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Methicillin-resistant *Staphylococcus aureus*

A primer for dentists

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S*taphylococcus aureus* is a gram-positive coccus that frequently colonizes the nose and skin of healthy people, and it can cause a variety of localized and invasive syndromes, ranging from superficial skin infections to life-threatening pneumonia and bloodstream infections.¹ Methicillin-resistant *S. aureus* (MRSA) refers to *S. aureus* that is resistant to all currently available β -lactam antimicrobial agents, including antistaphylococcal penicillins (methicillin, oxacillin, nafcillin) and cephalosporins. The objective of this article is to provide dental care professionals with basic, evidence-based knowledge about MRSA to inform their actions in preventing the pathogen's transmission during clinical care and in supporting prevention in the community.

HISTORY OF METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS

S. aureus infections have plagued humans since Biblical times.² The first therapeutic use of penicillin for a *S. aureus* infection in 1940 was followed quickly by the appearance of

ABSTRACT



Background and Overview. In 2005 in the United States, an estimated 94,370 new, invasive infections and 18,650 deaths were associated with methicillin-resistant *Staphylococcus aureus* (MRSA); most of these infections were in people with exposures in health care settings. MRSA also has emerged as a community-based pathogen, causing primarily skin infections that are not life-threatening, but occasionally causing more severe and invasive infections. The authors describe the history of MRSA; identify populations at greatest risk of experiencing MRSA colonization and infection; compare characteristics of MRSA infections occurring in health care and community settings; and summarize strategies, based on U.S. Centers for Disease Control and Prevention recommendations and the literature, to prevent transmission of MRSA in dental offices.

Conclusions and Clinical Implications. Standard infection control precautions should be enforced strictly in all ambulatory care settings, including dental offices, to prevent facility-based transmission of MRSA and other infectious agents.

Key Words. Methicillin-resistant *Staphylococcus aureus*; MRSA; Standard Precautions; Contact Precautions; dental office; infection control.

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the first penicillin-resistant strains of *S. aureus*.³ Methicillin was introduced in 1960 to treat penicillin-resistant *S. aureus* infections and was followed in 1961 by the development of MRSA in the United Kingdom.^{4,5} In 1968, the first outbreak of health care–associated MRSA was reported in a U.S. hospital.⁶ In response to outbreaks of infectious diseases in health care settings, the U.S. Centers for Disease Control and Prevention (CDC) and volunteer hospitals devel-

oped the National Nosocomial Infections Surveillance (NNIS) system in 1970. The system's goal was monitoring the incidence of health care–associated (nosocomial) infections and their risk factors and pathogens. Across time, data from NNIS have shown an important increase in the proportion of *S. aureus* infections caused by MRSA, from 2 percent in 1975 to 29 percent in 1991⁷ to 64 percent in 2003 (in participating intensive care units).⁸ However, a recent analysis of data from the National Healthcare Safety Network indicated a decline in the rate of MRSA bloodstream infections associated with central venous catheters through 2007.⁹

MRSA emerged as a significant public health problem in the community in the late 1990s. In 1997, four previously healthy children, with no established MRSA risk factors, died in Minnesota and North Dakota as a result of systemic MRSA infections.¹⁰ For the next several years, public health personnel in multiple states investigated outbreaks of MRSA infections of the skin and soft tissue among diverse community populations, including American Indians,¹¹ sports teams,¹² correctional facility inmates¹³ and child-care attendees^{6,14}—all groups with typically little or no previous contact with the health care system. Concerns about outbreaks in the community encouraged the CDC to conduct coordinated surveillance activities in the United States.

CHARACTERISTICS OF METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* IN HEALTH CARE AND COMMUNITY SETTINGS

To date, certain characteristics have differentiated MRSA in health care and community set-

TABLE 1

General characteristics of MRSA* transmission in health care settings and in the community.

FACTOR	SETTING	
	Health Care Settings	Community
Population Affected	Frequently affects people with chronic illness	Frequently affects young, otherwise healthy people
Spectrum of Disease	Frequently causes invasive disease	Predominantly causes skin and soft-tissue infections
Antibiotic Resistance	Resistance to multiple classes of antimicrobial agents	Susceptibility to most classes of antimicrobial agents other than β -lactams
Molecular Characteristics	Pulsed-field types most often USA100, USA200, USA500	Pulsed-field types most often USA300, USA400, USA1000, USA1100

* MRSA: Methicillin-resistant *Staphylococcus aureus*.

tings (Table 1). These characteristics include the populations affected, predominant clinical syndromes and genetic and phenotypic characteristics of the isolates, such as strain types, antimicrobial susceptibility patterns and presence of genes coding for various toxins or virulence factors. These genetic differences suggest that MRSA strains associated with community transmission originated in the community, where community strains of methicillin-susceptible *S. aureus* acquired genes conferring methicillin resistance. Across time, distinctions between MRSA in community and health care settings have begun to blur, as MRSA strains considered to be of community origin have entered health care settings¹⁵ and acquired new resistance elements.¹⁶

Population affected and clinical presentation. In general, patients in health care settings, especially acute care hospitals, are more vulnerable to all infections because of age, underlying disease, treatments that alter immune response or invasive medical procedures that interrupt normal skin barriers.¹⁷ Health care–associated MRSA infections most commonly manifest as sur-

ABBREVIATION KEY. CDC: Centers for Disease Control and Prevention. EPA: U.S. Environmental Protection Agency. MDROs: Multidrug-resistant organisms. MRSA: Methicillin-resistant *Staphylococcus aureus*. NNIS: National Nosocomial Infections Surveillance. PFGE: Pulsed-field gel electrophoresis. PFTs: Pulsed-field types. PPE: Personal protective equipment. VRSA: Vancomycin-resistant *Staphylococcus aureus*.

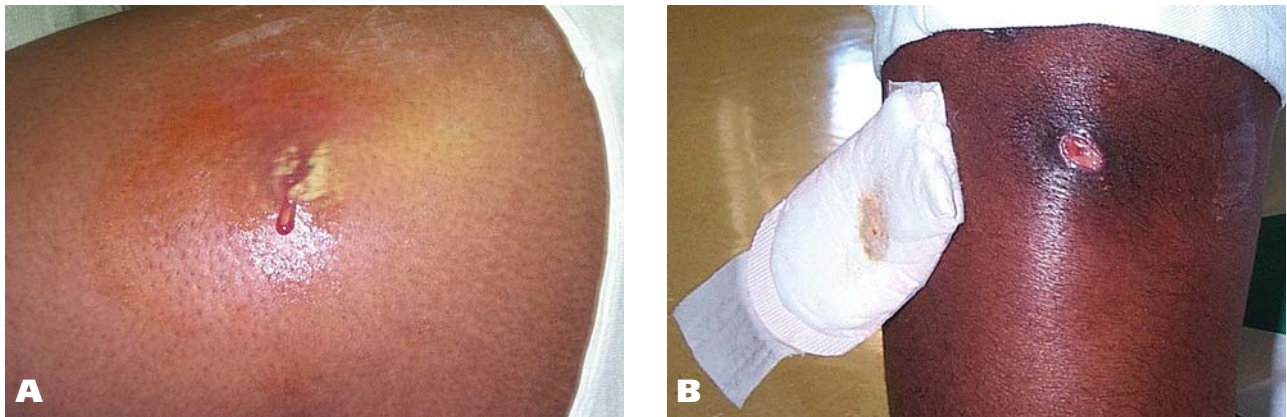


Figure. Skin abscesses associated with methicillin-resistant *Staphylococcus aureus*.

gical site infections, pneumonia or bloodstream infections, and they require treatment with systemic antimicrobial agents. In the community, outbreaks of MRSA infections have been reported in settings in which people are crowded, have frequent skin-to-skin contact, have compromised skin (cuts and abrasions), lack adequate hygiene practices and share personal items. About 77 percent of community-associated MRSA infections are localized in the skin in the form of pustules, boils or abscesses¹⁸ (Figure) and typically can be treated in outpatient settings, often without antibiotics.¹⁹ However, less frequently, community strains of MRSA can lead to severe infections²⁰ and potentially to invasive disease that can be fatal.²¹

Antimicrobial susceptibility patterns. In general, the MRSA strains most frequently associated with infections in health care settings are resistant to multiple classes of antimicrobial agents in addition to β -lactam agents. In contrast, MRSA strains in the community have been susceptible to most classes of antimicrobial agents other than β -lactams, macrolides and azalides (such as erythromycin and azithromycin).¹⁸ However, resistance to additional agents—including fluoroquinolones, tetracyclines and clindamycin—has been observed among community MRSA strains.^{16,18,20,22,23}

Vancomycin remains an agent of choice for treatment of invasive MRSA infections. However, increased use of vancomycin has contributed to a rapid increase in the incidence of colonization and infection with vancomycin-resistant enterococci in U.S. hospitals.²⁴ Coexistence of vancomycin-resistant enterococci and MRSA in the same host was shown to facilitate the transfer of vancomycin resistance to *S. aureus*.²⁴ In 1995, the CDC's Hos-

pital (now Healthcare) Infection Control Practices Advisory Committee developed and released its Recommendations for Preventing the Spread of Vancomycin Resistance.²⁵ As of 2006, seven clinical cases of vancomycin-resistant *S. aureus* (VRSA) had been reported in the United States.²⁶ Antimicrobial treatment options exist for vancomycin-resistant *S. aureus* infections but are limited.

Molecular characterization. The CDC has primarily used a type of genotyping known as pulsed-field gel electrophoresis (PFGE) for molecular typing of *S. aureus* strains.²⁷ Using this information, the CDC developed a PFGE nomenclature scheme and created a database identifying major MRSA lineages present in the United States, referred to as “pulsed-field types” (PFTs).²⁸ The PFTs primarily associated with transmission in health care settings are USA100, USA200 and USA500, and those primarily associated with community transmission are USA300, USA400, USA1000 and USA1100.²⁸⁻³¹

USA300 has emerged as the major community MRSA PFT in most areas of the country.³² The spread of USA300 as a common cause of community-associated *S. aureus* infection suggests that it has unique virulence and transmissibility factors. The relative importance of various toxins and other genetic elements in the pathogenicity of USA300 is an area of ongoing investigation.³³ At present, testing of MRSA isolates for identification of specific virulence factors to inform clinical management of disease in individual patients is not recommended.

THE OCCURRENCE OF MRSA IN THE UNITED STATES

Colonization. Colonization refers to the presence of microorganisms growing and multiplying

in or on a host without causing disease. Approximately 30 percent of people in the United States carry *S. aureus* in their noses (anterior nares).³⁴ Skin and mucosal membranes normally function as barriers to prevent tissue invasion in colonized people; however, any activity that promotes breakdown in the skin and mucosal integrity (such as chronic skin infections, physical trauma or poor health) can promote infection. Colonized people are capable of transmitting *S. aureus* to other people with whom they have close contact, and people who have active infections such as purulent skin infections offer a greater risk of transmission.

In 2003 and 2004, results of a national survey of *S. aureus* and MRSA nasal colonization among noninstitutionalized people in the United States showed that 28.6 percent were colonized with *S. aureus*, but only 1.5 percent carried MRSA.³⁴ This corresponds to an estimated 78.9 million and 4.1 million people colonized with *S. aureus* and MRSA, respectively, in the United States.³⁴ MRSA colonization was most prevalent among people 60 years or older.³⁵ Among MRSA-colonized people, 19.7 percent were colonized with PFTs USA300 or USA400; USA1000 and USA1100 were rarely identified. Investigators in some smaller studies focusing on patients seeking health care have identified higher rates of MRSA nasal colonization. For example, among pediatric patients making health maintenance visits to two clinics in Tennessee, MRSA nasal colonization increased from 0.8 percent in 2001 to 9.2 percent in 2004.³⁶ In addition, 22 percent of children admitted to a children's hospital in Dallas during one month in 2005 had nasal colonization with MRSA on admission,³⁷ as did 7.3 percent of adolescent and adult patients admitted to a public urban hospital in Atlanta during a one-month period in 2003.³⁸ Other populations with a higher occurrence of MRSA colonization than the general population include patients undergoing hemodialysis,³⁹ residents of nursing homes⁴⁰ and patients admitted to hospitals.⁴¹

Investigators in a small number of studies have looked at MRSA colonization of the oral cavity. In a study of patients undergoing dialysis in a hospital who were screened for MRSA, 25 percent had MRSA recovered from specimens

from the anterior nares and tongue.⁴² In a study in which researchers monitored three years of records from a regional oral microbiology laboratory, *S. aureus* was isolated in oral cavity specimens from 1,017 of the 5,005 specimens; of these, 50 specimens in 37 of 615 patients (6 percent) were MRSA.⁴³ MRSA has been found in the oral cavity more frequently in people 70 years or older⁴³ and, in another study of people with MRSA colonization, has been found in multiple body sites and on dentures.⁴⁴ A risk factor for oral carriage of MRSA among older people in hospital-based long-term care is related to antibiotic use, low serum albumin levels and poor nutrition.⁴⁵

MRSA colonization is a risk factor for development of MRSA infections in both health care and community settings. Results of a study in five hospitals showed that MRSA infection was about 10 times more frequent among patients who were colonized with MRSA at admission compared with those who were colonized with susceptible *S. aureus*.⁴⁶ In the community, researchers followed a cohort of soldiers for eight to 10 weeks, during which 38 percent of those colonized with MRSA developed an infection and only 3 percent of those colonized with susceptible *S. aureus* developed a MRSA infection.⁴⁷

Infection. Administrative data captured in nationally representative ambulatory care surveys indicate that from 2001 through 2003, there were 11.6 million outpatient visits annually in the United States associated with skin and soft-tissue infections typical of *S. aureus*, such as abscess, cellulitis, impetigo, carbuncle and furuncle.⁴⁸ This finding corresponded to an annual visit rate of 410.7 visits per 10,000 people. Rates of visits to hospital outpatient departments and emergency departments for these visits increased by 59 percent and 31 percent, respectively, from 1992 through 1994 and from 2001 through 2003, possibly reflecting the emergence of MRSA as a community pathogen.⁴⁸ Visit rates for these infections were highest for children younger than 2 years and people 65 years or older and were higher in the South than in the Midwest and among patients receiving Medicare and Medicaid than among patients with private insurance or no insurance. Between the two periods examined, rates increased in metropolitan statis-

MRSA colonization is a risk factor for development of Methicillin-resistant *Staphylococcus aureus* infections in both health care and community settings.

TABLE 2

Estimated number and incidence of invasive MRSA* infections and deaths per 100,000 people in the United States, by age group, Active Bacterial Core surveillance, 2005.†

AGE GROUP (YEARS)	ESTIMATED INFECTIONS	ESTIMATED RATE	ESTIMATED DEATHS	ESTIMATED RATE
< 1	950	23.1	80	2.0
1	160	3.8	0	0.0
2-4	290	2.4	10	0.1
5-17	730	1.4	60	0.1
18-34	7,050	10.1	460	0.7
35-49	16,100	24.3	1,400	2.1
50-64	22,120	43.9	3,640	7.2
≥ 65	46,970	127.7	13,000	35.3
TOTAL	94,370	31.8	18,650	6.3

* MRSA: Methicillin-resistant *Staphylococcus aureus*.
† Estimated numbers are rounded. Rates are expressed as number per 100,000 population. Source: Klevens and colleagues.²¹

tical areas in the South and decreased in the Midwest. Since the 1990s, MRSA has accounted for an increasing proportion of community-associated *S. aureus* infections in the United States.⁴⁹ In a 2004 study of adult patients with purulent skin and soft-tissue infections presenting to emergency departments in 11 U.S. cities, MRSA accounted for 78 percent of *S. aureus* skin and soft-tissue infections and 59 percent of skin and soft-tissue infections overall.²⁰ In the head and neck area, community-associated MRSA increased as a proportion of all *S. aureus* infections in one otolaryngology clinic from 21 percent in 2000 to 64 percent in 2004.⁵⁰

Since 2003, the CDC has supported routine surveillance for invasive infections in nine sites participating in its Emerging Infections Program. A case of invasive infection is defined by the isolation of MRSA from a normally sterile body site (such as blood, cerebrospinal fluid or pleural fluid). During 2005, the estimated number of new invasive MRSA infections in the United States, stratified by age, was 94,370 (Table 2).²¹ Rates of invasive infection were highest among men, people 65 years and older and African-Americans. Approximately 85 percent of all invasive MRSA infections occurred in people with health care risk factors (such as a history of MRSA, hospitalization, surgery, dialysis or residence in a long-term care facility within the previous year, or presence

of an invasive device at the time of evaluation). An estimated 18,650 people with invasive MRSA died in the United States in 2005.

TRANSMISSION OF MRSA

In health care settings. In health care settings, *S. aureus* most often is spread indirectly from patient to patient on the transiently contaminated hands of health care professionals. Colonized health care personnel and visitors also sometimes can serve as reservoirs for transmission. MRSA has been isolated from environmental surfaces in health

care facilities,⁵¹ but contaminated environmental surfaces and objects likely play a relatively minor role in MRSA transmission.⁵² In a study of *S. aureus* in a dental school clinic, investigators isolated MRSA from samples collected from the emergency treatment area: dental chair push buttons, light handles, air-and-water syringes and a computer keyboard; they did not evaluate transmission from the environment to patients or staff members.⁵³

There has been one documented transmission of MRSA from a British dental practitioner to patients.⁵⁴ Two patients undergoing oral surgical procedures within three weeks of each other developed MRSA infections of the same type. The dentist was identified as the only staff member with the same type of MRSA isolated from his fingers and nares. Of note, the dentist may have been colonized during a recent hospitalization for emergency surgery at a time when the hospital surgical unit was dealing with an outbreak of MRSA. The dentist was treated, and infection control practices were instituted in his practice, including the routine use of gloves. After nine weeks, no further MRSA was detected.

In the community. In the community, *S. aureus*, including MRSA, can be spread among people having close skin-to-skin contact with an infected person. Draining lesions are highly infectious and represent the most common source of

transmission. Spread also may occur through indirect contact by touching objects (such as towels, sheets, wound dressings, clothes, workout areas or sports equipment) contaminated by the infected skin of a person with MRSA.

Frequent exposure to antimicrobial agents may facilitate acquisition of MRSA. For example, in a case-control study conducted during a large community outbreak of MRSA skin and soft-tissue infections in southwestern Alaska, case subjects received significantly more courses of antimicrobial agents for nonskin infections during the 12 months before the outbreak than did age-matched control subjects without skin and soft-tissue infections.¹¹ In an outbreak of MRSA skin and soft-tissue infections among professional football players, the risk of infection was almost eight times higher among players who had received antimicrobial agents in the year preceding the outbreak than among those who had not. Furthermore, the number of antimicrobial prescriptions received in the year before the outbreak was 10 times higher among members of the team who experienced the outbreak than among people of the same age and sex in the general community.⁵⁵

PREVENTING MRSA TRANSMISSION

In health care settings. The CDC's Healthcare Infection Control Practices Advisory Committee⁵⁶ developed measures to control the spread of multidrug-resistant organisms (MDROs) of epidemiologic importance, such as MRSA, in health care settings. Prevention of MRSA and other MDRO transmission in these settings requires a comprehensive strategy that includes administrative measures (such as systems support and provision of resources); education and training of health care personnel; judicious use of antimicrobial agents; use of what the CDC classifies as Standard Precautions for all patients; use of Contact Precautions in acute care hospitals for patients known to be infected or colonized with these organisms; and ongoing monitoring of trends through time to measure progress in prevention and control. If rates do not decline despite these measures, additional intensified interventions—such as use of active surveillance

cultures to identify colonized patients and implementation of Contact Precautions (see below)—are recommended.

Standard Precautions. Standard Precautions are recommended for use with all patients in all health care settings to protect health care personnel and patients from contact with microorganisms, regardless of whether the source is recognized.⁵⁷ Standard Precautions are based on the assumption that every person potentially is infected or colonized with an organism that could be transmitted in a health care setting. These precautions include the following:

- performance of hand hygiene before and after having direct contact with patients or when moving from a contaminated body site to a clean body site during patient care;
- use of personal protective equipment—such as gloves, gowns, and mouth, nose, and eye protection—for anticipated contact with blood or other potentially infectious materials, mucous membranes, nonintact skin or potentially contaminated intact skin (such as that of a patient incontinent of stool or urine);
- use of respiratory hygiene and cough etiquette;
- placing patients who pose a risk for transmission to others (for

example, those with uncontained secretions, excretions or wound drainage) in a single-patient room when available;

- establishing policies and procedures for containing, transporting and handling patient-care equipment and devices that may be contaminated with blood or body fluids;
- establishing policies and procedures for routine and targeted cleaning of environmental surfaces;
- use of safe injection practices.

In ambulatory care settings, including outpatient dental offices, strict enforcement of Standard Precautions, including making sure that gloves and gowns are used for anticipated contact with uncontrolled secretions and other potentially infectious body fluids, is considered adequate in most circumstances to prevent the transmission of MRSA and other MDROs. For this reason, dentists do not need to determine patients' MRSA status routinely by means of history-taking or surveillance cultures or testing.

In outpatient dental offices, strict enforcement of Standard Precautions is considered adequate in most circumstances to prevent the transmission of methicillin-resistant *Staphylococcus aureus*.

TABLE 3

Standard Precautions for use in outpatient dental clinical settings.		
PRECAUTION	RELATED FACT	DENTAL HEALTH CARE WORKER ACTIONS*
Hand Hygiene: Washing	Inadequate hand hygiene leaves organisms on the hands that can be transferred to another patient; hand hygiene should be performed before and after direct contact with patients, before and after use of gloves, or after contact with inanimate objects in the immediate vicinity of the patient	When soil or dirt are visible: wet the hands with water, apply nonantimicrobial soap, rub together for 15 seconds, rinse hands dry with a disposable towel (the towel can be used to turn off the water) When hands are not visibly soiled: apply the proper amount of an alcohol-based hand rub; rub the hands together, covering all surfaces until hands are dry
Hand Hygiene: Preventing Bacterial Spread	Dental health care workers with gloved or ungloved hands can come into contact with bacteria; dental health care workers can touch their noses or other skin inadvertently and transmit bacteria to themselves	Keep hands away from face, avoid touching or adjusting PPE, [†] and limit surfaces and items touched; perform hand hygiene as indicated
Use of PPE	Physical barriers protect health care workers from exposure to infectious agents in blood and saliva	Use masks and protective eyewear or face shields, and change them between patients; use protective clothing such as a gown that covers areas likely to become soiled; use gloves, which should be new for each patient and removed if they become torn, cut or punctured
Proper Wear of PPE[‡]	PPE can become contaminated on the outside; proper use of PPE will protect patients as well as the dental health care worker by limiting the dental health care worker's transport of infectious agents between patients	Personal protective barriers and used clothing items should not be shared; proper wear and removal of PPE is important to reduce microbial spread
Aseptic Technique	Skin wounds that are draining or have purulent material may be evident and outside of areas covered by normal street clothing Improper aseptic technique for removal and disposal of bandages may contaminate the environment or the dental health care worker's hands Improper aseptic technique for inserting intravenous (IV) catheters used in conscious sedation	Cover these infected areas with a clean, dry bandage Wear gloves and use aseptic technique to dispose of patient bandages Clean skin with an appropriate skin disinfectant, wear gloves when inserting an IV catheter, use a sterile IV catheter and single-use IV tubing, and maintain aseptic technique throughout procedure
Patient-Care Items and Equipment	Patient-care items and equipment can become contaminated with methicillin-resistant <i>Staphylococcus aureus</i>	Before each use of patient-care items and equipment that are used intraorally and are heat-stable (for example, surgical instruments, periodontal scalers, mirrors, impression trays), clean and heat-sterilize them before each use; for non-critical items (such as furniture, radiograph cone), use barrier protection or clean them after each use with a hospital disinfectant registered with the U.S. Environmental Protection Agency (EPA)
Environmental Surfaces	Environmental surfaces may become contaminated during the course of patient treatment	Maintain a clean environment by establishing disinfecting procedures for frequently touched surfaces and surfaces that come into direct contact with patient's skin; use an EPA-registered hospital disinfectant

* Centers for Disease Control and Prevention guidelines provide more detailed information on hand hygiene, dental infection control practices and strategies to prevent transmission of infectious agents; see Boyce and colleagues,⁵⁸ Kohn and colleagues⁵⁹ and Siegel and colleagues.^{56,57}
[†] PPE: Personal protective equipment.
[‡] For more information about proper wear of PPE, see Centers for Disease Control and Prevention.⁶⁰

Dental procedures routinely require contact with saliva, blood and intraoral mucous membranes, all of which are potentially infectious. Table 3 provides a summary of infection control

practices such as hand hygiene^{58,59} and use of personal protective equipment⁶⁰ that prevent transmission of infectious agents (including MRSA) in the dental office. Few studies have been con-

ducted to determine whether any additional actions can improve prevention of MRSA in dental settings. Investigators in one such study described the elimination of MRSA from patients' dentures by use of common denture-cleansing solutions.⁶¹ Researchers in another study found that the rate of bacteremia occurring within one hour after a tooth extraction can be reduced by means of a preoperative rinse with an oral chlorhexidine solution.⁶²

Contact Precautions. Contact Precautions are recommended in addition to Standard Precautions in acute care hospitals for patients known to be infected or colonized with an MDRO and for certain patients in ambulatory settings (such as those with uncontrolled wound drainage or other syndromes that represent increased risk of contact transmission).⁵⁷ These additional measures include patient placement in single-patient rooms when available or grouping as roommates patients who are infected or colonized with the same pathogen, use of personal protective equipment (gown and gloves) on room entry, transporting and moving patients outside of the room in acute care hospitals only for medically necessary purposes, use of single-use or patient-dedicated noncritical patient-care equipment (such as blood pressure cuffs) and ensuring that rooms of patients subject to Contact Precautions are prioritized for frequent cleaning and disinfection. In outpatient settings, such as a dental clinic, Contact Precautions would be indicated only in a situation in which a patient had uncontained drainage of an infected wound.

In the community. No *S. aureus* vaccines are available, although such products are being developed.⁶³ Optimal strategies for prevention of MRSA in the community have yet to be determined; however, an emphasis on general hygiene and wound care is imperative. In community outbreak settings, transmission has been interrupted after implementation of multicomponent strategies focusing on increased awareness, prompt identification and appropriate management of new infections, education on wound care and containment, enhanced hygiene, restricting shared use of potentially contaminated items such as clothing and towels, regular cleaning of frequently touched environmental surfaces, and restricting infected people from participation in certain close-contact activities if wound drainage cannot be contained.^{55,64}

CONCLUSIONS

This article briefly describes the history and epidemiology of MRSA in health care and community settings and summarizes recommended control strategies in these settings. Dentists' implementation of appropriate infection control practices can prevent and control transmission of bacteria and viruses in their offices; MRSA is only one of these pathogens. Dentists also can help educate the public on how to prevent and manage MRSA in the community. In dental offices, the risk of transmission of MRSA is lower than in acute care hospitals, and Standard Precautions combined with other selected measures are recommended. In the community, dentists' awareness of opportunities for direct contact and factors that facilitate MRSA transmission—such as crowding, physical contact and lack of hygiene—will facilitate their support of community prevention.

The CDC has developed resources for health care professionals, including dental health care workers, and for patients^{56-60,65,66}; it is hoped that readers will find them helpful in the battle against MRSA. ■

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