
	Appendix D – 12-Step Campaign to Prevent Antimicrobial Resistance Among Long-Term Care Residents.	57
	Appendix E – Task Force Members	59
	Appendix F – Florida Infection Control Organizations	60

I. Statement of Purpose

This document is an update of the Florida Department of Health, “Guidelines for the Control of Antibiotic Resistant Organisms, 1999.” In the time since the 1999 guidelines were released, many advances in the prevention and control of drug-resistant organisms have been developed, largely in response to increasing antimicrobial resistance and to fewer available options for treatment.

These expanded guidelines include new information on prevention and infection control issues in the management of antibiotic-resistant organisms, including methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE), and of newer problematic microbes, such as *Clostridium difficile*, and multidrug-resistant gram-negative organisms such as *Acinetobacter baumannii* and *Klebsiella pneumoniae*. This update will also address Community-Associated MRSA (CA-MRSA) and antibiotic resistance in animals.

Since no single approach to the control of antibiotic-resistant organisms is appropriate for all healthcare facilities, these guidelines will review routine control measures appropriate for all settings and specific measures for a number of healthcare settings that frequently encounter these organisms.

This document is not a guide to 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 healthcare team. These guidelines also do not and are not intended to encompass the whole body of knowledge on this subject. Many resources from the Centers for Disease Control and Prevention (CDC) and other professional infection control organizations are provided for review of in-depth and supplemental information.

The audience for these guidelines may 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 healthcare facilities including county health departments (CHDs).

II. Definitions

Acinetobacter baumannii – A ubiquitous species of gram-negative 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 for the purpose of determining if the patient is colonized with a multidrug-resistant organism or other pathogen of epidemiologic importance.

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) and *Clostridium difficile*-Associated Disease (CDAD)** – The disease manifestation resulting from infection with *C. difficile*, characterized by diarrhea, which may progress to pseudo-membranous colitis and toxic mega-colon. The term *Clostridium difficile* Infection (CDI) is replacing the older name for this disease, *Clostridium difficile*-Associated Disease (CDAD).

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

Cohort – Two or more residents colonized or infected with the same antibiotic-resistant organisms, physically separated from other residents 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 – In addition to Standard Precautions, Contact Precautions or the equivalent are used with specified patients known or suspected to be infected or colonized with epidemiologically important micro-organisms that can be transmitted by direct contact with the patients or indirect contact with environmental surfaces or patient-care items in the patients' environment. Contact precautions include proper patient placement, and the use of personal protective and environmental measures as recommended in the Healthcare Infection Control Practices Advisory Committee/Centers for Disease Control and Prevention (HICPAC/CDC) Isolation Guidelines.

Community-Associated MRSA (CA-MRSA) – The CDC defines CA-MRSA as a culture-confirmed MRSA infection with the culture taken within 48 hours after admission to a hospital if the patient did not have any of the following in the previous year: hospitalization, surgery, residency in a long-term care facility, or hemodialysis/peritoneal dialysis, or if during the present admission had indwelling percutaneous devices or catheters. This is an operational definition of CA-MRSA infections, excluding certain criteria, to differentiate from Healthcare-Associated MRSA infections. Many CA-MRSA infections do not require hospitalization.

Decolonization therapy – Topical and/or systemic antibiotic treatment administered for the purpose of eliminating the carriage state in an individual. Typically associated with MRSA.

Enterococcus species (*E. faecium* and *E. faecalis*) – A ubiquitous gram-positive micro-organism that commonly colonizes 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 β -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 sp.*, *E. coli*, *Ps. aeruginosa*, *Enterobacter sp.*, *Acinetobacter sp.*)

Healthcare-Associated Infection (HAI) – Infection associated with a hospital or healthcare setting, usually secondary to the patient's original condition. The phrase HAI has replaced "nosocomial" in current terminology.

Healthcare-Associated MRSA (HA-MRSA) – The CDC defines HA-MRSA as healthcare-associated if the original admission criteria for hospitalization is within 48 hours before culture was obtained or if in the year before the present hospitalization, the patient had any one of the following: hospitalization, surgery, residency in a long-term care facility, hemodialysis or peritoneal dialysis, or at the present admission had indwelling percutaneous devices or catheters.

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 β -lactamase enzyme produced by certain strains of enteric bacilli (e.g., *Klebsiella sp.*, *E. coli*, *Enterobacter sp.*) allowing for increased resistance to the carbapenem and cephamycin groups of antimicrobial agents, in addition to the extended-spectrum cephalosporins.

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

Methicillin-Resistant *Staphylococcus aureus* (MRSA) – A strain of *Staphylococcus aureus* resistant to methicillin. Such strains also are resistant to oxacillin, nafcillin, cephalosporins, and imipenem.

Outbreak – The Florida Department of Health, Division of Disease Control under 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 of time and geographical area. For diseases where the expected number is zero, a single case may constitute an outbreak."

Personal Protective Equipment (PPE) – Occupational Safety and Health Administration (OSHA) defines PPE as "specialized clothing or equipment worn by an individual for protection against infectious materials." PPE is to be used when administrative and engineering controls are insufficient to adequately protect the healthcare worker from splash/spray 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 healthcare worker while in contact with infective patients.

Standard Precautions – Basic infection control precautions designed for the care of all patients in hospitals, regardless of their diagnosis or presumed infection status. 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.

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

Transmission-Based Precautions – Transmission-Based Precautions are designed for patients documented as or suspected to be infected/colonized with highly transmissible or epidemiologically important pathogens for which additional precautions beyond Standard Precautions are necessary. 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) – Strains of *Enterococcus* species resistant to vancomycin.

III. Introduction

Infectious diseases caused by multiple drug-resistant organisms (MDRO) are a major and costly public health problem. A recent study by (Klevins et al. 2007) estimated that in 2005, methicillin-resistant *Staphylococcus aureus* (MRSA) was associated with approximately 94,000 life-threatening infections and 19,000 deaths in the U.S. Though less significant than MRSA, data also indicate that other drug-resistant organisms such as Vancomycin-resistant *Enterococcus* (VRE), *C. difficile*, and *Acinetobacter baumannii* are also major contributors to infectious disease morbidity and mortality.

Most commonly associated with healthcare-acquired infections (HAI), multidrug-resistant organisms 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 MRSA-related costs estimates the economic burden to be greater than \$35,000 per infection compared to less than \$14,000 for a non-resistant pathogen (Stone, AJIC 2002). Data from other MDRO studies also indicate that VRE, *C. difficile*, *A. baumannii* and other drug-resistant organisms may also contribute significantly to the healthcare burden (Cosgrove, CID 2006).

Additionally, the emergence of Community-Associated MRSA has changed the epidemiology of MRSA. CA-MRSA routinely causes infection in healthy individuals outside the healthcare system. Public and private settings in which close person-to-person contact takes place are potential reservoirs of transmission.

No single remedy exists for antibiotic resistance. A coordinated multidisciplinary approach is required to address the problem. Comprehensive use of general infection control practices and procedures is essential for the prevention of infections with drug-resistant organisms. In addition, 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, *Clostridium difficile*, or other MDRO may require additional transmission-based infection control measures be taken.

Currently, MRSA, VRE, *Clostridium 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 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 healthcare settings including acute care settings, long-term care (LTC) facilities, rehabilitation facilities, psychiatric facilities, hospice, home healthcare, outpatient clinics, correctional healthcare, 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 considered to be resistant to all beta-lactam antibiotics (including penicillins, cephalosporins, and cephamicins). 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 healthcare-acquired 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.

More recently, MRSA has also been increasing in the community in individuals without healthcare-associated risk factors. In a 2005 study of *S. aureus* in Florida outpatient settings, 49.7% of *S. aureus* isolates were reported to be MRSA (Kolar and Sanderson, 2007). The strains of these CA-MRSA infections are genetically distinct from the typical HA-MRSA commonly encountered in healthcare settings.

1. **Healthcare-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 are frequently seen in younger persons and involve skin and soft tissue infections. Outbreaks of these infections have been described in numerous populations including people found in correctional facilities (jails and prisons), sport teams, men who have sex with men, commercial fishermen, and minority populations. Resistance to multiple classes of antimicrobials is uncommon. The most common CA-MRSA strain in the United States, the USA300 strain, is routinely resistant to erythromycin. Many of the CA-MRSA infections may be effectively treated with good wound care with or without oral antibiotics, while more resistant strains may require intravenous vancomycin.

Frequently, these community-associated cases have initially been misdiagnosed as spider bites. This misdiagnosis prevents timely treatment which may result in a progression of the infection and increased chance of transmission to others.

Although genetic variation exists between the types of MRSA, the community-associated variant has been found in healthcare settings and is capable of causing invasive infections and serious complications. 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 epidemiologic criteria of the infection.

B. Vancomycin-Resistant Enterococci (VRE)

Vancomycin-resistant enterococci were initially reported in 1986 in Europe. In the last two decades enterococci have become recognized as a leading cause of healthcare-associated bacteremia, surgical wound infection, and urinary tract infection. According to the National Nosocomial Infection Surveillance System (NNIS), prior to 1990 the occurrence of VRE infections in ICU's in the U.S. was less than 1% of all enterococcal infections reported; by 1993 the occurrence had risen to 13.6% and ten years later, in 2003, VRE infections had more than doubled to 28.5%. Though the occurrence of VRE in hospitals was typically associated with larger hospital size (more than 200 beds) and university affiliation, hospitals of other sizes have also reported increases in endemic rates and clusters of VRE colonization and infection, indicating the upward trend is not limited by institution size. Data reported to the CDC during 2004 showed that VRE caused about one of every three infections in hospital intensive care units. This increase poses several problems, 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.

In addition, evidence suggests the vancomycin-resistant gene (VAN A gene) present in VRE may be transmitted to other gram-positive organisms, such as *S. aureus*. Though VRE is neither more infectious nor more virulent than 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 healthcare-associated diarrhea in the United States. In recent years, the incidence of *Clostridium difficile* infections (CDI) has risen in hospitals across the U.S. and Canada, including Florida, where a recent study has indicated an increase in the number of discharges coded for CDI in hospitals over the past several years. One reason for the increase in North America may be attributable to a new "epidemic strain" of *C. difficile* recently described. This new "epidemic strain" produces a greater volume of toxin than previously known strains, and is the likely 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 healthcare 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 healthcare facilities to eliminate the environmental spores in order to stop the spread of the disease. In addition, the 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 healthcare-associated infections for many years and may be found in patients in virtually all healthcare settings as either infection or colonization. In recent years, multidrug-resistant gram-negative organisms have increased in nearly all healthcare settings. Though resistance to any class of antibiotic can occur, it occurs mainly among the extended spectrum beta-lactam antimicrobial agents. This is mainly due to the ability of these organisms to produce extended spectrum beta lactamase enzymes (ESBLs), which make 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 bacteria 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 other tier 2, intensified control efforts when cases of MDR-GNB are identified. Two of the significant MDR-GNB include:

1. *Acinetobacter baumannii*

In recent years, multidrug-resistant *A. baumannii* (MDR Ab) has increased in prominence as a healthcare-associated pathogen. Primarily affecting hospital ICU's, *A. baumannii* is associated with longer hospitalizations, greater economic cost, and increased morbidity. Infection due to MDR Ab can occur sporadically, but is more commonly associated with outbreaks. MDR Ab infections typically manifest as respiratory (ventilator 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. MDR Ab is an ESBL-producing gram-negative bacilli that routinely exhibit resistance to multiple classes or even all classes of antimicrobial drugs leading to greater difficulty in treatment.

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, as well as long-term outbreaks.

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

2. *Klebsiella pneumoniae* and other Carbapenemase-Producing Enterobacteriaceae

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 as well as carbapenem antibiotics, e.g., imipenem, ertapenem, meropenem).

In the U.S., a type of carbapenemase referred to as KPC (*Klebsiella pneumoniae* carbapenemase) has been demonstrated in several species of enteric bacilli but is most commonly found in strains of *Klebsiella pneumoniae*. A KPC-producing strain of *Klebsiella 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 directly 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 web site at:
http://www.doh.state.fl.us/disease_ctrl/epi/httopics/anti_res/MRSA.html.

V. Colonization vs. Infection

- A. Colonization is the presence, growth, and multiplication of the organism without observable clinical symptoms or immune reaction.
 1. **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 healthcare workers may become colonized with MRSA (as they may with susceptible *S. aureus*), they rarely develop infections.
 2. **Enterococci** – Are normally found in the bowel, the female genital tract, and the mouth. Strains resistant to vancomycin (VRE) may survive and multiply, resulting in a colonization of the bowel.
 3. ***C. difficile*** – Commonly found in the gastrointestinal tract, the organism including drug-resistant and “epidemic strains” can asymptotically colonize the bowel of individuals. Patients receiving antimicrobial therapy may be especially susceptible to developing CDI. Generally, there are more asymptomatic carriers than CDI patients. Though no symptoms may be evident, the colonized patient may test positive for the organism or its toxin(s).
 4. **Multidrug-Resistant Gram-Negative Bacilli (MDR-GNB)** – Colonization may occur on the skin (healthy skin and wounds) and the respiratory tract of both healthcare workers and patients. Colonization may also occur in the bowel where these organisms may occur as normal intestinal flora. As with other MDROs, infection of healthcare workers is rare.
 - a. ***A. baumannii*** – Colonization may occur on 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 healthcare workers
- B.** 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 disease such as pneumonia, bloodstream infections, urinary tract infections, gastrointestinal infections, and skin infections.

VI. Epidemiology

A. Healthcare-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, GI, 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 reservoir 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 a 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-old.
 - 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.

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. Reservoirs** – Colonized and infected persons are the major reservoir of CA-MRSA. Animals, including pets, have also been documented as sources of infection or contact leading to colonization.
- 3. Risk Factors** – The risk factors associated with CA-MRSA infections are:
 - a. Inclusion in a high-risk population.
 - b. Younger age.
 - c. Participating in contact sports.
 - d. Sharing towels or athletic equipment.
 - e. Having a weakened immune system.
 - f. Living in crowded or unsanitary conditions.
 - g. Association with healthcare workers.
 - h. IV drug use.
 - i. Men having sex with men.

Data (Klevens et al. 2007) indicate that for 2005, of the estimated 94,360 invasive MRSA infections, most were HA-MRSA with 58.4% community onset HA-MRSA and 26.6% hospital onset HA-MRSA. Comparatively, CA-MRSA was estimated to be 13.7% of invasive MRSA infections, a figure which would represent only a fraction of the total CA-MRSA infections if non-invasive CA-MRSA infections were included for the time period.

C. Vancomycin-Resistant Enterococci

- 1. Mode of Transmission** – Recent reports have demonstrated that 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 genitourinary tract. Most infections with these micro-organisms have been attributed to the patient's endogenous flora. However, VRE may be spread by healthcare workers through either inadequate hand hygiene or through contact with items such as bedrails, 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 healthcare-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. This includes 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 healthcare 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 have not been properly disinfected. Contaminated surfaces may include bedrails, 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 patient population, however the major factors for *C. difficile* infection and colonization are:
 - a. Recent or on-going antimicrobial therapy. In certain circumstances onset of infection may occur after as little as one dose.
 - b. Staying in a healthcare 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) – *A. baumannii*, *K. pneumoniae* and other Enterobacteriaceae

1. **Mode of Transmission** – As with other MDROs, the primary mode of transmission is patient-to-patient via hand carriage from contaminated healthcare 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** – Have been shown to be similar to those of other MDROs and may include:
 - a. Prolonged hospital stay.
 - b. Exposure to invasive medical procedures.
 - c. Indwelling medical devices (catheters).
 - d. Broad-spectrum antibiotic use.
 - e. Severity of underlying illness.
 - f. Mechanical ventilation (*A. baumannii*).

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 **all unnecessary antibiotic** use in all patients, including, but not limited to **vancomycin**. Methods to ensure the prudent use of vancomycin for strictly appropriate indications should be in place and 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 Healthcare Settings, Recommendations of the Healthcare 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 micro-organisms to both patients and personnel in healthcare settings. **Healthcare workers should be required to perform hand hygiene (hand washing for approximately 15 to 20 seconds) or use of an alcohol-based cleanser before leaving a patient room whether or not gloves were worn.**

The indications for hand hygiene are specified in the CDC's 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 *C. difficile*, 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.

3. **Communications to Maintain Appropriate Patient-Based Infection Control Precautions Between and In Facilities**
 - a. A facility (e.g., hospitals, LTC facilities, etc.) transferring the 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 that a patient admitted from another institution is infected or colonized with a MDRO within 48 hours of admission, should inform the transferring institution as soon as possible.
 - c. Healthcare 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 a MDRO, identifying such patients at the time of readmission to the facility can assist the admissions department and nursing personnel to promptly implement appropriate infection control precautions. This measure requires some indication in the patient's medical record and/or computer file, which is 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 Healthcare 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 for care of individuals with MDROs. These would include cases of active MRSA, VRE, CDI, 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. **Healthcare 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 are not to 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: Visitor Information Tool Kit at www.APIC.org.

8. Surveillance

Culture and susceptibility data should be reviewed routinely to detect MRSA, VRE, and other MDROs, and a line listing of cases (infection or colonization) should be maintained. It should be recorded whether cases are healthcare-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 over the expected (usual) level of a disease within a geographic area (e.g., hospital, long-term care facility).

Active Surveillance Culturing (ASC), the culturing of patients usually at the time of admission to determine MRSA status, is a controversial surveillance method with divergent conclusions among the Healthcare Infection Control Practices Advisory Committee (HICPAC), the Association of Professionals in Infection Control and Epidemiology (APIC), and the Society for Healthcare 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 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 healthcare 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 healthcare 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 and VRE can be found in “EPA’s Registered Antimicrobial Products Effective Against Methicillin-Resistant *Staphylococcus aureus* (MRSA) and Vancomycin Resistant *Enterococcus faecalis* or *faecium* (VRE).” 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 including all surfaces (floors, bedrails, toilets), and patient care items (rectal thermometers, other equipment) that may become contaminated with feces. Thorough cleaning should be followed by disinfection with a 10% hypochlorite solution (bleach), in accordance with 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 situations such as frequent or recurrent outbreaks, it may be appropriate or necessary to monitor personnel for adherence to housekeeping policies. This might include the use of cleaning checklists for personnel or even direct observation, if necessary. Routine environmental culturing (bacterial culturing of swabbed surfaces) for contamination is not recommended. This applies to all MDROs.

Dedication of non-critical patient-care equipment to individuals or cohorting patients with the same pathogen may also be useful in preventing 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 is critical in preventing transmission.

10. Administrative Support

Administrative support should be included as a control measure in any multi-faceted infection control program. Interventions that require fiscal or human resources such as addition of alcohol rub stations, availability of appropriate PPE (gloves, gowns, masks) or additional staffing must have the support of institutional leadership. 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 treatment may be adjusted accordingly and therapy stopped when the infection has resolved. The facilities consulting pharmacist or pharmacy service may be utilized for assistance in establishing these measures. The CDC's "Campaign to Prevent Antimicrobial Resistance" features a 12-step plan, which includes several steps for the use and control of antimicrobials.

VIII. Decolonization Therapy

Decolonization therapy is the use of antibiotics to treat MRSA colonized patients for the purpose of reducing the magnitude of the colonization or eliminating 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 intervention, monitoring is necessary to determine the transmission rate of MRSA in the treatment group and any developing resistance to mupirocin. 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 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

1. **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 such as those 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/or 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.**
2. **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.
3. **VRE** – Decolonization is not recommended, as there is no clinically proven decolonization regimen for these organisms.
4. **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.

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

B. Healthcare Workers

- 1. MRSA** – Healthcare personnel should be cultured only if epidemiologic data implicates 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 healthcare workers should be encouraged to report symptoms of infection without fear of reprisal. Identified **infected** personnel with hand or 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/or 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 healthcare 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 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, "The Infected or Colonized Healthcare Worker".

- 2. VRE** – To date, carriers of enterococci have been rarely implicated in transmission of this organism. Facilities with continued VRE cross-transmission should review adherence to standard and contact precautions. VRE decolonization of healthcare 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

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, form of healthcare 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 own unique circumstances and needs.

Recommendations are included for several settings other than acute care facilities in order to describe appropriate measures to better meet the specific needs and circumstances of facility types.

Access to healthcare must not be denied or limited on the basis of 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* 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 Healthcare Settings 2007" with consideration of what is possible, practical, and prudent.

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

- Healthcare Infection Control Practices Advisory Committee (HICPAC) "Management of Multidrug-Resistant Organisms in Healthcare Settings 2006"
- "SHEA Guideline for Preventing HAI Transmission of Multidrug-Resistant Strains of *Staphylococcus aureus* and *Enterococcus*".
- Guide to the Elimination of Methicillin-Resistant *Staphylococcus aureus* (MRSA) Transmission in Hospital Settings. March 2007. 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.

2. Long-Term Care Facilities

- a. Admission to licensed facilities should not be denied on the basis of infection or colonization with multidrug-resistant organisms. This includes MRSA, VRE, *C. difficile*, *A. baumannii* and other MDROs.**
- b. 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 room. 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 of stool and urine or have bodily fluids well contained. These requirements may also be applied to residents on 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.

- c. Precautions** – The implementation of Contact Precautions in addition to Standard Precautions should be based upon the site and severity of 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.
- d. Standard Precautions** (Appendix A) are indicated for:
 - (1) 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.
 - (2) The VRE or *C. difficile* patient who is colonized in the gastrointestinal tract and continent of stool and capable of maintaining hygienic practices (e.g., hand hygiene).
- e. Contact Precautions** (Appendix B) are indicated for:
 - (1) Patients who have indwelling urinary catheter-associated MRSA, VRE, or other MDRO urinary tract infection or colonization. This can be based on facility protocol.
 - (2) Patients who have wounds or other body sites heavily colonized or infected with MRSA, VRE, or other MDRO.
 - (3) Patients who have tracheostomies with colonized or infected respiratory tracts and who are unable to handle secretions.
 - (4) All identified cases of an MDRO, when a cluster of HAI (institution-acquired) infections are recognized.
 - (5) Patients with active gastrointestinal VRE or CDI, particularly those which are incontinent of stool.

The HICPAC/CDC 2006 MDRO Guideline recommends that "LTCFs modify contact precautions to allow 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."

f. Room Placement for Patient on Contact Precautions

- (1) Ideally, the patient on Contact Precautions should be placed in a private room.

- (2) When a private room is not available, the patient may be placed in a room with a patient(s) with the same micro-organism, but no other known infection or colonization with a different MDRO. This practice is known as cohorting.
- (3) 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.

g. Gloves

- (1) In addition to wearing gloves as outlined under Standard Precautions, wear gloves (clean, single-use, non-sterile gloves are adequate) when providing direct patient care or handling items potentially contaminated by the patient on Contact Precautions.
- (2) During the course of providing care of 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).
- (3) Remove gloves and **perform hand-asepsis immediately** before leaving the patient's environment. The use of alcohol gel is acceptable unless hands are visibly soiled, 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.

h. Gowns

- (1) 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.

- (2) Remove the gown before leaving the patient environment. In order to avoid transfer of micro-organisms to other patients or environments, ensure that clothing does not contact potentially contaminated environmental surfaces after gown removal (Appendix C).
- i. **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.
- j. **Patient Care Equipment**

 - (1) When possible, dedicate the use of non-critical 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.
 - (2) Electronic thermometers used with the VRE or CDI 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.
 - (3) If 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.
- k. **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 the healthcare worker clothing. (See Appendix C for further information).
- l. **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.
- m. **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.
- n. **Routine and Terminal Cleaning** – The room and bedside equipment of patients on Contact Precautions are cleaned using the same procedures used for all patients in accordance with Standard Precautions. Multiple antibiotic-resistant organisms are susceptible to disinfectants, as are antibiotic-sensitive strains with the exception of *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."
- o. **Termination of Contact Precautions**

 - (1) **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 of time. 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. A recent survey of Florida hospitals found no clear consensus on policy for termination of contact precautions of known MRSA patients, therefore the decision to discontinue contact precautions should be based on the “best practices” for MRSA control and what is reasonable for the facility given its patient population.

- (2) **VRE** – For patients colonized/infected with VRE, there is no recommended strategy for discontinuing of 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.
- (3) **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.
- (4) **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.

The Centers for Disease Control and Prevention (CDC) features a 12-step campaign to prevent antimicrobial resistance among long-term care residents. This plan is outlined in Appendix D and is available as a downloadable poster from the CDC web site at: http://www.cdc.gov/DRUGRESISTANCE/healthcare/ltc/12steps_ltc.htm.

3. **Home Healthcare/Hospice** – In addition to Standard Precautions, healthcare personnel providing care in the home should follow the recommended practices for Contact Precautions when indicated as described by the CDC for acute care facilities HICPAC/CDC Isolation Guideline. Specifically, home healthcare workers should focus on preventing cross-transmission via the **clinical bag, clothing, and equipment, which is carried to and from the home by the healthcare professional**. 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 prior to returning to the clinician’s vehicle or facility for disinfection. Hands should be washed or disinfected with a waterless antiseptic agent before leaving the 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.** Patients exhibiting such symptoms should be removed from the waiting area to an exam room as soon as possible. Once a patient has been identified with a multiple antibiotic-resistant organism, 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) prior to use for another patient. Refer to the CDC Standard Precautions and Contact Precautions regarding the proper use of gloves, gowns, handling linen, laundry, and isolation room solid waste. (http://www.cdc.gov/ncidod/dhqp/gl_isolation_contact.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:

- a. 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.
- b. 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.
- c. Personnel should not carry common medical supplies or medications in their pockets.
- d. 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.
- e. 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. "Recommendations for Preventing Transmission of Infections among Chronic Hemodialysis Patients" published by the CDC. *MMWR* 2001; 50 (13-23) provides detailed guidelines for the prevention of infections including the MDROs as well as 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 multiple drug-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 prior to using school materials). Shared items such as books and computer keyboards must be cleaned and disinfected with an EPA-registered disinfectant (used as directed) prior to 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 prior to 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 on the basis of colonization with multiple antibiotic-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 education should be emphasized in employee and patient education efforts.
- 8. Rehabilitation Hospitals** – This patient population is generally not immune-compromised; thus, the risk of colonization with multiple antibiotic-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 own care (e.g., wound, indwelling urinary). 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 VRE would be contrary to the philosophy and policy of most of these facilities. However, patients with MRSA, VRE, 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 over-crowded, 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: <http://www.bop.gov/news/PDFs/mrsa.pdf>. These comprehensive guidelines include screening, surveillance, diagnosis, treatment, infection control, and outbreak control. In addition to the 2005 Bureau of Prison MRSA guidelines, infection control guidelines for jails and prisons that include MRSA have been published (Bick, CID 2007).

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 healthcare facilities or providers of a patient's prior colonization/infection with a MDRO when the patient arrives for treatment. Family members should wash their hands with an antibacterial soap 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. EMS (Emergency Medical Services) and Non-Emergent Transport

- a. EMS and Non-Emergent transport personnel should be advised if any patient has infectious MRSA, VRE, CDI, or other MDRO, as well as any specific precautions required other than Standard Precautions (i.e., any of the indicators in Section 11.d.).
- b. Precautions. Standard Precautions (Appendix A) should be based upon the site and severity of infection and whether the 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.
- c. Standard Precautions (Appendix A) are indicated for:
 - (1) The patient who is nasally colonized with MRSA.
 - (2) The VRE or *C. difficile* patient who is colonized in the gastrointestinal tract and continent of stool.
- d. Contact Precautions (Appendix B) are indicated for:
 - (1) The patient who has an indwelling urinary catheter-associated MRSA or VRE urinary tract infection or colonization.
 - (2) 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.
 - (3) The patient who has a tracheostomy with a colonized or infected respiratory tract and who is unable to contain secretions.
 - (4) The VRE or *C. difficile* patient with a colostomy/ileostomy when secretions are not contained or contamination is likely.
- e. Gloves worn as indicated under Standard Precautions are adequate. Wash hands with soap and water after removal of gloves.

- f. Gowns should be worn:
 - (1) When providing direct patient care when there is an anticipation of substantial contact with the patient.
 - (2) If the patient is incontinent or has diarrhea, an ileostomy, a colostomy, or wound drainage not contained by a dressing.
- g. Masks should be worn as specified in Standard Precautions and in Transmission-based precautions with patients colonized/infected in the respiratory tract exhibiting symptoms of coughing and purulence.
- h. Patient Care Equipment
 - (1) Equipment should be adequately cleaned and disinfected with an EPA-registered disinfectant (used as directed) prior to use with another patient.
 - (2) All linen should be properly placed in laundry bags at the receiving facility. Care should be used to avoid contact with healthcare worker clothing.
 - (3) Vehicle and equipment should be cleaned and disinfected routinely with an EPA-registered disinfectant (used as directed) using Standard Precautions.

X. Outbreak Control

An outbreak is generally defined as an excess over the expected (usual) level of disease within a population or region. For healthcare facilities, an outbreak may occur within a wing, ward, unit or maybe facility-wide. Outbreaks of MDROs can occur in a number of different settings. For the purpose of this document an outbreak is defined as cases of the same MDRO clearly in excess of normal expectancy. Prompt detection of an increase in a MDRO, particularly MRSA, VRE, 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 healthcare personnel working within the outbreak setting:

- A. Perform cultures only on personnel who are linked epidemiologically to an outbreak.
- B. If cultures are positive, exclude personnel from patient contact until carriage is eradicated or the risk of disease transmission is eliminated.
- C. Do not perform routine surveillance cultures of healthcare personnel in absence of a cluster or outbreak in which personnel are implicated.

- D. Do not exclude personnel from duty who are colonized but not epidemiologically linked to an increase in infections.

Additional Recommendations for outbreaks:

- A. All suspected outbreaks, whether they are healthcare associated, community-associated, or from another facility, should be reported to the local CHD as required by Florida statute.
- B. The Florida Department of Health (FDOH) can provide guidance and laboratory support, if needed, to control an outbreak.
- C. After consulting the FDOH, consider sending representative VRE, 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 are reportable to your local CHD.

XI. The Infected or Colonized Healthcare Worker

Healthcare workers (HCW) infected or colonized with MRSA, VRE, *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 healthcare 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.

In healthcare 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 non-intact skin of the patient (i.e., surgical wounds and tube entry sites). Service animals should also be restricted to contact with only their owners and handlers. Institutions must determine their own 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 healthcare team may consider:

- A. Including pet ownership, MRSA status of owner, pet, or both in the patient history which may assist in identifying patient risk.
- B. Pet screening, but only in cases of recurrent infection and only after reinforcement of hygiene practices. Consult with your local CHD before making the decision to screen a pet.
- C. Treatment of colonized pets is not recommended. Colonization is usually short term and decolonization has not been demonstrated to be effective.
- D. 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 has emerged in the general population as a frequent cause of skin infections (boils, abscesses, furuncles, etc.), 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 and among varied populations. CA-MRSA is most frequently transmitted when the following conditions, characterized by the CDC as the **5 C's**, are present:

- A. **C**rowding many people in close quarters or proximity for periods of time.
- B. **C**ontact (skin-to-skin contact), such as sports activities.
- C. **C**ompromised skin (cuts or abrasions).
- D. **C**ontaminated items or surfaces.
- E. Lack of **C**leanliness.

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

Personal Hygiene

- A. 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.
- B. Individuals should refrain from picking at pimples, scabs, and other non-intact areas of skin.
- C. Wounds or lesions should be covered and contained, dressings should be kept dry and changed frequently until infection has resolved.
- D. Avoid contact with other people's wounds or bandages.
- E. Towels and other hygiene and toiletry items, such as soap, razors, and cosmetics should not be shared.
- F. Medical attention should be sought for cuts, abrasions, or lesions which appear to be infected.

Control Measures for Healthcare Practitioners

- A. 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.
- B. 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.
- C. Practice Standard Precautions (Appendix A) when treating possible or known infections.
- D. Treat wounds appropriately and use antibiotics judiciously. When possible, treat based on the antibiogram; avoid fluoroquinolones, which CA-MRSA can develop resistance to quite readily, and macrolide/azalide drugs, to which MRSA strains are frequently resistant.
- E. Decolonization therapy for individuals, households, or other cohorts is not recommended.

The CDC web page, "Outpatient management of CA MRSA Skin and Soft Tissues Infections", provides additional information to assist the clinician with diagnosis and treatment of CA-MRSA infection.

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 healthcare 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), and paying special attention to frequently touched items and areas such as telephones, light switches, and door knobs. 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 healthcare provider at the time of contact (doctor's appointment, return to a healthcare facility, etc.) that they are CA-MRSA positive or have had close contact with a CA-MRSA positive individual.

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:

- A. Education of students and staff in the transmission (person-to-person contact) of CA-MRSA and individual precautions emphasizing hand hygiene to reduce the likelihood of transmission.
- B. Do not exclude colonized individuals from routine activities. Many people are asymptomatic carriers of CA-MRSA. Focusing on carriers will not decrease transmission.
- C. Teachers, coaches, and staff are encouraged to look for signs and symptoms of infection and refer the individuals to their healthcare providers and outbreaks to the local CHD.
- D. Regular housekeeping and cleaning regimens should be applied. Locker rooms and sports equipment should be cleaned and disinfected frequently with an EPA-approved disinfectant (used as directed).
- E. Laundry (uniforms, towels, etc.) should be routinely washed. Bleaching is not necessary. Items should be thoroughly dried on high heat (>160°F) and not allowed to air dry.
- F. 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.

- G. Infected individuals may be excluded from activities that increase the chance for spreading the infection (i.e., physical education, sports activities) until lesions have resolved or can be adequately covered and contained.
- H. The Florida CHDs are available as resources for education and infection control plans.

The Florida Department of Health 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 utilizing 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:

- A. Florida Department of Health, Bureau of Epidemiology; Antibiotic Resistance and Methicillin-resistant *Staphylococcus aureus* (MRSA)
- B. Centers for Disease Control, Methicillin-Resistant *Staphylococcus aureus* (MRSA) in Schools http://www.cdc.gov/ncidod/dhqp/ar_mrsa_in_schools.html

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 type of 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.

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:

- A. Encouraging personal hygiene among patrons and staff.

- B. Not allowing infected individuals with lesions that cannot be adequately covered to participate.
- C. 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.
- D. Encouraging showering at the end of activities.
- E. 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).
- F. 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.

Work Place

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

- A. Using good personal hygiene practices (i.e., frequent hand washing or use of alcohol-based hand sanitizers). This is appropriate for family and close contacts as well.
- B. Keeping wounds or lesions covered and dry.
- C. Not sharing personal items such as uniforms, PPE, clothing, and personal hygiene items.
- D. Educating workers in general safety and health measures, including education on CA-MRSA prevention in the workplace, when appropriate.
- E. Making facilities and supplies available that encourage the practice of good hand hygiene.
- F. 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.

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:

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

- B. Educating staff and inmates on methods of transmission, prevention, treatment, and containment of MRSA in the facility.
- C. Encouraging inmates to seek medical assistance for skin conditions indicative of infection or that may lead to infection.
- D. Housing individuals who have poor hygiene or draining lesions that cannot be contained separately from other inmates, if possible, until infection has resolved or is contained.
- E. 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).
- F. Developing and following a facility-wide infection control plan.

Comprehensive guidelines for control of MRSA in correctional facilities can be found at: Management of Methicillin-Resistant *Staphylococcus aureus* (MRSA) Infections August, 2005. (Federal Bureau of Prisons - Clinical Practice Guidelines)
<http://www.bop.gov/news/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 glycopeptide intermediate have been identified in the U.S. In 2002, the first two vancomycin resistant *S. aureus* 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.

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 FDOH. 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 FDOH, Bureau of Epidemiology by phone. The Florida Administrative Code also requires that cultures are saved and made available for confirmatory testing by the FDOH Bureau of Laboratories and CDC.

As soon as a patient has been identified with a laboratory-confirmed VISA or VRSA, it is essential that measures be taken immediately to prevent transmission to others and that 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 healthcare workers should provide one-on-one care.

When a patient is identified with VISA or VRSA, transmission to others must be assessed immediately, including healthcare workers and patients. The local CHD must be notified immediately when a culture is positive for VISA or VRSA. The FDOH 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 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 FDOH.
- 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 prior to transferring the patient to another facility or discharging the patient.

References

- Boyce JM, Jackson MM, Pugliese G, Murray DB et al. Methicillin-Resistant *Staphylococcus aureus* (MRSA): A Briefing for Acute Care Hospitals and Nursing Facilities. *Infect Control Hosp Epidemiol* 1994; 15:105-113.
- Boyce, JM. Preventing Staphylococcal Infections by Eradicating Nasal Carriage of *Staphylococcus aureus*: Proceeding with Caution. *Infect Control Hosp Epidemiol* 1996; 17:775-779.
- Crossley, K. The Long-Term-Care Committee of the Society for Healthcare Epidemiology of America. Vancomycin-resistant *Enterococci* in Long-Term-Care Facilities. *Infect Control Hosp Epidemiol* 1998; 19:521-525.
- Guideline for Infection Control in Healthcare Personnel, 1998; *Am. J. Infect Control* 1998; 26:289-354.
- Guideline for Infection Control in Health Care Personnel, *Infection Control and Hospital Epidemiology* 1998; 19:407-463.
- Hoffmann, Karen and Kittrell I. North Carolina Guidelines for Control of Antibiotic Resistant Organisms, Specifically Methicillin-Resistant *Staphylococcus aureus* (MRSA) and Vancomycin-Resistant Enterococci (VRE). 1997. Modified 2005.
- Hospital Infection Control Practices Advisory Committee. Recommendation for preventing the spread of vancomycin resistance: Recommendations of the Hospital Infection Control Practice Advisory Committee (HICPAC). *Am J Infect Control* 1995; 23:87-94.
- Huycke, Mark, Sahm DF, Gilmore MS. Multiple-Drug Resistant *Enterococci*: The Nature of the Problem and an Agenda for the Future. *Emerging Infectious Diseases* 1998; 4(2):239-249.
- Interim guidelines for Prevention and Control of Staphylococcal Infection Associated with Reduced Susceptibility to Vancomycin. *MMWR* 1997; 46:626-8, 635.
- Larson E. APIC guideline for hand washing and hand antisepsis in healthcare settings. *Am J Infect Control* 1995; 23:251-69.
- Organisms, Specifically Methicillin-Resistant *Staphylococcus aureus* (MRSA) and Vancomycin-Resistant *Enterococci* (VRE). Statewide Infection Control Program, Chapel Hill, NC January 1997.
- Rutala W. and the APIC Guideline Committee. APIC guidelines for selection and use of disinfectants. *Am J Infect Control* 1996; 24:313-42.
- Smith P, Rusnak P. Special Communication Infection prevention and control in the long term-care facility. *Am J Infect Control* 1997; 25:488-512.
- Wenzel P, Reagan R, Bertino J, Baron E, Arias K. Methicillin-resistant *Staphylococcus aureus* outbreak: A consensus panel's definition and management guidelines. *Am J Infect Control*; 1998; 26:102-110.

Additional References:

Acinetobacter baumannii Infections Among Patients at Military Medical Facilities Treating Injured U.S. Service Members, 2002-2004.

www.cdc.gov/mmwr/preview/mmwrhtml/mm5345a1.htm - Vol 53, No 45;1063.

Barton, Michelle MBBS, Hawkes, Michael MDCM, Moore, Dorothy PhD MD, Conly John MD, Nicolle, Lindsay MD, Allen, Upton MBBS, Boyd, Nora RN, Embree, Joanne MD, Van Horne, Liz RN CIC, Le Saux, Nicole MD, Richardson, Susan MDCM, Moore, Aideen MD, Tran, Dat MD, Waters, Valerie MDCM, Vearncombe, Mary MD, Katz, Kevin MDCM MSc, Weese, Scott DVM, Embil, John MD, Ofner-Agostini, Marianna RN PhD, Ford-Jones, E Lee MD; The Writing Group of Expert panel of Canadian Infectious Disease, Infection Prevention and Control, and Public Health Specialists. Guidelines for the prevention and management of community-associated methicillin-resistant *Staphylococcus aureus*: A perspective for Canadian healthcare practitioners. *Can J Infect Dis Med Microbiol* Vol 17 Suppl C September-October 2006. Available at: Full-Text, MRSA Guidelines Supplement, Pulsus Group Inc.

Bergogne-Berezin, E. and Towner, KJ. *Acinetobacter* spp. as Nosocomial Pathogens: Microbiological, Clinical, and Epidemiological Features. *Clin Microbiol Rev* 1996; 9:148-165.

Bick, J. Infection Control in Jails and Prisons. *CID*, 2007; 45:1047–55.

Bolyard, Elizabeth A, RN, MPH, Tablan, Ofelia C., MD, Williams, Walter W., MD, Pearson, Michele L., MD, Shapiro, Craig N., MD, Deitchman, Scott D., MD, and The Hospital Infection Control Practices Advisory Committee. Guideline for infection control in healthcare personnel, 1998. Published simultaneously in *AJIC: American Journal of Infection Control* 1998; 26:289-354 and *Infection Control and Hospital Epidemiology* 1998; 19:407-63.

<http://www.cdc.gov/ncidod/dhqp/pdf/guidelines/InfectControl98.pdf>

Borlaug, Gwen, CIC, MPH, Wisconsin Division of Public Health. Davis, Jeffrey P., MD. Wisconsin Division of Public Health, Fox, Barry C., MD, University of Wisconsin Hospital and Clinics. Community Associated Methicillin Resistant *Staphylococcus Aureus* (CA MRSA); *Guidelines for Clinical Management and Control of Transmission*. October, 2005. <http://www.unc.edu/depts/spice/WisconsinCAMRSAGuide.pdf>

Cherifi, S., MD; Delmee, M., PhD; Van Broeck, J., MT; Beyer, I., MD; Byl, B., PhD; Mascart, MD. Management of an Outbreak of *Clostridium difficile*-Associated Disease Among Geriatric Patients. *Infection Control and Hospital Epidemiology*. Volume 27, Issue 11, Pages 1200–1205, Nov 2006.

Cosgrove S. The Relationship between Antimicrobial Resistance and Patient Outcomes: Mortality, Length of Hospital Stay and Health Care Cost. *Clinical Infectious Diseases* Volume 42, Issue 42, S82-S89.

Crogan, Neva L. PhD, APRN, BC, FNGNA and Evans, Bronwynne C. PhD, RN, FNGNA. *Clostridium difficile*: An Emerging Epidemic in Nursing Homes. *Geriatric Nursing*. Volume 28, Issue 3, May-June 2007, Pages 161-164.

- D'Agata, Erika M. C, MD, MPH. Rapidly Rising Prevalence of HAI Multidrug-Resistant, Gram-Negative Bacilli: A 9-Year Surveillance Study. *Infection Control and Hospital Epidemiology*. Volume 25, Issue 10, Pages 842–846, Oct 2004.
- Duncan, Susan L., RN, et al. The 1997, 1998, and 1999 APIC Guidelines Committees APIC State-of-the-Art Report: The implications of service animals in healthcare settings. *AJIC*. Volume 28, Number 2 (170-180).
- Fawley, Warren N., PhD; Underwood, Sarah, BSc; Freeman, Jane, PhD; Baines, Simon D. PhD; Saxton, Katie, BSc; Stephenson, Keith, PhD; Owens, Robert C., Jr., MD; Wilcox, Mark H., MD. Efficacy of Hospital Cleaning Agents and Germicides Against Epidemic *Clostridium difficile* Strains. *Infection Control and Hospital Epidemiology*. Volume 28, Issue 8, Pages 920–925, Aug 2007.
- Federal Bureau of Prisons - Clinical Practice Guidelines. Management of Methicillin-Resistant *Staphylococcus aureus* (MRSA) Infections. August, 2005.
www.bop.gov/news/PDFs/mrsa.pdf
- Fletcher, Kathleen Ryan RN, MSN, GNP and Cinalli, Marisa MSN, APRN, C. Identification, Optimal Management, and Infection Control Measures for *Clostridium difficile* – Associated Disease in Long-Term Care. *Geriatric Nursing*. Volume 28, Issue 3, May-June 2007, Pages 171-181.
- Friedland, Ian, MD; Stinson. Lue, MD; Ikaiddi, Margaret Mary, MD; Harm, Sandra, MD; Woods, Gail L., MD. Resistance in Enterobacteriaceae: Results of a Multicenter Surveillance Study, 1995–2000. *Infection Control and Hospital Epidemiology*. Volume 24, Issue 8, Page 607–612, Aug 2003.
- Gerding, Dale N., Muto, Carlene A., Owens, Jr., Robert C. Measures to Control and Prevent *Clostridium difficile* Infection. *Clinical Infectious Diseases*. 2008; 46:S43-9.
- Guidelines for Management of Patients with Multidrug-Resistant Organisms (MDROs) for Nebraska Hospitals, Long-term Care Facilities and Medical Facilities. January 2005.
<http://www.goapic.org/mdro%20info/MDRO%20final%20document-1-05-revised%20-05.pdf>
- Guide to the Elimination of *Clostridium difficile* in Healthcare Settings 2008, Association for Professionals in Infection Control and Epidemiology.
- Guide to the Elimination of Methicillin-Resistant *Staphylococcus aureus* (MRSA) Transmission in Hospital Settings. March 2007. Association for Professionals in Infection Control and Epidemiology.
- Health Canada. *Prevention and Control of Occupational Infections in Health Care*. An infection control guideline. *CCDR* 2002; 28SI:1-264. <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/02pdf/28s1e.pdf>
- “Interim Guidelines for the Control and Prevention of Methicillin Resistant *Staphylococcus aureus* (MRSA) Skin and Soft Tissue Infections in Non Healthcare Settings.” Montana Department of Public Health and Human Services, Communicable Disease Control and Prevention Bureau. 1400 Broadway, Helena, MT. 2007:124.

Jacoby, George A. M.D., Munoz-Price, Luisa Silvia, M.D., Mechanisms of Disease, The New β -Lactamases. *N Engl J Med* 2005; 352:380-91.

Juhász-Kaszanyitzky, Éva, Jánosi, Szilárd, Somogyi, Pál, Dán, Ádám, van der Graaf-van Bloois, Linda, van Duijkeren, Engeline, Wagenaar, Jaap A. MRSA Transmission between Cows and Humans. *Emerging Infectious Diseases*. www.cdc.gov/eid Vol. 13, No. 4, April 2007. (9630-632).

Kader, Abdulrahman Abdulla, MSc, FRCPath; Kumar, Angamuthu, MD, ABMM; Kamath, Katapadi Ananthkrishna, BSc. Fecal Carriage of Extended-Spectrum β -Lactamase-Producing *Escherichia coli* and *Klebsiella pneumoniae* in Patients and Asymptomatic Healthy Individuals. *Infection Control and Hospital Epidemiology*. Volume 28, Issue 9, Pages 1114–1116, Sep 2007.

Klevens RM et al. Invasive methicillin-resistant *Staphylococcus aureus* infections in the United States. *JAMA* 2007 Oct 17; 298:1763

Kolar, Stephanie, MSPH; Sanderson, Roger, MA, BSN. Outpatient *Staphylococcus aureus* Infections in Florida: Descriptive Epidemiology of Methicillin Sensitive and Resistant Infections. Florida Department of Health, *Epi Update*. July 26, 2007. (6-10).
http://www.doh.state.fl.us/disease_ctrl/epi/Epi_Updates/2007/July2007EpiUpdate.pdf

Manian, FA. Asymptomatic nasal carriage of mupirocin, methicillin resistant *Staphylococcus aureus* (MRSA) in a pet dog associated with MRSA infection in household contacts. *Clin Infect Dis*. 2003; 36:e26–8. Epub 2003 Jan 6.

Muto, Carlene A., MD, MS; Jernigan, John A., MD, MS; Ostrowsky, Belinda E., MD, MPH; Richet, Hervé M., MD; Jarvis, William R., MD; Boyce, John M., MD; Farr, Barry M., MD, MSc. SHEA Guideline for Preventing HAI Transmission of Multidrug-Resistant Strains of *Staphylococcus aureus* and *Enterococcus*. *Infection Control and Hospital Epidemiology*. Vol. 24, No. 5 (362-386).

Nan-Yao Lee, MD; Hsin-Chun Lee, MD; Nai-Ying Ko, RN, PhD; Chia-Ming Chang, MD; Hsin-I Shih, MD; Chi-Jung Wu, MD; Wen-Chien Ko, MD, Clinical and Economic Impact of Multidrug Resistance in HAI *Acinetobacter baumannii* Bacteremia. *Infection Control and Hospital Epidemiology*. Volume 28, Issue 6, Page 713–719, Jun 2007.

National Nosocomial Infections Surveillance (NNIS) System Report, data summary from January 1992 through June 2004, issued October 2004. *American Journal of Infection Control*. Volume 32, Issue 8, December 2004, Pages 470-485.

North Carolina Department of Health and Human Services, Division of Public Health Control of MRSA in Child Care Settings. North Carolina Public Health Recommendations. NC Communicable Disease Manual/Other Diseases of Public Health Significance: CA-MRSA – Child Care, October 2007.
http://www.epi.state.nc.us/epi/qcdc/ca_mrsa/pdf/child.pdf

Oughton, M. T., Dick, H. L. N., Willey, B. M., Brown S., McGeer, A., Kreiswirth, B., Low, D. E. Methicillin-resistant *Staphylococcus aureus* as a Cause of Infections in Domestic Animals: Evidence for a New Humanotic Disease? 2001 [abstract] Canadian

Association for Clinical Microbiology and Infectious Diseases

http://www.cacmid.ca/abstracts_01/r2.htm

- Paterson, David L., Bonomo, Robert A. Extended-Spectrum β -Lactamases: A Clinical Update. *Clin Microbiol Rev.* 2005 October; 18(4): pp 657–686. American Society for Microbiology.
- Poutanen, Susan M. Simor, Andrew E. *Clostridium difficile*-associated diarrhea in adults. *CMAJ-JAMC.* Volume 171(1), 6 July 2004, pp 51-58. 2004 Canadian Medical Association; Association médicale canadienne
- Simor, Andrew E., MD; Bradley, Suzanne F., MD; Strausbaugh, Larry J., MD; Crossley, Kent, MD; Nicolle, Lindsay E., MD; The SHEA Long-Term-Care Committee. *Clostridium difficile* in Long-Term-Care Facilities for the Elderly. *Infection Control and Hospital Epidemiology.* Volume 23, Issue 11, Pages 696–703, Nov 2002.
- State of Missouri. Department of Health and Senior Services. MRSA Overview for Child Care Centers. <http://www.dhss.mo.gov/MRSA/MRSACChildCare.pdf>
- Stone, P.W., Larson, E., Kawar, L.N. A Systematic Audit of Economic Evidence Linking Nosocomial Infections and Infection Control Interventions: 1990-2000. *Am J Infection Control.* 2002; 30: pages 145-152.
- Sunenshine, R.H. MD and McDonald, L.C. MD. *Clostridium difficile*-associated disease: New Challenges from an Established Pathogen. *Cleveland Clinic Journal of Medicine,* Volume 73 (2) Feb 2006, pages 187-197.
- Van Duijkeren E, Wolfhagen MJHM, Box ATA, et al. Human to dog transmission of methicillin resistant *Staphylococcus aureus*. *Emerg Infect Dis.* 2004; 10: 2235–7.
- Villegas, Maria Virginia, MD, MSc; Hartstein, Alan I., MD. *Acinetobacter* Outbreaks, 1977–2000. *Infection Control and Hospital Epidemiology,* Volume 24, Issue 4, Page 284–295, April 2003.
- Virginia Department of Health, Office of Epidemiology, October 25, 2007 MRSA Infections: Information for Jails and Prisons.
- Vitale, Carlo B., Gross, T. L., Weese, J. Scott. Methicillin resistant *Staphylococcus aureus* in Cat and Owner. *Emerging Infectious Diseases.* www.cdc.gov/eid Vol. 12, No. 12, December 2006 (1998-1999).
- Neil Woodford, Philip M. Tierno, Jr., Katherine Young, Luke Tysall, Marie-France I. Palepou, Elaina Ward, Ronald E. Painter, Deborah F. Suber, Daniel Shungu, Lynn L. Silver, Kenneth Inglima, John Kornblum, and David M. Livermore. Outbreak of *Klebsiella pneumoniae* Producing a New Carbapenem- Hydrolyzing Class A β -Lactamase, KPC-3, in a New York Medical Center. *Antimicrob Agents Chemother.* 2004 48: 4793-4799.
- Zanetti, Giorgio MD, MS; Blanc, Dominique S., PhD; Federli Isabelle, RN, CIC; Raffoul Wassim, MD; Petignat Christiane, MD; Maravic Philippe, RN; Francioli Patrick, MD; Berger Mette M., MD, PhD, Importation of *Acinetobacter baumannii* Into a Burn Unit: A Recurrent Outbreak of Infection Associated With Widespread Environmental Contamination.

Infection Control and Hospital Epidemiology. Volume 28, Issue 6, Pages 723–725, June 2007.

CDC Resources:

Centers for Disease Control and Prevention. Guidance for Control of Infections with Carbapenem-Resistant or Carbapenemase-Producing Enterobacteriaceae in Acute Care Facilities. *MMWR* 2009; 58 (256-260)

<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5810a4.htm>

Centers for Disease Control and Prevention. Guideline for Hand Hygiene in Healthcare Settings: Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. *MMWR* 2002; 51(No. RR- 16): [inclusive page numbers]. Available at: <http://www.cdc.gov/mmwr/PDF/rr/rr5116.pdf>

Centers for Disease Control and Prevention. Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007.

http://www.cdc.gov/ncidod/dhqp/gl_isolation.html

Centers for Disease Control and Prevention. Standard Precautions. Excerpt from “Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007”. http://www.cdc.gov/ncidod/dhqp/gl_isolation_standard.html.

Centers for Disease Control and Prevention. Contact Precautions. Excerpt from “Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007”. http://www.cdc.gov/ncidod/dhqp/gl_isolation_contact.html.

Centers for Disease Control and Prevention. Overview of *Clostridium difficile* Infections.

http://www.cdc.gov/ncidod/dhqp/id_Cdiff.html

Centers for Disease Control and Prevention. “Campaign to Prevent Antimicrobial Resistance in Healthcare Settings”. <http://www.cdc.gov/drugresistance/healthcare/default.htm>

Healthcare Infection Control Practices Advisory Committee (HICPAC). "Management of Multidrug-Resistant Organisms In Healthcare Settings 2006".

<http://www.cdc.gov/ncidod/dhqp/pdf/ar/mdroGuideline2006.pdf>.

Centers for Disease Control and Prevention. Campaign to Reduce Antimicrobial Resistance in Healthcare Settings. (www.cdc.gov/drugresistance/healthcare/default.htm), a multifaceted, evidence-based approach with four parallel strategies: infection prevention; accurate and prompt diagnosis and treatment; prudent use of antimicrobials; and prevention of transmission. Campaign materials are available for acute care hospitals, surgical settings, dialysis units, LTCFs and pediatric acute care units.

Centers for Disease Control and Prevention. Recommendations for Preventing Transmission of Infections among Chronic Hemodialysis Patients. *MMWR* 200; 50 (13-23).

<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5005a1.htm>

Centers for Disease Control and Prevention. Strategies for Clinical Management of MRSA in the Community March 2006. Summary of an Experts' Meeting Convened by the CDC.

http://www.cdc.gov/ncidod/dhqp/pdf/ar/CAMRSA_ExpMtgStrategies.pdf

Centers for Disease Control and Prevention. Methicillin-Resistant *Staphylococcus aureus* (MRSA) in Schools.

http://www.cdc.gov/ncidod/dhqp/ar_mrsa_in_schools.html.

Centers for Disease Control and Prevention, NIOSH Safety and Health Topic: MRSA and the Workplace. www.cdc.gov/niosh/topics/mrsa/

Management of Methicillin-Resistant *Staphylococcus aureus* (MRSA) Infections. August, 2005. (Federal Bureau of Prisons - Clinical Practice Guidelines)

<http://www.bop.gov/news/PDFs/mrsa.pdf>

Centers for Disease Control and Prevention. Investigation and Control of Vancomycin Intermediate and Resistant *Staphylococcus aureus* (VISA/VRSA): A Guide for Health Departments and Infection Control Personnel. Atlanta 2006.

http://www.cdc.gov/ncidod/dhqp/ar_visavrsa_prevention.html

Centers for Disease Control and Prevention List H: EPA's Registered Antimicrobial Products Effective Against Methicillin Resistant *Staphylococcus aureus* (MRSA) and Vancomycin Resistant *Enterococcus faecalis* or *faecium* (VRE) (PDF).

http://epa.gov/oppad001/list_h_mrsa_vre.pdf

Centers for Disease Control and Prevention

Guidelines for Environmental Infection Control in Healthcare Facilities. Excerpt from "Guidelines for Environmental Infection Control in Healthcare Facilities, 2003".

http://www.cdc.gov/ncidod/dhqp/gl_envirinfection.html

Centers for Disease Control and Prevention. "Personal Protective Equipment (PPE) in Healthcare Settings". <http://www.cdc.gov/ncidod/dhqp/ppe.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/publications/shear_position_papers.cfm.

Association for Professionals in Infection Control and Epidemiology (APIC). Worldwide organization of infection control and epidemiology professionals with chapters nationwide. APIC presents evidence-based guidelines publications for infection control epidemiology.

<http://www.apic.org/AM/Template.cfm?Section=Practice>.

Education Resources located at:

http://www.apic.org/AM/Template.cfm?Section=Education_Resources&Template=/TaggedPage/TaggedPageDisplay.cfm&TPLID=91&ContentID=8738

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 at:

http://www.doh.state.fl.us/disease_ctrl/epi/topics/surv.htm.

Appendix A

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 healthcare settings though the extent may vary by the type of facility and type of healthcare 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 healthcare environment.

Excerpt from the “Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007.” PDF (1.33MB/219 pages)

Background

III.A. 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 healthcare 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 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 healthcare 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 healthcare 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 healthcare 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 healthcare facility. The term *cough etiquette* is derived from recommended source control measures for *Mycobacteria tuberculosis*. The elements of Respiratory Hygiene/Cough Etiquette include 1) education of healthcare facility staff, patients, and visitors; 2) posted signs, in language(s) appropriate to the population served, with instructions to patients and accompanying family members or friends; 3) 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); 4) hand hygiene after contact with respiratory secretions; and 5) 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 streptococcus 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 healthcare 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. Healthcare 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. Healthcare 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 healthcare setting and apply the following infection control practices during the delivery of health care.

IV.A. Hand Hygiene

IV.A.1. During the delivery of healthcare, 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.

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 nonantimicrobial soap and water or an antimicrobial soap and water.

IV.A.3. If hands are not visibly soiled, or after removing visible material with nonantimicrobial 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 nonantimicrobial soap may increase the frequency of dermatitis. Perform hand hygiene:

IV.A.3.a. Before having direct contact with patients.

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

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).

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

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

IV.A.3.f. After removing gloves:

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.

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).

IV.A.5.a. Develop an organizational policy on the wearing of non-natural nails by healthcare personnel who have direct contact with patients outside of the groups specified above.

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.

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

IV.B.1.c. Before leaving the patient's room or cubicle, remove and discard PPE.

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.

IV.B.2.b. Wear gloves with fit and durability appropriate to the task.

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.

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).

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.

IV.B.3.a.i. Wear a gown for direct patient contact if the patient has uncontained secretions or excretions.

IV.B.3.a.ii. Remove gown and perform hand hygiene before leaving the patient's environment.

IV.B.3.b. Do not reuse gowns, even for repeated contacts with the same patient.

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

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.

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).

IV.C. Respiratory Hygiene/Cough Etiquette

IV.C.1. Educate healthcare 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.

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 healthcare 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.

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.

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.

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.

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

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.

IV.D.2. Determine patient placement based on the following principles:

- 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.

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.

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 is visibly soiled or may have been in contact with blood or body fluids.

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.

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).

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.

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.

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 IA*

- Use the following principles in developing this policy and procedures:
- 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).

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.

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.

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.

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.

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.

IV.H.4. Use single-dose vials for parenteral medications whenever possible.

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

IV.H.6. If multidose vials must be used, both the needle or cannula and syringe used to access the multidose vial must be sterile.

IV.H.7. Do not keep multidose vials in the immediate patient treatment area and store in accordance with the manufacturer's recommendations; discard if sterility is compromised or questionable.

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

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).

IV.J. Worker safety: Adhere to federal and state requirements for protection of healthcare personnel from exposure to bloodborne pathogens.

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". http://www.cdc.gov/ncidod/dhqp/gl_isolation_standard.html

Appendix B

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”.

Excerpt from the “Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007.” PDF (1.33MB/219 pages)

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 healthcare 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. Healthcare 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).

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).

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

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.

V.B.2.c. In *ambulatory settings*, place patients who require Contact Precautions in an examination room or cubicle as soon as possible.

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.

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.

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 microorganism to other patients or environmental surfaces.

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.

V.B.4.b. When transport or movement in any healthcare setting is necessary, ensure that infected or colonized areas of the patient's body are contained and covered.

V.B.4.c. Remove and dispose of contaminated PPE and perform hand hygiene prior to transporting patients on Contact Precautions.

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.

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.

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.

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.

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.

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.

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.

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". http://www.cdc.gov/ncidod/dhqp/gl_isolation_contact.html.

Appendix C

Use of Personal Protective Equipment (Gowning)

Donning PPE

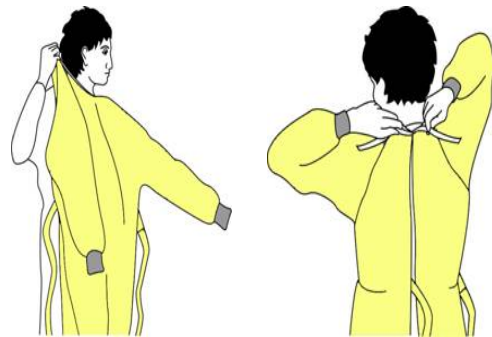
When the use of PPE other than gloves is necessary, such as when splashes or spray of blood or body fluids are possible or when attending a patient on Contact Precautions, it is preferable for the healthcare worker to don the PPE before entering the patient's room. The order for donning of PPE is as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

1. Gown
2. Mask
3. Eye and Face Protection (goggles, face shield)
4. Gloves

Donning a Gown

The healthcare 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 patients 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:

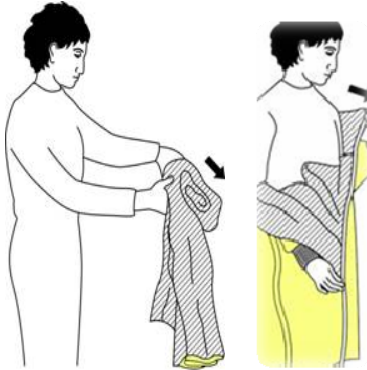
1. Gloves
2. Eye Protection
3. Gown
4. Mask

De-Gowning

Gowns should be removed carefully to prevent contamination of the healthcare 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. "Personal Protective Equipment (PPE) in Healthcare Settings" found at: <http://www.cdc.gov/ncidod/dhqp/ppe.html>.

This CDC link features downloadable instructional posters and training information in the proper use of all types of Personal Protective Equipment utilized in the healthcare setting.

Appendix D

The Centers for Disease Control and Prevention (CDC) has a 12-step campaign to prevent antimicrobial resistance among long-term care residents. The steps include:

Step 1. Vaccinate.

- Give influenza and pneumococcal vaccinations to residents.
- Promote vaccination among all staff..

Step 2. Prevent conditions that lead to infection.

- Prevent aspiration.
- Prevent pressure ulcers.
- Maintain hydration.

Step 3. Get the unnecessary devices out.

- Insert catheters and devices only when essential and minimize duration of exposure.
- Use proper insertion and catheter-care protocols.
- Reassess catheters regularly.
- Remove catheters and other devices when no longer essential.

Step 4. Use established criteria for diagnosis of infection.

- Target empiric therapy to likely pathogens.
- Target definitive therapy to known pathogens.
- Obtain appropriate cultures and interpret results with care.
- Consider *C. difficile* in patients with diarrhea and antibiotic exposure.

Step 5. Use local resources.

- Consult infectious disease experts for complicated infections and potential outbreaks.
- Know your local and/or regional data.
- Get previous microbiology data for transfer residents.

Step 6. Know when to say “no”.

- Minimize use of broad-spectrum antibiotics.
- Avoid chronic or long-term antimicrobial prophylaxis.
- Develop a system to monitor antibiotic use and provide feedback to appropriate personnel.

Step 7. Treat infection, not colonization or contamination.

- Perform proper antisepsis with culture collection.
- Re-evaluate the need for continued therapy after 48-72 hours.
- Do not treat asymptomatic bacteriuria.

Step 8. Stop antimicrobial treatment

- When cultures are negative and infection is unlikely.
- When infection has resolved.

Step 9. Isolate the pathogen.

Use Standard Precautions.

- Contain infectious body fluids (use approved Droplet and Contact isolation

precautions).

Step 10. Break the chain of contagion.

- Follow CDC recommendations for work restrictions and stay home when sick.
- Cover your mouth when you cough or sneeze.
- Educate staff, residents, and families.
- Promote wellness in staff and residents.

Step 11. Perform hand hygiene.

- Use alcohol-based hand-rubs or wash your hands.
- Encourage staff and visitors.

Step 12. Identify residents with multidrug-resistant organisms, (MDROs).

- Identify both new admissions and existing residents with MDROs.
- Follow standard recommendations for MDRO case management.

The CDC provides a downloadable poster of the 12-steps for posting. This can be found at: www.CDC | 12 Steps to Prevent Antimicrobial Resistance among Long-term Care Residents.

Appendix E

TASK FORCE MEMBERS

BJ Gossett, R.N.C.
Health Services
Department of Corrections
2601 Blairstone Rd.
Tallahassee, FL 32399-2500

Jean M. LeMire
Health/Safety Officer
Alachua County Fire Rescue
Post Office. Box 548
Gainesville, FL 32602

William S. Nakashima, M. (A.S.C.P.)
Florida Department of Health, Bureau of Laboratories
50 W. Maxwell St.
Pensacola, FL 32501

Cathy Ricchezza, R.N., C.I.C.
St. Joseph's Hospital
3001 W. MLK Jr. Blvd.
Post Office Box 4227
Tampa, FL 33607

Barbara Russell, R.N., M.P.H., C.I.C., A.C.R.N.
Baptist Hospital of Miami
8900 North Kendall Dr.
Miami, FL 33176

Roger Sanderson, B.S.N., M.A.
Florida Department of Health, Epidemiologist
3602 Spectrum Blvd.
Tampa, FL 33612

Peggy Thompson, B.S.N., C.I.C.
Tampa General Hospital
Post Office Box 1289
Tampa, FL 33606

APPENDIX F

Florida Infection Control Organizations

Florida Department of Health (FDOH): The FDOH provides the infection control community with a variety of resources. All of the 67 county health departments (CHDs) have disease control professionals and epidemiologists. 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.doh.state.fl.us/disease_ctrl/epi/topics/contact.htm. Additional information can be found at: **Florida Department of Health, Bureau of Epidemiology, Division of Disease Control** http://www.doh.state.fl.us/disease_ctrl/epi/index.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 healthcare 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 healthcare 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 (www.BAPIC55.org)
091 West Central Council Florida
092 Central Florida
103 Suwannee Regional Florida

Northwest Florida Infection Control Professionals: This group of infection control professionals meets in Pensacola regularly. While not belonging to APIC, they function in much the same way as an APIC chapter. Further information can be obtained by contacting the Escambia County Health Department epidemiologist or the local hospital infection control professionals.