

Hospital-based *Staphylococcus aureus* infections are an increasingly serious public health issue. According to the U.S. Centers for Disease Control and Prevention (CDC), more than 2 million patients in the U.S. each year contract an infection as a result of receiving healthcare in a hospital.¹ Within the nation's 7,000 acute care hospitals, *S. aureus* is one of the three leading causes of hospital-based bloodstream infections and has a crude mortality rate of 25 percent.² Furthermore, the rate of *S. aureus* infections is on the rise, with the incidence in intensive care units more than doubling from 1987 to 1997.³ In the U.K., where hospital-acquired infection rates are among the worst in Europe, bloodstream infections resulting from *S. aureus* are increasing with 40 percent resistant to the antibiotic methicillin.⁴ With its capacity to cause serious complications and its increasing antibiotic-resistance, *S. aureus* is becoming a critically dangerous pathogen.

WHO IS AT RISK?

An estimated 12 million patients are at risk for developing an *S. aureus* infection each year in the U.S.⁵ Patients at the greatest risk are those who are immunocompromised, those whose treatment requires an invasive device such as a catheter and those with chronic illnesses. Those at high risk include:

- Surgical patients, particularly those undergoing lengthy cardiac and orthopedic procedures
- Trauma and burn patients
- Individuals undergoing invasive outpatient procedures
- Patients receiving an implanted medical device or prosthetic
- Newborns whose immune systems are not yet developed
- Individuals in long-term care
- Kidney dialysis patients
- Type 1 diabetics
- Immunocompromised individuals, such as cancer patients and patients with acquired immune deficiency syndrome (AIDS).^{6,7}

Studies have shown that patients with a defective immune system, such as kidney dialysis patients, have as high as a one in 25 chance of contracting an *S. aureus* bloodstream infection over a one-year period.⁸

CONTRACTING AN *S. AUREUS* INFECTION

While an *S. aureus* infection can be contracted anywhere, it is mainly a hospital-based, or nosocomial, infection. Humans are natural reservoirs for *S. aureus*. In fact, 30 to 50 percent of healthy adults are carriers of the bacteria.³ Infection occurs when the integrity of the skin barrier is broken (e.g. as a result of injury or surgical procedure) and the body's immune system can no longer sufficiently combat the bacteria. There are a number of ways to contract an *S. aureus* infection, including:

- From another patient or healthcare worker in a hospital setting
- From any invasive medical device, such as a catheter or syringe
- From home care treatments, such as total parenteral nutrition (TPN)
- From any number of prosthetic devices, such as a prosthetic hip or knee
- Following surgical procedures⁷

WHY ARE *S. AUREUS* INFECTIONS SO DANGEROUS?

S. aureus infections are of special concern because of their ability to cause a number of devastating complications and their increasing resistance to current antibiotics. Serious complication from hospital *S. aureus* infections may include:

- Bacteremia (blood infection)
- Osteomyelitis (bone infection)
- Endocarditis (infection of the inner lining of the heart and its valves)
- Abscesses in internal organs such as the lungs
- Toxic shock syndrome³ ❖

STATS ON *S. AUREUS*

- According to the CDC, the 1992 cost of hospital-based infections was estimated at more than \$4.5 billion in the U.S. alone.⁹
- According to a 1995 study conducted in New York, nosocomial infections increased a patient's medical costs on average by \$28,800.¹⁰
- According to the same New York study, *S. aureus*-associated hospitalizations resulted in approximately twice the length of stay, deaths and medical costs of typical hospitalizations.¹⁰
- *S. aureus* infections cost New York City well over \$400 million for the treatment of 13,500 people during 1995.¹⁰
- The overall rate of mortality from staphylococcal bacteremia ranges from 11 to 43 percent.³
- According to a recent study in *Emerging Infectious Diseases*, nosocomial bacteremias may represent the eighth leading cause of death in the U.S.²
- Endocarditis (infection of the lining of the heart and its valves) accounts for 25 to 35 percent of *S. aureus* complications, and the mortality rate ranges from 20 to 44 percent.³
- The rate of methicillin-resistant *S. aureus* (MRSA) infections is increasing, with the incidence in intensive care units approximately doubling from 1987 to 1997.³
- Strains of MRSA, which had been largely confined to hospitals and long-term care facilities, are emerging in the community.¹¹

S. AUREUS IS BECOMING INCREASINGLY RESISTANT TO ANTIBIOTICS

- Strains of drug-resistant *S. aureus* are found in most hospitals, often leaving vancomycin as the only antibiotic for treating patients with these infections. Hospitals and other healthcare settings worldwide face unprecedented crises from the rapid emergence and dissemination of antibiotic-resistant microorganisms, according to the National Institutes of Health.¹¹
- 70 percent of the bacteria causing hospital-based infections are resistant to at least one of the antibiotics used to treat them.¹
 - It has been estimated that more than 95 percent of patients worldwide with *S. aureus* infections no longer respond to first-line antibiotics (penicillin or ampicillin).¹⁰
 - Methicillin is alternatively used, but more than 55 percent of strains of *S. aureus* are now methicillin-resistant.¹²
 - Vancomycin is the antibiotic of last resort. However, for the first time in history, isolates of *S. aureus* with reduced or no sensitivity to vancomycin have been identified in the U.S., Japan and France.¹³

S. AUREUS IS AN URGENT PUBLIC HEALTH ISSUE

- S. aureus* infections have increased in the past 20 years primarily due to the increased use of invasive devices in both hospital and home care settings, as well as the increase in the number of elderly and/or immune compromised patients. Antibiotic-resistant strains of *S. aureus* also have increased, limiting viable therapies to treat and prevent infections. These antibiotic-resistant strains can result in serious medical complications and death.
- *S. aureus* is one of the most prevalent nosocomial infections.
 - Complications related to *S. aureus* infections have high rates of mortality.
 - Healthcare costs associated with *S. aureus* infections are high.
 - *S. aureus* is the most common cause of community-acquired bacteremia.¹⁴

- Centers for Disease Control and Prevention. Antimicrobial Resistance: A Growing Threat to Public Health. DHQP/NCIDOD; November 2002. Available from http://www.cdc.gov/ncidod/hip/aresist/am_res.htm Accessed on July 12, 2004.
- Wenzel, Richard and Edmond, Michael. The Impact of Hospital-Acquired Bloodstream Infections. *Emerging Infectious Diseases*. Vol. 7:174–177, March – April 2001.
- Lowy, Franklin. *Staphylococcus aureus* Infections. *New England Journal of Medicine*. Vol. 339:520-532, August 20, 1998.
- National Audit Office (UK). Improving patient care by reducing the risk of hospital acquired infection: A progress report: A Report by the Comptroller and Auditor General. House of Commons 876, Session 2003–2004, July 14, 2004.
- The Mattson-Jack Group. Use of StaphVAX, *Epidemiology and Market Forecast*. 2002.
- Centers for Disease Control and Prevention. Community-Associated MRSA: Frequently Asked Questions. NCIDOD; August 2003. Available from http://www.cdc.gov/ncidod/hip/aresist/mrsa_comm_faq.htm Accessed on July 12, 2004.
- Centers for Disease Control and Prevention. MRSA – Methicillin Resistant *Staphylococcus aureus*: Fact Sheet. NCIDOD; February 2003. Available from <http://www.cdc.gov/ncidod/hip/aresist/mrsafaq.htm> Accessed on July 12, 2004.
- Kessler M., Hoen B. Mayeux D., Hestin D., Fontenaille C. Bacteremia in patients on chronic hemodialysis. A multicenter prospective survey. *Nephron*. Vol. 64(1):95–100, 1993.
- Centers for Disease Control and Prevention. Public Health Focus: Surveillance, Prevention, and Control of Nosocomial Infections. *MMWR* 1992;41:783–787.
- Rubin, Robert J., et al. The Economic Impact of *Staphylococcus aureus* Infection in New York City Hospitals. *Emerging Infectious Diseases*. Vol. 5:9–17, January–February 1999.
- U.S. Department of Health and Human Services. The Problem of Antibiotic Resistance: Fact Sheet. NIAID/NIH, April 2004. Available from <http://www.niaid.nih.gov/factsheets/antimicro.htm> Accessed on July 12, 2004.
- Centers for Disease Control and Prevention. National Nosocomial Infections Surveillance (NNIS) System Report, data summary from January 1992 through June 2003. *Am J Infect Control* 2003. Vol. 31:481–98.
- Centers for Disease Control and Prevention. Investigation and control of vancomycin-intermediate and –resistant *Staphylococcus aureus*: A Guide for Health Departments and Infection Control Personnel. Atlanta, GA. April 21, 2004. Available from http://www.cdc.gov/ncidod/hip/aresist/visa_vrsa_guide.pdf Accessed on July 12, 2004.
- Chenoworth, Carol. Four-year prospective evaluation of community-acquired bacteremia: Epidemiology, microbiology and patient outcome. *Diagnostic Microbiology and Infectious Disease*. Vol. 41:15–22, 2001.

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