CA-MRSA: How Should We Respond to Outbreaks?

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Introduction to MRSA

Methicillin-resistant Staphylococcus aureus (MRSA) was first reported decades ago in the United States and was related to exposures in the healthcare system. These staphylococcal (Staph) bacteria are resistant to beta-lactam antibiotics, including methicillin, oxacillin, penicillin, and amoxicillin.

CA-MRSA vs HA-MRSA

Over the past 10 years, MRSA has emerged in the community with clinical, epidemiologic, and bacteriologic characteristics distinct from healthcare-associated MRSA (HA-MRSA).

Community-associated MRSA (CA-MRSA) has its onset in the community in an individual lacking the established MRSA risk factors, such as a recent hospitalization, surgery, residence in a long-term care facility, receipt of dialysis, or the presence of an invasive medical device. Additionally, there is molecular evidence that CA-MRSA strains evolved spontaneously rather than from migration out of hospitals. The methicillin resistance is coded in the chromosome mec type IV, which had not been characteristic of healthcare-associated strains. Furthermore, CA-MRSA produces several toxins that aren't commonly found in the nosocomial strains, such as the Panton-Valentine leukocidin, which causes leukocyte destruction and tissue necrosis. The MRSA strain, USA 300, is most associated with CA-MRSA.

CA-MRSA: Clinical Presentation and Disease Burden

CA-MRSA most often presents as a skin or soft-tissue infection, such as a boil, pimple, or abscess, in an otherwise healthy person. Patients frequently recall a "spider bite." The lesions are often red, swollen, and painful and may have pus or a discharge. They are commonly found in cuts and scrapes and in hairy areas of the body, such as the back of the neck, groin, buttocks, armpits, and the inner thigh. By 2007, CA-MRSA was the most frequent cause of skin and soft-tissue infections seen in emergency departments in the United States. Although most MRSA cases are skin and soft-tissue infections, some are more serious with septicemia and pneumonia. In 1999, four children in Minnesota and North Dakota were reported to have died from fulminant CA-MRSA infections. It was reported in 2005 that previously
healthy adolescents without any predisposing risk factors presented more frequently with severe Staph infections (mostly the USA 300 strain) since 2002.\cite{5} CA-MRSA has been associated with necrotizing pneumonia and empyema; sepsis syndrome; musculoskeletal infections, such as pyomyositis and osteomyelitis; necrotizing fasciitis; purpura fulminans; and disseminated infection with septic emboli. A recent editorial speculated that the number of deaths from MRSA would exceed the total number of deaths attributable to HIV/AIDS in the United States in 2005.\cite{6}

**CA-MRSA: Disease Transmission and Risk Factors**

CA-MRSA infections can be spread by contact with infected skin or personal items, such as towels, bandages, or razors, that have been in contact with infected skin. It is more likely to spread in places where there is close contact, such as locker rooms or correctional facilities. The bacteria get into the skin through scrapes or cuts or small openings in the skin, particularly around hair follicles. Investigations have shown transmission through the sharing of common objects, such as athletic equipment, towels, benches, and personal items contaminated with MRSA.\cite{7,8} Outbreaks have been reported in football, wrestling, rugby, soccer, fencing, canoeing,\cite{9-11} and groups with close person-to-person contact, such as day care center attendees, jail and prison inmates, and the military.\cite{2,12} There have also been CA-MRSA cases in tattoo recipients.\cite{13} A study conducted at 3 emerging infection program sites by the US Centers for Disease Control and Prevention (CDC) found between 18.0 and 25.7 cases of CA-MRSA per 100,000 population, with 75% being skin and soft-tissue infections.\cite{13}

Risk factors include:

- Close skin-to-skin contact;
- Openings in the skin, such as cuts and scrapes;
- Contaminated items and surfaces, such as soap and towels;
- Crowded living conditions;
- Poor hygiene, skipping showers before using communal w/;
- Improper wound care; and
- Poor hand hygiene -- lack of access to handwashing faciliti
CA-MRSA: Diagnosis and Treatment

The criteria for the diagnosis of CA-MRSA are that the diagnosis is made by culture in an outpatient setting or within 48 hours of hospital admission; there is no medical history of MRSA infection or colonization; there is no history in the past year of hospitalization, admission to a nursing home, admission to a skilled nursing facility or hospice, dialysis, or surgery; and there are no permanent indwelling catheters or medical devices that pass though the skin. The treatment of skin and soft-tissue infections includes incision and drainage and antibiotic therapy, if indicated, on the basis of the susceptibility profile of the culture.

CA-MRSA: Prevention and Control

There are several strategies that healthcare providers should take to prevent and control CA-MRSA infections. Clinicians should culture suspect lesions and provide targeted antimicrobial and surgical therapy. Healthcare workers must maintain the appropriate infection control precautions during wound care of patients with skin infections. Patients and families should be provided simple instructions to prevent the transmission of skin infections to family members or other contacts with education on appropriate wound management, hand and body hygiene, and eliminating the sharing of potentially contaminated items.[14] The CDC convened a meeting of experts in March 2006, and issued the following recommendations for controlling CA-MRSA:

- Keep draining wounds covered with clean, dry bandages.
- Stress good hand hygiene; wash regularly with soap and water or alcohol-based gel if not visibly soiled. Always wash hands immediately after any contact with infected skin or items in direct contact with drainage.
- Bathe regularly.
- Don't share items that may be contaminated from a wound, such as towels, clothing, bedding, bar soap, razors, and athletic equipment.
- Launder clothing that comes into contact with the wound and dry thoroughly.
- No participation in athletic events and other activities with skin contact with other people unless the wound can be kept covered with a clean, dry bandage.

Clean equipment and other environmental surfaces if multiple people have skin contact with it.[1] MRSA can survive on some surfaces for a long time (hours to months) depending on the temperature; humidity; the amount present; the type of surface, such as those that are porous; and if nutrients are present. Effective disinfectants registered with the US Environmental
Protection Agency (EPA) are available at retail stores and should be used according to their directions. Contact time is critical.\[8\]

There are not enough data available to assess the association between MRSA colonization and infection in the community. MRSA is frequently colonized in the nose. Colonization can also occur in the pharynx, axilla, rectum, and perineum. The CDC reports that 25% to 30% of the US population are colonized with Staph at any time, but that only about 1% is colonized with MRSA.\[15\] Colonization may be important in the development and transmission of infection and the persistence or reappearance of colonization after the use of decolonization agents. A combination of topical and systemic antimicrobial agents and antiseptic body washes have been used. Mupirocin used intranasally has been effective in the short term, but recolonization has been common.\[1\]

**Response at the Community Level**

Public health agencies have a critical role to play in the prevention and control of CA-MRSA. One role is surveillance. Public health needs to know what is going on in their state and in their communities. Until recently, most states had not made CA-MRSA a reportable condition where healthcare practitioners and laboratories report cases to their local and/or state health departments. Tennessee made it reportable in 2004 and showed that it was a major public health problem. MRSA was the third most common of the reportable conditions in Tennessee. Case reporting allows public health authorities to know what the trends are in their area of responsibility so that they can take appropriate actions and alert their healthcare community, particularly on drug susceptibility. Case reporting will also allow outbreaks to be identified earlier so that appropriate investigations can be done. More knowledge is needed on the epidemiology of CA-MRSA, and it should be a vital part of the mission of public health agencies to ascertain as much about the epidemiology as possible.

**CA-MRSA: Leadership and Education From Public Health Agencies**

Public health also has a key leadership function. They [ie, public health agencies] should provide essential information on CA-MRSA to their healthcare community and work with them to improve diagnosis, treatment, and control efforts. Public health agencies should also work with their healthcare providers and the public to reduce the spread of antibiotic resistance. Efforts should focus on ensuring that the appropriate antibiotics are used for the appropriate conditions. These efforts can help reduce the growing antibiotic resistance in organisms, such as MRSA. Campaigns have shown success in educating the public not to demand antibiotics for conditions, such as pharyngitis, that do not normally require antibiotics.
Education of the public about CA-MRSA is critical. People need to know what it is and how to prevent it. Public health authorities have a lead role in working with the media, community groups, and healthcare providers to get this information to the public. There is a need to stress the hygiene message. Handwashing is something that the public needs to do more frequently and more effectively. Improved hygiene and improved wound care by the public must be stressed. It is also important that the health authorities work with their school systems, correctional facilities, athletic teams, day care centers, and other places where there is close interpersonal contact to make them aware of CA-MRSA and what steps they should or should not take to prevent or control the disease.

Public health agencies at the state and local level are responsible for the control of outbreaks of communicable disease in their jurisdictions. This includes CA-MRSA. Early recognition and reporting allow the health department to make epidemiologic investigations and quickly implement control measures to stop the spread of CA-MRSA. Much of what is known about CA-MRSA has come from epidemiologic investigations of clusters by public health agencies.

**CA-MRSA: Rapid Response Lessons Learned in Virginia**

In October 2007, the Virginia Department of Health faced a major crisis with CA-MRSA or at least the public's fear of it. A teenager in central Virginia became ill and went to the local hospital. He was promptly transferred to a tertiary care hospital, diagnosed with CA-MRSA, and treated aggressively. He did not improve and died. Word of the teenager's death created fear and concern among parents and students at the public high school that he attended. Students held protests outside the school and refused to enter the building. Local school officials received a high volume of calls from concerned parents, and local and national media provided extensive coverage of his death.

The local school superintendent, responding to intense pressure from parents, students, and staff, decided to close all of the schools in the county and hired a contractor to "disinfect" the schools. The timing of the child's death coincided with the publication of a report from the CDC that estimated that there were as many as 90,000 MRSA infections annually, and the publication of an editorial stressed the growing problem of antibiotic-resistant infections, such as MRSA, and speculated that there could be as many deaths occurring due to MRSA as from HIV.\(^{[3,6]}\) This created the "perfect storm" within the state with intense concern from the media, the public, and elected officials demanding that "something be done" to stop the "outbreak." Concern bordered on panic.

The mention of a possible MRSA case created pressure for local officials to close schools or cancel sporting events. A number of schools and colleges were closed and events postponed unnecessarily. Community concerns were not limited to parents and students. A local motor
vehicle agency closed when an employee was thought to have a MRSA lesion on her arm despite the advice of the physician and local health department. Media interest reached a fever pitch not seen since the anthrax attacks of 2001. Local media carried a MRSA feature with a count of suspected cases on each broadcast.

The state health department, however, was slow to react to the crisis and took several days to develop a program to get information effectively to the public, schools, and government officials to calm the panic, and spent incredible amounts of time and effort to respond to the media and others. It was quickly learned that it is critically important to respond immediately and consistently with the basic information about the disease and what is needed to prevent and control it at the individual, institutional, and community levels. Once health department information was shared with the school systems at the local and state levels, most schools responded rationally. Eventually, one television manager personally appeared on his station to apologize for his staff's contribution to the panic and stopped the sensationalism of CA-MRSA there. It was important that information be made available in multiple ways to reach multiple audiences -- the media, healthcare providers, schools, governmental officials, and concerned and frightened citizens. Staff investigated reported outbreaks and cases and were able to provide assurances and appropriate guidance.

Governmental officials from the governor down became involved. Among the most frequently asked questions was how many MRSA infections occurred in Virginia each year. MRSA was not a reportable condition in Virginia, and the health department could provide little data on numbers of cases and trends in the state. There was intense interest at all levels of government to introduce legislation to address the public's concern. The governor began to draft legislation along with a number of state legislators to have schools report all cases of MRSA to health authorities. Ensuing discussions showed that this was not workable, but the state health commissioner, using his emergency powers, issued an emergency order requiring all laboratories serving Virginia to report to the health department all cultures, from a normally sterile site, positive for MRSA. Because MRSA requires laboratory confirmation, it was decided that this was the most effective way to get information on MRSA quickly and efficiently.

It is extremely important that public health authorities and healthcare providers work cooperatively to combat the increasing numbers of CA-MRSA infections. It is also critical that work continues to combat the increase in antibiotic resistance generally.

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