



## METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* (MRSA) BACKGROUND

### What is MRSA?

- Methicillin-resistant *Staphylococcus aureus* (MRSA) is a type of bacteria that causes serious infections that are resistant to many of the strongest antibiotics, including methicillin and other more commonly used antibiotics (including penicillin and amoxicillin).<sup>1</sup>
- MRSA occurs most frequently among patients who undergo invasive medical procedures or who have weakened immune systems and are being treated in hospitals and healthcare facilities.<sup>2</sup> These healthcare-associated infections (HAIs) include surgical wound infections, urinary tract infections, bloodstream infections and pneumonia.<sup>3</sup> People who have been hospitalized or had surgery within the past year or who are receiving treatments like dialysis are at increased risk for infections with MRSA.<sup>4</sup>
- MRSA infections have risen sharply in recent years. In 1972, MRSA accounted for only two percent of all *Staphylococcus aureus* HAIs reported to the Centers for Disease Control and Prevention (CDC) in the U.S.<sup>5</sup> Recent data show that MRSA now accounts for 50 to 70 percent of *Staphylococcus aureus* infections.<sup>6</sup>
- *Staphylococcus aureus* (“staph”) organisms are common bacteria that can live on the skin and are one of the most common causes of skin infections in the U.S.<sup>7</sup> The bacteria also live harmlessly in the nasal passages of roughly 30 percent of the U.S. population. These people are sometimes called “staph carriers” or persons who are “colonized” with staph organisms. Staph organisms can cause infection when they enter the skin through a cut or sore. Infection can also occur when the bacteria move inside the body through a catheter or breathing tube. The infection can be minor and local (for example, a pimple) or more serious.<sup>8</sup>
- Though MRSA is generally associated with healthcare institutions, it can also occur in persons who have had no contact with a healthcare facility. These types of MRSA infections are classified as community-acquired MRSA (CA-MRSA) and are presenting to hospital emergency departments and outpatient clinics in increasing numbers. In addition, patients with CA-MRSA who are admitted to a healthcare facility can be the source for organisms that can be spread to other hospitalized patients, and such spread has been well-documented. Many such infections have also occurred among athletes who share equipment or personal items (such as towels or razors) and among children in daycare facilities who are in very close contact with one another throughout the day.<sup>9</sup> By some estimates, more than half of all skin infections now treated in emergency rooms are caused by MRSA.<sup>10</sup>

## **What are the symptoms?**

- Staph skin infections normally cause a red, swollen and painful area on the skin, like a boil. Other symptoms include a skin abscess, drainage of pus or other fluids from the site, fever, or warmth around the infected area.
- Symptoms of a more serious staph infection may include rash, shortness of breath, fever, chills, chest pain, fatigue, muscle aches, malaise (general feeling of illness) or headache. Serious staph infections may include cellulitis (skin infection), endocarditis (infection of the valves of the heart or the inner lining of the heart chambers), toxic shock syndrome, pneumonia or blood poisoning.<sup>11</sup>

## **How does someone contract MRSA?**

- MRSA is most often contracted while a patient is in the hospital. Transmission of MRSA organisms can occur from skin-to-skin contact with someone who has MRSA on their skin, by hands of healthcare personnel who pick up organisms on their hands from a colonized patient and then care for another patient without washing their hands between the tasks, by contact with items such as computer keyboards or surfaces such as bedrails that have the organisms on them, and through insertion of devices such as catheters or breathing tubes that bypass the body's natural defenses.
- The risk for the spread of CA-MRSA is highest where people with poor hygiene are associating in close quarters such as prisons, homeless shelters, locker rooms and daycare centers.

## **What is causing this explosion of MRSA cases?**

- We do not know the answer to this question. Overuse of antibiotics and use of more powerful drugs than necessary for less serious infections can be causing the emergence of more drug-resistant strains of the organism. These resistant bacteria survive and multiply, leading to antibiotic resistance. Researchers have also speculated that widespread prophylactic use of antibiotics in livestock may also be contributing to the problem by giving these bacteria the opportunity to evolve into super-resistant organisms.

## **How serious is MRSA?**

- Even with treatment, these infections are difficult to cure because our armamentarium of drugs is becoming ineffective. This is a *super* bug that has developed resistance to our strongest antibiotics.
- The MRSA death rate has been estimated to be more than 2.5 times higher than deaths from *Staphylococcus aureus* bacteria that are susceptible to methicillin.<sup>12</sup>
- The mortality rate among patients with MRSA bacteremia (bacterial infection in the bloodstream) is estimated to be as high as 23 percent.<sup>13</sup>
- MRSA infections also lead to longer hospital stays – on average 10 days longer than if a patient hadn't become infected.<sup>14</sup> Costs of a MRSA HAI are estimated to be \$35,367 compared with \$13,973 for a non-MRSA HAI.<sup>15</sup> According to the CDC, HAIs lead to more than 4.5 billion in excess healthcare costs<sup>16</sup>, with MRSA being the lead cause of these infections.<sup>17</sup>

- According to data collected by the state of Pennsylvania, compared to patients without MRSA, patients in that state with MRSA were four times as likely to die, had hospital stays more than 2.5 times longer, and were charged three times as much for their hospitalization.<sup>18</sup>

## **Prevention of MRSA**

- Practicing good hand hygiene, not sharing personal items such as razors and towels, keeping wounds clean and covered, and seeking immediate medical attention if you have a painful skin infection are good first steps toward preventing serious infections.
- In healthcare institutions, many HAIs can be prevented by system-wide adoption of MRSA elimination strategies. The Association for Professionals in Infection Control and Epidemiology (APIC), an international organization representing more than 11,000 infection control experts, issued the guidelines for elimination of MRSA transmission. The bundle of strategies includes:<sup>19</sup>
  - MRSA risk assessment – As the first step in any MRSA prevention program, the risk assessment identifies high risk areas for MRSA within the hospital to guide the development of a plan for MRSA surveillance, screening, prevention and control.
  - MRSA surveillance program – Is based on risk assessment data and outlines specific activities (e.g., laboratory tests) and procedures that are designed to identify MRSA cases.
  - Hand hygiene – The cornerstone of any infection prevention and control program, hand hygiene plays an integral role in reducing the transmission of organisms. All hospitals should require adherence to established CDC hand hygiene guidelines.
  - Contact precautions – Separating MRSA patients from other patients and the use of gloves and gowns and other precautions to avoid transfer of microorganisms to other patients or environments.
  - Environmental and equipment cleaning and decontamination – Procedures to avoid contamination through equipment or the environment. In general, items that are close to patients (e.g., bedrails, bedside equipment, in-room computer keyboards) present a greater risk for contamination with MRSA than walls and floors.
  - Targeted active surveillance cultures – Testing of patients at high-risk for MRSA colonization or infection. “High-risk” groups may include:
    - Long-term care residents
    - Patients with recent or frequent hospitalizations
    - Dialysis patients
    - Athletes
    - Those with a history of incarceration
    - History of IV drug use
  - Cultural transformation – For an infection control program to be successful, the culture of the hospital needs to support and require compliance with known infection control practices. This requires clinical and administrative commitment as well as adequate resources. To accomplish a successful program, APIC recommends participation and support at all levels.
  - Involving hospital administration – Leadership on the part of hospital administration is crucial to any infection prevention program including MRSA elimination.

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<sup>1</sup> [www.nlm.nih.gov/medlineplus/print/ency/article/007261.htm](http://www.nlm.nih.gov/medlineplus/print/ency/article/007261.htm)

<sup>2</sup> [http://www.cdc.gov/ncidod/dhqp/ar\\_MRSA\\_spotlight\\_2006.html](http://www.cdc.gov/ncidod/dhqp/ar_MRSA_spotlight_2006.html)

<sup>3</sup> [http://www.cdc.gov/ncidod/dhqp/ar\\_mrsa\\_ca\\_public.html](http://www.cdc.gov/ncidod/dhqp/ar_mrsa_ca_public.html)

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- <sup>4</sup><http://www.nlm.nih.gov/medlineplus/print/ency/article/007261.htm>
- <sup>5</sup> [www.cdc.gov/od/oc/media/pressrel/r061019.htm](http://www.cdc.gov/od/oc/media/pressrel/r061019.htm)
- <sup>6</sup> Siegel JD, Rhineheart E, Jackson M, Linda C; Healthcare Infection Control Practices Advisory Committee. "Management of Multidrug-Resistant Organisms in Healthcare Settings, 2006." Available at <http://www.cdc.gov/ncidod/dhqp/pdf/ar/mdroGuideline2006.pdf>.
- <sup>7</sup> [http://www.cdc.gov/ncidod/dhqp/ar\\_mrsa\\_ca\\_public.html](http://www.cdc.gov/ncidod/dhqp/ar_mrsa_ca_public.html)
- <sup>8</sup> <http://www.nlm.nih.gov/medlineplus/print/ency/article/007261.htm>
- <sup>9</sup> <http://www.nlm.nih.gov/medlineplus/print/ency/article/007261.htm>
- <sup>10</sup> Moran GJ, Krishnadasan A, Gorwitz RJ, Fosheim GE, McDougal LK, Carey RB, Talan DA; Emergency ID Net Study Group. (2006). Methicillin-Resistant *S. aureus* Infections among Patients in the Emergency Department, *New England Journal of Medicine*, 355,666-674.
- <sup>11</sup> <http://www.nlm.nih.gov/medlineplus/print/ency/article/007261.htm>
- <sup>12</sup> Rubin RJ, Harrington CA, Poon A, Dietrich K, Greene JA, Moiduddin A. The economic impact of *Staphylococcus aureus* infection in New York City hospitals. *Emerg Infect Dis*. 1999;5:9-17.
- <sup>13</sup> Blot, S.I., Vandewoude, K.H., Hoste, E.A., & Colardyn, F.A. (2002). Outcome and attributable mortality in critically ill patients with bacteremia involving methicillin-susceptible and methicillin-resistant *staphylococcus aureus*. *Archives of Internal Medicine*, 162, 2229-2235.
- <sup>14</sup> <http://infectioncontrolday.com/hotnews/55h168584264313.html>.
- <sup>15</sup> Stone PW, Larson E, Kawar LN. A systematic audit of economic evidence linking nosocomial infections and infection control interventions: 1990-2000. *Am J Infect Control*. 2002;30:145-152.
- <sup>16</sup> [www.cdc.gov/ncidod/dhqp/healthDis.html](http://www.cdc.gov/ncidod/dhqp/healthDis.html)
- <sup>17</sup> [www.cdc.gov/ncidod/dhqp/ppt/ICU\\_RESTrend1995-2004.ppt#1](http://www.cdc.gov/ncidod/dhqp/ppt/ICU_RESTrend1995-2004.ppt#1)
- <sup>18</sup> Pennsylvania Health Care Cost Containment Council, PHC4 Research Brief, MRSA in Pennsylvania Hospitals, Issue No. 10, August 2006.
- <sup>19</sup> Guide to the Elimination of Methicillin-Resistant *Staphylococcus aureus* (MRSA) Transmission in Hospital Settings, APIC, 2007.