We conferred with experts in Alaska for insight into the disease in our state. In Alaska, as in the vast majority of the United States, MRSA is not a reportable disease, according to Dr. Beth Funk of the epidemiology section of the State of Alaska's Division of Public Health.[4] Dr. Funk explains that MRSA is a common (and usually harmless) affliction and it would be prohibitively costly—and bureaucratically problematic—to track MRSA on a large scale. As there are no detailed data regarding the pervasiveness of MRSA in Alaska or elsewhere, Dr. Funk was hesitant to make an estimate on its prevalence in the state.

Dr. Tom Hennessey of the CDC's Arctic Investigations program estimates that less than 5% of those who seek medical care for the disease have serious or "invasive" MRSA.[5] Dr. Hennessy confirmed that MRSA is not a reportable disease in Alaska—or in most of the country—making comparisons between and among states problematic. Along with Dr. Funk, Dr. Hennessey believes that the most thorough study on invasive MRSA was published in the October 17, 2007, edition of the *Journal of American Medical Association* (JAMA). In the study, the CDC arrived at national estimates by projecting from the number of invasive MRSA cases from nine sites in the United States.[6] The report estimates that MRSA caused more than 94,000 life-threatening infections and nearly 19,000 deaths in the United States in 2005, the majority of which were associated with health care settings. The study also found that infection rates were highest among individuals 65 years of age and older and that blacks were twice a likely to be affected as were whites. We include the study as Attachment A along with a CDC press release highlighting the results of the study

Prisoners are among those groups recognized as being at a high risk of contracting MRSA. The CDC published a report in October 2003 that looks at MRSA transmission among inmates of correctional facilities in Georgia, California and Texas.[7] An example of the study's findings is that in Texas—with approximately 145,000 inmates—there were 10,942 cases of MRSA reported during the surveillance period (January 1996 through July 2002). Of these cases, 1.7% were the invasive variety of MRSA, while 94.6% were less serious skin or soft tissue infections. The study points out that because of their enclosed and often crowded environments, prisons and jails can serve as amplifiers of MRSA skin disease. Briefly, the study highlights the following factors as contributing to the spread of MRSA among inmates:

- Barriers to routine inmate hygiene (such as inadequate access to soap);
- Lack of access to medical care and inadequate supplies and staff for wound care;
- Medical staff turnover; and
- Lack of recognition of MRSA (e.g. wounds may be erroneously attributed to spider bites).

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[4] Reportable diseases are those tracked and monitored by states and/or countries usually through public health departments because of their potential to threaten the general population. Alaska currently has approximately 60 reportable diseases. Tuberculosis, HIV, botulism, hantavirus, and anthrax are examples of such diseases. Dr. Funk can be reached at (907) 269-8004.

[5] Dr. Hennessey can be reached at (907) 729-3400.

[6] The sites in the study were Monroe County, New York; Baltimore County, Maryland; Davidson County, Tennessee; Ramsey County, Minnesota; the San Francisco Bay Area; the state of Connecticut; and the metropolitan areas of Atlanta, Denver, and Portland, Oregon.

[7] The CDC study on MRSA in correctional facilities in Georgia, California, and Texas is included as Attachment B.

The study offers a basic strategy to improve hygiene and infection-control practices in correctional facilities. Their suggested strategy includes:

- Skin infection screening and monitoring;
- Culturing suspect lesions;
- Improving inmate hygiene (e g. basic hygiene education, appropriate laundering, and greater availability of soap); and
- Improved access to wound care and trained health-care staff.

Dwayne Peoples, Deputy Commissioner of Alaska's Department of Corrections (DOC), relates that the DOC does not have data on the prevalence of MRSA in Alaska's correctional facilities.[8] Mr. Peoples told us that the Department is in the process of creating a centralized surveillance system to track MRSA. When it is implemented, clinics at prison sites will make weekly reports regarding occurrences of MRSA that will allow for a better understanding of the magnitude of the problem.

Brad Wilson, Business Manager of the Alaska Correctional Officers Association (ACOA), argues that tracking MRSA incidents among the inmates and staff of correctional facilities is of paramount importance.[9] According to Mr. Wilson, MRSA infection is "rampant" among prisoners and correctional staff across the state. Nina Salerno-Ashford, administrator and attorney for Corrections U.S.A., concurs that MRSA is a significant problem nationwide in correctional facilities. She adds that a lack of data makes it difficult to quantify the magnitude of MRSA, but notes that Corrections U.S.A. considers it a major concern for correctional officers.[10] We include as Attachment C an ACOA document that includes information regarding MRSA in the correctional environment as well as proposed guidelines for management of the disease.[11]

I hope you find this information to be useful. Please do not hesitate to contact us if you have questions or need additional information.

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[8] Dwayne Peoples can be reached at (907) 465-4652.

[9] Brad Wilson can be reached at (907) 646-2262.

[10] Corrections U.S.A. is a non profit corporation representing correctional officers employed by federal, state and local governments. Currently, they represent over 80,000 correctional officers across the county. Nina Salerno-Ashford can be reached at (877-885-8756).

[11] Attachment C also includes the Federal Bureau of Prisons clinical practice guidelines regarding MRSA management.

Attachment A

Center for Disease Control press release: Study establishes baseline for MRSA infection estimates, October 16, 2007

and

Invasive Methicillin-Resistant *Staphylococcus aureus* Infections in the United States, the Journal of the American Medical Association, October 17, 2007

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Press Release

For Immediate Release
Tuesday, October 16, 2007

Contact: CDC Media Relations
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CDC estimates 94,000 invasive drug-resistant staph infections occurred in the U.S. in 2005

Study establishes baseline for MRSA infection estimates

Methicillin–resistant staph aureus (MRSA) caused more than 94,000 life–threatening infections and nearly 19,000 deaths in the United States in 2005, most of them associated with health care settings, according to the most thorough study of life–threatening infections caused by these bacteria, experts with the Centers for Disease Control and Prevention (CDC) report.

The study in the Oct. 17 edition of the Journal of American Medical Association (JAMA), establishes the first national baseline by which to assess future trends in invasive MRSA infections. MRSA infections can range from mild skin infections to more severe infections of the bloodstream, lungs and at surgical sites.

The study found about 85 percent of all invasive MRSA infections were associated with health care settings, of which two–thirds surfaced in the community among people who were hospitalized, underwent a medical procedure or resided in a long–term care facility within the previous year. In contrast, about 15 percent of reported infections were considered to be community–associated, which means that the infection occurred in people without documented health care risk factors.

The 2005 rates of invasive infection were highest among people 65 years of age or older. Black people were affected at twice the rate of whites, which could be due to higher rates of chronic illness among blacks.

"These numbers show that many families are being affected by these drug–resistant infections," said Denise Cardo, M.D., director of CDC's Division of Healthcare Quality Promotion. "Healthcare facilities need to make MRSA prevention a greater priority. The closer we get to 100 percent compliance with CDC recommendations, the greater the impact on patient health and safety."

Experts arrived at the new national estimate by projecting from the number of invasive MRSA cases from nine U.S. sites. The sites included the state of Connecticut; the Atlanta metropolitan area; the San Francisco Bay area; the Denver metropolitan area; the Portland, Ore., metropolitan area; Monroe County, N.Y.; Baltimore City, Md.; Davidson County, Tenn.; and Ramsey County, Minn. All the sites were part of CDC's Active Bacterial Core surveillance program, which actively tracks a number of pathogens in the United States representing a population of 38 million Americans.

In health care settings, MRSA occurs most frequently among patients who undergo invasive medical procedures or who have weakened immune systems and are being treated in hospitals and health care facilities such as nursing homes and dialysis centers.

For more information on MRSA, please visit http://www.cdc.gov/ncidod/diseases/submenus/sub_mrsa.htm. For more information on CDC's guidelines for the prevention of MRSA in health care settings, visit http://www.cdc.gov/ncidod/dhqp/ar_mrsa_prevention.html.

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Original Contribution

Invasive Methicillin-Resistant *Staphylococcus aureus* Infections in the United States

R. Monina Klevens, DDS, MPH; Melissa A. Morrison, MPH; Joelle Nadle, MPH; Susan Petit, MPH; Ken Gershman, MD, MPH; Susan Ray, MD; Lee H. Harrison, MD; Ruth Lynfield, MD; Ghinwa Dumyati, MD; John M. Townes, MD; Allen S. Craig, MD; Elizabeth R. Zell, MSTAT; Gregory E. Fosheim, MPH; Linda K. McDougal, MS; Roberta B. Carey, PhD; Scott K. Fridkin, MD; for the Active Bacterial Core surveillance (ABCs) **MRSA** Investigators

JAMA. 2007;298:1763-1771.

ABSTRACT

Context As the epidemiology of infections with methicillin-resistant *Staphylococcus aureus* (**MRSA**) changes accurate information on the scope and magnitude of **MRSA** infections in the US population is needed.

Objectives To describe the incidence and distribution of **invasive MRSA** disease in 9 US communities and to estimate the burden of **invasive MRSA** infections in the United States in 2005.

Design and Setting Active, population-based surveillance for **invasive MRSA** in 9 sites participating in the Active Bacterial Core surveillance (ABCs)/Emerging Infections Program Network from July 2004 through December 2005. Reports of **MRSA** were investigated and classified as either health care–associated (either hospital-onset or community-onset) or community-associated (patients without established health care risk factors for **MRSA**).

Main Outcome Measures Incidence rates and estimated number of **invasive MRSA** infections and in-hospital deaths among patients with **MRSA** in the United States in 2005; interval estimates of incidence excluding 1 site that appeared to be an outlier with the highest incidence; molecular characterization of infecting strains.

Results There were 8987 observed cases of invasive **MRSA** reported during the surveillance period. Most **MRSA** infections were health care–associated: 5250 (58.4%) were community-onset infections, 2389 (26.6%) were hospital-onset infections; 1234 (13.7%) were community-associated infections, and 114 (1.3%) could not be classified. In 2005, the standardized incidence rate of **invasive MRSA** was 31.8 per 100 000 (interval estimate, 24.4-35.2). Incidence rates were highest among persons 65 years and older (127.7 per 100 000; interval estimate, 92.6-156.9), blacks (66.5 per 100 000; interval estimate, 43.5-63.1), and males (37.5 per 100 000; interval estimate, 26.8-39.5). There were 1598 in-hospital deaths among patients with **MRSA** infection during the surveillance period. In 2005, the standardized mortality rate was 6.3 per 100 000 (interval estimate, 3.3-7.5). Molecular testing identified strains historically associated with community-associated disease outbreaks recovered from cultures in both hospital-onset and community-onset health care–associated infections in all surveillance areas.

Conclusions **Invasive MRSA** infection affects certain populations disproportionately. It is a major public health problem primarily related to health care but no longer confined to intensive care units, acute care

hospitals, or any health care institution.

INTRODUCTION

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After being initially reported among injecting drug users in Detroit in 1981[1] and then associated with the deaths of 4 children in Minnesota and North Dakota in 1997,[2] community-associated methicillin-resistant *Staphylococcus aureus* (**MRSA**) has become the most frequent cause of skin and soft tissue infections presenting to emergency departments in the United States.[3] Although community outbreaks of **MRSA** in diverse populations, including American Indian and Alaska Natives,[4] sports teams,[5-6] prison inmates,[7] and child care attendees,[8] usually involved skin disease, **MRSA** also can cause severe, sometimes fatal **invasive** disease.[9-13]

Studies of the emergence of community-associated **MRSA** disease over the past decade determined that isolates causing community-associated and health care–associated **MRSA** infections were distinct.[10] Isolates from the community were susceptible to most non–β-lactam antimicrobial agents,[10] carried staphylococcal cassette chromosome type IV,[14] and frequently encoded the dermonecrotic cytotoxin known as Panton-Valentine leukocidin.[15] The strain most often isolated in community outbreaks was pulsed-field type USA300.[16] Other strains of community origin include USA400, USA1000, and USA1100.[17] In contrast, strains most frequently associated with **MRSA** infections in health care settings were USA100, USA200, and less often, USA500[18]; these traditionally have been multidrug-resistant and have carried staphylococcal cassette chromosome type II.[10]

In hospitalized patients, **MRSA** has been a problem since the 1960s[19]; approximately 20% of bloodstream infections in the hospital setting have been caused by *S aureus*.[20] The proportion of hospital-onset *S aureus* infections that were methicillin-resistant reached 64.4% in US intensive care units in 2003.[21] In the hospital, **MRSA** infections are associated with greater lengths of stay, higher mortality,[22] and increased costs.[23-24] Although more recently there has been increased surveillance activity for **invasive MRSA** infections in the community, surveillance for **MRSA** bloodstream infections in the United States traditionally has been limited to hospital-onset (ie, nosocomial) disease.[20-21]

As the epidemiology of **MRSA** disease changes, including both community- and health care–associated disease, accurate information on the scope and magnitude of the burden of **MRSA** disease in the US population is needed to set priorities for prevention and control. In this report we describe the incidence and distribution of **invasive MRSA** disease in 9 US communities and use these results to estimate the burden of **invasive MRSA** infections in the United States.

METHODS

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Surveillance Methodology and Definitions

The Active Bacterial Core surveillance system (ABCs) is an ongoing, population-based, active laboratory surveillance system and is a component of the Emerging Infections Program (EIP) of the US Centers for Disease Control and Prevention (CDC). From July 2004 through December 2005, 9 EIP sites conducted surveillance for **invasive MRSA** infections. A site number was assigned in descending order of population size: site 1, the state of Connecticut (estimated population, 3.5 million); site 2, the Atlanta, Georgia, metropolitan area (8 counties; estimated population, 3.5 million); site 3, the San Francisco, California, Bay Area (3 counties; estimated population, 3.2 million); site 4, the Denver, Colorado, metropolitan area (5 counties; estimated population, 2.3 million); site 5, the Portland, Oregon, metropolitan area (3 counties; estimated population, 1.5 million); site 6, Monroe County, New York (estimated population, 733 000); site 7, Baltimore City, Maryland (estimated population, 636 000); site 8,

Davidson County, Tennessee (estimated population, 575 ,00); and site 9, Ramsey County (St Paul area), Minnesota (estimated population, 49 ,000). The total population under surveillance in 2005 was an estimated 16.5 million, or approxi ' 5.6% of the US population. Surveillance sites were similar to the US population in the distribution by sex (49.2% and 49.2%, respectively); however, surveillance sites had a lower frequency of whites (72.7% and 81.0%, respectively) and of persons 65 years and older (10.8% and 12.4%, respectively).

ABCs case finding was both active and laboratory-based. Clinical microbiology laboratories in acute care hospitals and all reference laboratories processing sterile site specimens for residents of the surveillance area were contacted regularly for case identification. In hospitals without computerized microbiology data, surveillance personnel telephoned designated microbiology laboratory contacts regularly to identify new cases and request isolate submission. Where microbiology data were computerized, electronic line listings of all **MRSA** isolated from normally sterile sites were received on a monthly basis by surveillance staff, which investigated each potential case to confirm residency status, presence of infection, demographic characteristics, and underlying illness. The burden of disease can be estimated by this surveillance method using census data and the surveillance site–specific incidence rates and age-, race-, and sex-adjusted incidence rates pooled across all surveillance sites. This infrastructure is the same as that used for estimated incidence and disease burden for bacterial meningitis[25] and **invasive** infections with *Streptococcus pneumoniae*.[26-27]

Case reporting and isolate collection were determined to be surveillance activities at the CDC; in addition, each of the 9 participating surveillance sites evaluated the protocol and either deemed it a surveillance activity (eg, that involving a reportable disease) or obtained institutional review board approval with a waiver of informed consent.

A case of **invasive MRSA** infection was defined by the isolation of **MRSA** from a normally sterile body site in a resident of the surveillance area, including residents institutionalized in long-term care facilities, prisons, etc. Normally sterile sites included blood, cerebrospinal fluid, pleural fluid, pericardial fluid, peritoneal fluid, joint/synovial fluid, bone, internal body site (lymph node, brain, heart, liver, spleen, vitreous fluid, kidney, pancreas, or ovary), or other normally sterile sites. Cultures designated as "fluid" were investigated as potentially sterile culture sites; cultures designated as "tissue" with no specification of original source were not investigated.

Personnel in each EIP site abstracted data from medical records from hospital and clinic visits using a standard case report form. Information on the following health care risk factors for **MRSA** was collected: culture obtained more than 48 hours after admission; presence of an **invasive** device (eg, vascular catheter, gastric feeding tube) at time of admission or evaluation; and a history of **MRSA** infection or colonization, surgery, hospitalization, dialysis, or residence in a long-term care facility in the 12 months preceding the culture. Cases could have more than 1 health care risk factor. For this analysis, we used health care risk factor information to classify cases into mutually exclusive groups (those with health care–associated and community-associated infections) justified previously[28] and consistent with other studies (Table 1).[29-30] Health care–associated infections, in turn, were classified as either community-onset (cases with a health care risk factor but with a culture obtained ≤48 hours after hospital admission) and hospital-onset (cases with culture obtained >48 hours after admission, regardless of whether they also had other health care risk factors). Community-associated cases were those without documented health care risk factors.

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Table 1. Definitions Used for Epidemiologic Classification of **Invasive** Methicillin-Resistant *Staphylococcus aureus* (**MRSA**) Infections

Surveillance personnel also collected demographic (including race), clinical, and outcome (hospital death or discharge) information on each case from the initial hospitalization. Mortality was collected from the patient record and represented crude, in-hospital deaths only. Race was collected from information available in the

medical record. Cases were considered to have a diagnosis of bacteremia, pneumonia, cellulitis, osteomyelitis, endocarditis, septic shock, or other infection, if there was documentation of such a diagnosis in the medical record, regardless of the source of the isolate. Cases could have more than 1 clinical diagnosis. Bacteremias included those classified as primary, secondary, and not specified. Use of up to 4 antimicrobial agents was recorded, but all such agents reflected only initial empirical therapy and did not include dose, duration, therapeutic changes, or procedures (eg, draining, surgical therapy). Concordant empirical therapy was defined as receipt of any antimicrobial agent to which the isolate was susceptible by laboratory testing and that was documented in the medical record. Recurrent **invasive MRSA** was defined as a positive culture result obtained from the same case 30 days or more after the initial culture.

Isolate Collection and Testing

Laboratories identified by the EIP site were asked to submit isolates from **invasive MRSA** infections. Of 123 laboratories serving residents of the surveillance areas, 48 (39%) contributed isolates. All isolates were sent to the CDC for identification, selected testing, and storage. In situations in which more than 1 isolate was available from a single case, the protocol selected 1 isolate, preferably from a nonblood sterile site. Isolates were prioritized for testing as follows: within each geographic site, all nonblood isolates and the subsequent submitted blood isolate were selected; then, among blood isolates, those from cases with a diagnosis other than uncomplicated bacteremia were selected. Testing included confirmation of *S aureus* identification using catalase and Staphaurex (Remel Europe Ltd, Dartford, United Kingdom) agglutination tests and tube coagulase if necessary, as well as description of morphology on nonselective blood agar, confirmation of oxacillin resistance by the broth microdilution method,[18] and pulsed-field gel electrophoresis (PFGE) using the restriction endonuclease *Sma*I. PFGE patterns were analyzed using BioNumerics version 4.01 (Applied Maths, Austin, Texas) and grouped into pulsed-field types using Dice coefficients and 80% relatedness, as previously described.[18] PFGE testing was conducted at the CDC and at the reference centers in Colorado, Connecticut, Georgia, Minnesota, and Oregon. All PFGE patterns were entered into a single database for analysis.

Statistical Analysis

We selected cases reported from July 2004 through December 2005 to describe epidemiologic, clinical, and microbiological characteristics. We included only cases reported from January through December 2005 for the annual 2005 incidence rate calculations. Recurrent cases were excluded from incidence calculations. We used US Census Bureau bridged-race vintage postcensus population estimates for 2005, provided by the National Center for Health Statistics for surveillance area and national denominator values.

Because the surveillance sites varied in the distribution by age and race, for national estimates of burden of disease we multiplied the aggregate age-, race-, and sex-specific rates of disease in the surveillance areas by the age, race, and sex distribution of the US population for 2005. Because 1 site (site 7, Baltimore City) reported an excessively high incidence of infection, we calculated interval estimates for the age-, race-, and sex-adjusted incidence rates and estimated burden as well. This was performed by creating a lower bound by pooling data from the 3 EIP sites with lowest overall incidence (sites 4, 5, and 9) and an upper bound by pooling data from the 3 EIP sites with highest overall incidence (sites 2, 6, and 8), excluding site 7. Because data from site 7 were excluded from the interval estimates, there are occasions when the intervals do not include the overall rate. Confidence intervals are based on the properties of a sampling distribution and cannot be calculated with our data because our surveillance areas captured all cases, not a sample. We tested differences in proportions of descriptive characteristics using χ^2. Analyses were performed using SAS version 9.1.3 (SAS Institute Inc, Cary, North Carolina).

RESULTS

Incidence of Invasive MRSA

There were 8987 observed cases of **invasive MRSA** reported from July 2004 through December 2005. Most were health care–associated, with 5250 (58.4%) community-onset infections, 2389 (26.6%) hospital-onset infections, 1234 (13.7%)

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community-associated infections, and 114 (1.3%) that could not be classified.

Unadjusted incidence rates of all types of **invasive MRSA** ranged between approximately 20 to 50 per 100 000 in most ABCs sites but were noticeably higher in 1 site (site 7, Baltimore City) (Table 2). The rate of **invasive** community-associated **MRSA** was less than 3 per 100 000 in 4 sites and approximately 5 per 100 000 in 3 sites. Incidence rates were consistently higher among blacks compared with whites in the various age groups (Table 3). Adjusting for age, race, and sex, the standardized incidence rate of **invasive MRSA** for calendar year 2005 was 31.8 per 100 000 persons (Table 4). The overall interval estimate after exclusion of the outlier site (site 7) was 24.4 to 35.2 per 100 000.

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Table 2. Observed Incidence Rates of **Invasive** Methicillin-Resistant *Staphylococcus aureus* (**MRSA**) by Active Bacterial Core Surveillance Site and Epidemiologic Classification, United States, 2005[a]

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Table 3. Estimated Incidence Rates of **Invasive** Methicillin-Resistant *Staphylococcus aureus* Infections by Race, Active Bacterial Core Surveillance, United States, 2005

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Table 4. Numbers and Incidence Rates of **Invasive** Methicillin-Resistant *Staphylococcus aureus* (**MRSA**) Infections and Deaths, by Selected Demographic Characteristics and Epidemiologic Classifications, Active Bacterial Core Surveillance, United States, 2005[a]

The rate of health care–associated, community-onset infections (17.6 per 100 000; interval estimate, 14.7-18.2) was greater than either health care–associated, hospital-onset infections (8.9 per 100 000; interval estimate, 6.1-11.8) or community-associated infections (4.6 per 100 000; interval estimate, 3.6-4.4). Standardized incidence rates overall were highest among persons 65 years and older (127.7 per 100 000; interval estimate, 92.6-156.9), blacks (66.5 per 100 000; interval estimate, 43.5-63.1), and males (37.5 per 100 000; interval estimate, 26.8-39.5) (Table 4). Rates were lowest among persons aged 5 to 17 years (1.4 per 100 000; interval estimate, 0.8-1.7).

The standardized mortality rate was 6.3 per 100 000 (interval estimate, 3.3-7.5) overall, and was higher among persons 65 years and older (35.3 per 100 000; interval estimate, 18.4-44.7), blacks (10.0 per 100 000; interval estimate, 5.7-9.9), and males (7.4 per 100 000; interval estimate, 3.7-8.9) (Table 4). Among persons with **MRSA**, mortality for health care–associated, community-onset infections was higher (3.2 per 100 000; interval estimate, 1.7-3.7) than for health care–associated, hospital-onset infections (2.5 per 100 000; interval estimate, 1.2-3.1) or for community-associated infections (0.5 per 100 000; interval estimate, 0.3-0.6).

There were 5287 infections reported in the surveillance areas during 2005; after adjusting for age, race, and sex to the US population, we estimated that 94 360 (interval estimate, 72 850-104 000) patients had an **invasive MRSA** infection. There were 988 reported deaths, which we estimated were 18 650 (interval estimate, 10 030-22 070) in-hospital deaths subsequent to **invasive MRSA** infections in the United States (Table 4).

Pooled among all sites, we looked at the frequency of reports over the 18-month period from July 2004 through December 2005. The number of cases reported per month ranged from 443 in August 2004 to 541 in September 2005. Among all cases reported in the 18-month period, the percentage with community-associated infections ranged from 4.2% in April 2005 to 6.6% in July, August, and October 2005. When

limiting the evaluation to only the 172 community-associated pneumonia reports, there was no apparent clustering by season (data not shown).

Established MRSA Risk Factors and Spectrum of Disease

Apart from community-associated cases which, by definition, had no established health care risk factors for **MRSA**, 4105 of 5250 (78.2%) cases with health care-associated, community-onset infections and 1993 of 2389 (83.4%) cases with health care-associated, hospital-onset infections had more than 1 health care risk factor for **MRSA** documented in medical records. The most common health care risk factors among cases with community-onset infections and hospital-onset infections were a history of hospitalization (76.6% and 57.7%, respectively), history of surgery (37.0% and 37.6%), long-term-care residence (38.5% and 21.9%), and **MRSA** infection or colonization (30.3% and 17.4%).

Of the 8792 cases with complete information, the clinical syndrome associated with **invasive MRSA** disease included bacteremia (75.2%), pneumonia (13.3%), cellulitis (9.7%), osteomyelitis (7.5%), endocarditis (6.3%), and septic shock (4.3%). Almost all cases (8304 [92.4%]) were hospitalized, 1598 (17.8%) of all cases died during hospitalization, and 1162 (12.9%) developed recurrent **invasive** infections. Cases with endocarditis had a high frequency of recurrent infections (108 [19.3%]). Clinical outcome was recorded for 8849 cases (98%). Crude mortality varied by **MRSA**-related diagnosis, with high rates observed among cases with septic shock (55.6%) and pneumonia (32.4%), low rates among those with cellulitis (6.1%), and moderate rates among those with bacteremia (10.2%) or endocarditis (19.3%). The proportion of cases presenting with each major clinical condition varied between epidemiologic classifications (Table 5). Compared with the distribution of syndromes among cases with community-associated infections, bacteremia was more common, and cellulitis and endocarditis were significantly less common, among each of the cases with health care-associated infections.

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Table 5. Number and Percentage of **Invasive** Methicillin-Resistant *Staphylococcus aureus* Infections by Clinical Condition and Epidemiologic Classification, Active Bacterial Core Surveillance, United States, July 2004-December 2005[a]

Empirical therapy was documented for 5730 of the 8987 cases (63.8%). Overall, 4720 cases (82.4%) received concordant empirical therapy. Differential outcomes based on discordant therapy were not evaluated, since required data such as dose, duration, therapy changes, and adjunctive therapy were not abstracted. Receipt of concordant therapy was slightly lower among cases with community-associated infections compared with those having health care-associated infections either of community onset (80.1% vs 82.9%, respectively; $P = .03$) or hospital onset (80.1% vs 86.0%, $P < .001$). Vancomycin was the antimicrobial agent most frequently used for empirical therapy (75%), followed by semisynthetic penicillins (28%) and fluoroquinolones (26%). Similar proportions of cases were prescribed monotherapy (31.3%), therapy with 2 antimicrobials (37.9%), or therapy with more than 2 antimicrobials (30.9%).

Pulsed-Field Typing

PFGE results were available for 864 of the 1201 (71.9%) isolates received from 8 of the 9 ABCs sites (isolates were not available from site 7); these results represent 11.3% of the 7648 cases reported from these 8 sites (Table 6). Of these results, 81.6% were from blood cultures, 4.7% from bone, 4.8% from synovial fluid, 1.9% from pleural fluid, 1.5% from peritoneal fluid, and the remaining 5.5% from other normally sterile sites; this culture site distribution is similar to the distribution of culture sites reported among all 8987 cases. Isolates tested were associated with all of the major clinical conditions previously described, including uncomplicated bacteremia (69.8%), pneumonia (19.3%), cellulitis (11.3%), osteomyelitis (10.4%), endocarditis (8.5%), and septic shock (5.0%).

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Table 6. Number and Percentage of Pulsed-Field Types USA100 and USA300 of

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Methicillin-Resistant *Staphylococcus aureus* Isolates, Active Bacterial Core Surveillance Sites, United States, 2005[a]

USA300 was the strain type identified for 100 of 150 (66.6%) isolates from community-associated cases and also was found among 108 of 485 (22.2%) isolates from health care–associated, community-onset cases and among 34 of 216 (15.7%) health care–associated, hospital-onset cases (Table 7). Also, 35 of 150 (23.0%) isolates from community-associated cases were USA100. In contrast, other strains of community origin (USA400, USA1000) were rare, accounting for only 3 of 150 (2.0%) isolates from community-associated cases, perhaps reflecting that these isolates all come from normally sterile sites and not skin abscesses, where these strain types have often been reported. USA100 and USA300 were the predominant pulsed-field types in each surveillance site, with the exception of site 1 (state of Connecticut) (Table 6).

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Table 7. Pulsed-Field Gel Electrophoresis Type of Methicillin-Resistant *Staphylococcus aureus* Isolates Cultured From **Invasive** Sites, by Epidemiologic Case Classification, Active Bacterial Core Surveillance, July 2004-December 2005 (n = 864)[a]

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These data represent the first US nationwide estimates of the burden of **invasive MRSA** disease using population-based, active case finding. Based on 8987 observed cases of **MRSA** and 1598 in-hospital deaths among patients with **MRSA**, we estimate that 94 360 **invasive MRSA** infections occurred in the United States in 2005; these infections were associated with death in 18 650 cases. The standardized incidence rate of **invasive MRSA** for calendar year 2005 was 31.8 per 100 000 persons. The incidence of other important **invasive** pathogens in 2005, such as **invasive** infections with *S pneumoniae* or *Haemophilus influenzae*, ranged from 14.0 per 100 000 to less than 1 per 100 000, largely due to the availability and success of vaccination.[31-33]

The estimated 94 360 infections is larger than the estimate from a recent study using hospital discharge-coded data; in 2000, the CDC estimated that there were 31 440 hospitalizations for **MRSA** bacteremias (ie, septicemia) in the United States.[34] Some of the discrepancy may relate to a more inclusive definition of **invasive** disease in our study and to the limitations inherent in discharge coded data. Of the estimated 94 360 infections from this study, 75.2% were bacteremias, and 26.6% were of hospital onset; thus, our estimates would yield approximately 18 900 **MRSA**, hospital-onset bacteremias. In 2002, the CDC estimated that there were 248 678 hospital-acquired bacteremias in the United States,[35] of which approximately 20 390 (8.2%) could be expected to be **MRSA**[20]—a result consistent with our findings.

Regarding community-associated **MRSA**, noninvasive infections with **MRSA** greatly outnumber **invasive MRSA** infections. In fact, when 3 of the ABCs sites began surveillance in 2000 for all **MRSA** infections, only 7% represented **invasive** disease. However, findings described here further document that **invasive MRSA** disease does occur in persons without established health care risk factors,[28] is associated with strains of both community and health care origin,[36] and is associated with significant mortality. Molecular analysis of isolates in our study provides evidence supporting other studies[36] showing that strains of community origin do now cause some hospital-onset disease but also that, overall, most **invasive MRSA** disease is still caused by **MRSA** strains of health care origin.

Compared with rates of **invasive MRSA** infections in 2 of our sites from 2001-2002, the incidence of **invasive MRSA** has increased in 2005 from 19.3 per 100 000 to 33.0 per 100 000 in Atlanta and from

40.4 per 100 000 to 116.7 per 100 000 in Baltimore.[13] These increases were in both community- and health care-associated disease. However, in the state of Connecticut, the rate of community-onset **MRSA** bacteremias has been relatively stable at 2.5 per 100 000 in 1998[29] and 2.8 per 100 000 in 2005.

We describe striking differences in rates of **invasive MRSA** infections by race among all age groups. Connecticut documented a disparity for community-onset *S aureus* bacteremias in 1998.[29] More recently, surveillance in Atlanta reported a significantly higher rate of community-associated **MRSA** among blacks compared with whites[13]; however, little progress has been made in understanding why. It is likely that the prevalence of underlying conditions,[37] at least some of which vary by race,[38] may play a role. The incidence of **invasive** pneumococcal disease varies widely by underlying chronic illness, but racial disparities persist for all conditions evaluated.[39] **MRSA** prevalence has been linked to socioeconomic status,[40] and this might confound the association between race and incidence of **MRSA**. Future analyses should focus on understanding reasons for differences in **MRSA** incidence rates.

The geographic variability in **MRSA** rates has been documented in other studies.[3, 13] In this study we found that areas with lower incidence rates of **invasive MRSA** overall did not always have lower rates of community-associated **MRSA**. For example, site 6 (Monroe County, New York) had a relatively high rate of **invasive MRSA** overall (41.9 per 100 000) but a low rate of community-associated **MRSA** (2.7 per 100 000); site 5 (the Portland, Oregon, metro area) had a relatively low rate of **invasive MRSA** overall (19.8 per 100 000) but a high rate of community-associated **MRSA** (4.7 per 100 000). In addition to factors already mentioned such as socioeconomic status and underlying conditions, **MRSA** rates may be higher in urban areas.[29] As with differences in the incidence of **invasive MRSA** by race, geographic differences are probably multifactorial and complex. Improved understanding can help design and focus prevention messages as well as increase the timeliness of diagnosis and clinical management of **invasive** infections.

The majority of **invasive MRSA** cases occurred outside of the hospital (58%) but among persons with established risk factors for **MRSA**, such as a history of hospitalization in the past year. This observation was also made recently in a study from a single facility.[30] Patients with health care risk factors and community-onset disease likely acquired the pathogen from their health care contacts, such as those from a recent hospitalization or nursing home residence. Molecular analysis suggests that most of these infections were caused by **MRSA** strains of health care origin. If, in fact, these infections represent acquisition during transitions of care from acute care,[41] it follows that strategies to prevent and control **MRSA** among inpatients,[42-43] if properly applied, may have an impact on these infections as well as on the traditional hospital-onset infections. Since interventions for **MRSA** prevention are inconsistently implemented in US hospitals,[44] correlating the impact on either inpatient or outpatient disease will be challenging. Interventions used in the community to control outbreaks consist of improving hygiene and infection control along with enhanced surveillance, diagnosis, and appropriate treatment of infections[45-47]; however, studies of the effectiveness of community-based prevention and control interventions are lacking.

Our estimates have certain limitations. First, we may have underestimated the incidence of **invasive MRSA** disease if persons in the surveillance areas sought health care from facilities using laboratories outside the surveillance area. However, any underestimate is probably minor in light of the estimates derived from discharge data on **MRSA** hospitalizations.[34]

Second, we may have overestimated the incidence of community-associated **MRSA** if health care risk factors were not well documented in medical records. During surveillance conducted in 2000-2001, patient interviews were used to elicit undocumented health care risk factors; however, the effect on reclassification was small.[13]

Third, our surveillance sites were largely urban areas; thus, we might be overestimating the incidence of **invasive MRSA**.[29] Although our surveillance areas comprise a diverse set of regions and are likely representative of the United States, it is not known whether the incidence rates in the observed populations are actually representative of the distribution of incidence rates in other US cities. Since the methodology of population-based surveillance produces a single point estimate without confidence intervals (ie, all cases are identified), we calculated interval estimates excluding site 7 (Baltimore City) to allow the

reader to interpret a range of estimates reflecting different metropolitan areas. Regarding the high observed incidence rates reported by site 7, we conducted an evaluation to determine whether these results were valid, including a review of case-finding methods, elimination of cases to include only those with zip codes represented in the denominator, contamination in any laboratory, and other potential causes for increased rates; however, none were in error.

Fourth, our measures of deaths represented crude, in-hospital deaths, rather than attributable mortality. It is possible that **MRSA** infection did not cause or contribute to some deaths.

Fifth, the evaluation of isolates in this study was meant to describe strain diversity and to shed light on the potential crossover of strains from a community origin into the hospital setting. The isolate collection was a convenience sample. Furthermore, we only had test results from isolates of 864 (11.3%) of the cases reported; extrapolation of the molecular characterization to the US population should be avoided.

In conclusion, **invasive MRSA** disease is a major public health problem and is primarily related to health care but no longer confined to acute care. Although in 2005 the majority of **invasive** disease was related to health care, this may change.

AUTHOR INFORMATION

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Attachment B

Methicillin-Resistant *Staphylococcus aureus* Infections in Correctional Facilities—Georgia, California, and Texas, 2001-2003, Centers for Disease Control, October 17, 2003

CDC

MMWR

Weekly

October 17, 2003 / 52(41);992-996

Methicillin-Resistant *Staphylococcus aureus* Infections in Correctional Facilities -- Georgia, California, and Texas, 2001--2003

Infections caused by methicillin-resistant *Staphylococcus aureus* (MRSA) (Figure) are common in hospitals and nursing homes. Because MRSA is resistant to all commonly prescribed beta-lactam antibiotics (e.g., penicillins and cephalosporins), these infections require treatment with alternative antimicrobial drugs. In addition, because antimicrobial drugs usually must be selected before identifying MRSA as the cause of infection, treatment presents a challenge for clinicians. MRSA has emerged recently as a more frequent cause of skin and soft tissue infections in the community, particularly in correctional facilities such as prisons, jails, and detention centers (*1*--*3*). This report summarizes recent investigations of MRSA transmission among inmates of correctional facilities in Georgia, California, and Texas. Inadequate personal hygiene, barriers to medical care, and other factors contributed to transmission. Information from these investigations has been used in the development of recently released Federal Bureau of Prisons guidance for control of MRSA (*4*), which recommends improvements in inmate hygiene, infection control, and targeted antimicrobial treatment.

Case Definition

For the investigations described in this report, a confirmed case of MRSA infection was defined as illness, compatible with staphylococcal disease, in an inmate with laboratory evidence of MRSA from culture of tissue or blood. A possible case of MRSA was defined as an illness, compatible with staphylococcal infection, in an inmate who had an epidemiologic link to a laboratory-confirmed case but did not have cultures performed. A case of MRSA infection was defined as invasive if MRSA was isolated from cultures of a normally sterile site such as blood or cerebrospinal fluid.

Georgia

Since 2001, the Georgia Division of Public Health has assisted the Georgia Department of Corrections (GDC) and local health departments with three investigations of MRSA skin infection outbreaks in three different types of correctional facilities. These investigations are described below.

Investigation 1. During June--September 2001, a total of 11 cases of MRSA skin infections were identified in an all-male, 200-bed, minimum-security state detention center with an average incarceration duration of 90 days. Of the 11 inmates, five had repeated MRSA skin infection occurring after the initial lesion (i.e., recurrent disease). A case-control study identified prolonged (>36 days) incarceration and outdoor work duty as risk factors for MRSA infection. Other possible risk factors included inadequate wound care by medical staff and limited access to soap for hand washing and general bathing (soap was locked in inmate cells away from sinks and showers). In response to this outbreak, the detention center implemented facility-wide screening for skin disease, standardized antimicrobial treatment recommendations, inmate education, and introduction of alcohol-based hand rubs. During December 2001--May 2002, no MRSA cases occurred; however, during June--November 2002, a total of 14 cases were reported. Staff reviewed previous recommendations for hygiene education with inmates and reinforced proper wound care and antimicrobial use. Chlorhexidine-containing soap was provided daily for 3 days among the entire inmate population. During December 2002--April 2003, five cases of MRSA occurred.

Investigation 2. During April--July 2002, a total of 11 cases of MRSA were reported from a 1,500-bed, maximum-security state prison with an average incarceration duration of 591 days. Infections ranged from small furuncles to deeper abscesses; no deaths or bacteremias occurred, and no inmates were hospitalized. A case-control study identified risk factors, including previous antimicrobial use, self-draining of boils, skin laceration (intentional or accidental), washing clothes by hand, sharing soap, and recent arrival at the prison (since 2001). On the basis of these findings, the prison implemented appropriate laundering, improved access to wound care, increased availability and quantity of soap, and began inmate hygiene education. Monitoring of MRSA infections from the beginning of the outbreak in April 2002 until February 2003 identified 73 inmates with infection, 10 of whom had recurrent disease.

During July--August 2002, a total of 23 cases of MRSA occurred in 19 inmates. Interventions were implemented during late July--August; however, six cases of MRSA occurred among inmates during September--October. In response, in February 2003, the prison housed a cohort of MRSA-infected inmates separately and provided a 5-day supply of chlorhexidine-containing soap for personal hygiene. Despite these measures, during March--May 2003, an additional 29 cases of MRSA were reported. GDC and

prison staff are working to improve implementation of recommended interventions for preventing additional cases of MRSA among inmates.

Investigation 3. During June--October 2002, a 2,800-bed county jail with an average incarceration duration of 25 days identified 13 cases of skin lesions, initially thought to be spider bites, from which MRSA was isolated. Three inmates were hospitalized for wound care. A retrospective chart review identified 16 cases and 29 possible cases of MRSA skin infections that had occurred during this period. Infections included folliculitis, furunculosis, and abscess. In December, the jail implemented screening for active skin lesions among the inmates, standardized treatment protocols including treatment with non--beta-lactam antibiotics for suspected *S. aureus* infections, hygiene education for inmates, and changes in laundry practices. Through increased use of bacterial cultures to evaluate skin infections, 59 additional MRSA cases were identified during February--April 2003. A review of medical records of 50 patients who received antimicrobials identified 13 (26%) instances in which beta-lactam antimicrobials were used inappropriately for nine (18%) inmates treated before culture results and for four (8%) inmates treated after results indicated culture-confirmed MRSA.

Los Angeles County, California

The Los Angeles (LA) County jail system, the largest in the country, houses an estimated 20,000 inmates daily and has an average duration of incarceration of 44 days. After an increase in reports of spider bites, the jail developed a protocol in September 2001 that included culture of any lesions suspected to be spider bites. The LA County Department of Health Services (LACDHS) was notified after MRSA was found as the cause of many "spider bite" lesions (*2*). In 2002, a total of 921 MRSA skin infections were identified; 726 (79%) inmates had data available for review. The median time from incarceration to MRSA culture was 45 days (range: 1--1,160 days); 65 (9%) MRSA cases were identified within 5 days after incarceration. During January--June 2003, a total of 776 inmates with MRSA infections were identified (14% identified within 5 days after incarceration), yielding 1,697 cases reported since the jail began surveillance for skin lesions. Investigators observed inadequate infection-control measures in the clinic area; enhanced administrative controls were necessary to ensure frequent showering and appropriate personal hygiene for inmates. LACDHS recommended improvements for skin lesion surveillance, standardized treatment protocols including empiric treatment with non--beta-lactam antimicrobials for all wound infections, hygiene education for inmates, environmental cleaning, and increased frequency of laundry changes. Improvements in antimicrobial treatment of MRSA infections have occurred; however, other recommendations have yet to be implemented fully.

Texas

The Texas Department of Criminal Justice (TDCJ) operates 105 facilities housing 145,000 inmates. In 1996, TDCJ implemented a comprehensive set of treatment and prevention guidelines for MRSA skin infections that included six components: 1) surveillance, 2) hygiene education for inmates, 3) access to proper wound care, 4) standardized antimicrobial therapy based on drug susceptibility data (including directly observed therapy), 5) early treatment of skin disease, and 6) eradication of MRSA from asymptomatic carriers who have recurrent MRSA infections. Since 1998, TDCJ has required culturing of all draining skin lesions and reporting of results to the TDCJ Office of Preventive Medicine. The proportion of *S. aureus* infections that were methicillin-resistant increased from 24% (864 of 3,520) in 1998 to 66% (5,684 of 8,633) in 2002. In December 2000, a case-control study (16 cases and 32 controls) was performed for all cases of MRSA identified during November 2000 at the correctional system's largest intake facility. The study identified previous skin infections and recent close contact with an MRSA-infected inmate as risk factors for infection. Of 10,942 cases of MRSA reported from the beginning of surveillance during January 1996--July 2002, a total of 189 (1.7%) were invasive. The remainder were either unknown site (397 [3.6%]) or skin and soft tissue infections (10,356 [94.6%]). During 1999--2001, three deaths were attributed to MRSA infections. Skin infection screening at the time of incarceration was added to the guidelines in 2003. Implementation of guidelines and a continued multidisciplinary approach to MRSA infections has not led to substantial decreases in the incidence of MRSA. Additional interventions and their effects on infection and carriage are being evaluated, and barriers to efficient implementation of the guidelines are being investigated.

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Editorial Note:

The investigations described in this report identified four factors that contributed to spread of MRSA among inmates. First, investigators identified barriers to routine inmate hygiene. Access to soap often was limited or was restricted for security reasons, and new alcohol-based hand rubs were difficult to introduce because of misuse of these products. Mental health and behavior problems among inmates might have contributed to poor adherence and hindered efforts to improve hygiene. Inmates' clothing was washed by hand or in bulk loads, and potentially contaminated laundry

might not have undergone sufficiently high water temperatures or drying to eliminate bacteria. Second, proper access to medical care was hindered by co-payments required for acute care visits and by inadequate supplies and staff for wound care. Third, frequent medical staff turnover was a challenge to providing education on proper infection-control procedures. Finally, MRSA might have been an unrecognized cause of skin infections among inmates; wounds often were attributed to spider bites, and cultures might have been collected infrequently even in cases in which antimicrobial treatment failed.

The emergence of MRSA as a cause of inmate skin and soft tissue infections presents a challenge to correctional facilities, health-care providers, and public health agencies. The potential public health impact of MRSA disease transmission in correctional facilities is substantial; during 2002, approximately 2 million prisoners in the United States were incarcerated at any given time, and one in every 142 U.S. residents was in prison or jail (*5*). Barriers to control of communicable diseases such as viral hepatitis and tuberculosis in correctional facilities are well known (*3,6--8*). Because of these barriers, prisons and jails can serve as amplifiers of MRSA skin disease. In areas where community-associated MRSA appears to be increasing (e.g., LA County), correctional facilities with shorter durations of incarceration might represent settings in which MRSA is imported from the community and exported back to the community via released inmates.

A strategy to improve hygiene and infection-control practices in correctional facilities will likely be the most effective approach for long-term success. Such a strategy should include 1) skin infection screening and monitoring (e.g., maintaining a log of skin infections and visual skin screening on intake), 2) culturing suspect lesions and providing targeted antimicrobial therapy, 3) efforts to improve inmate hygiene (e.g., education about appropriate hand and body hygiene, appropriate laundering techniques, measures to limit use of shared items, and greater availability of soap), and 4) improved access to wound care and trained health-care staff. Adapting traditional hospital-based approaches to preventing MRSA transmission (e.g., placing infected persons in a separate area or eradicating nasal colonization) might not be feasible in most correctional facilities.

Some state public health agencies have developed their own approaches for addressing MRSA in correctional settings. In July 2003, the Federal Bureau of Prisons issued guidelines to prevent and control MRSA in correctional facilities (*4*). Facilities detecting a substantial number of MRSA infections should implement improved hygiene, infection-control, and treatment practices. Correctional facilities experiencing outbreaks of MRSA should seek assistance from their local and state health departments. Preventing MRSA disease in inmates might be an important measure for preventing MRSA in the community outside the correctional facility. Additional

information about MRSA is available at http://www.cdc.gov/ncidod/hip/aresist/mrsa.htm

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Figure

FIGURE. Scanning electron micrograph of *Staphylococcus aureus*

Photo/CDC

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Attachment C

Alaska Correctional Officers Association, Guidelines for Officers in Preventing Work Place Injury from MRSA, December 12, 2007

and

Management of Methicillin-Resistant *Staphylococcus aureus* Infections, Federal Bureau of Prisons, August, 2005

Alaska Correctional Officers Association

Guidelines for Officers in Preventing Work Place Injury from

Methocillin Resistant Staphylococcus Aureus (MRSA)

ALASKA CORRECTIONAL OFFICERS ASSOCIATION

"Walking Alaska's Toughest Beat"

December 12, 2007

Correctional Officers,

Methicillin-Resistant Staphylococcus aureus (MRSA) is a dangerous infection. Many cases of MRSA have been found in our institutions and we suspect many others have gone unreported and undiagnosed. Several of your fellow Officers have been painfully incapacitated by this disease. ACOA put this packet together to help educate and inform you using the most recent information available. Please protect yourself and those you love from this infectious disease.

Also enclosed is a copy of a draft Policy and Procedure we are sending to the Department of Corrections. Hopefully, the Department will react by adopting this model Policy and Procedure and will initiate a proactive program to educate inmates and staff on the prevention and control of MRSA. In the meantime, ACOA feels compelled to "start the ball rolling". We must take care of ourselves.

On behalf of ACOA,

Daniel J. Colang

Sergeant Daniel Colang
President

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What is MRSA?

MRSA - Methicillin-Resistant Staphylococcus Aureus

Staphylococcus Aureus (known as *"Staph"*) is a common bacteria which may cause skin infections that look like pimples or boils. Skin infections caused by Staph may be red, swollen, painful, or have pus or other drainage. Most Staph infections are minor and respond to normal antibiotic treatments and/or drainage. Some strains of Staph bacteria, known as **Methicillin-Resistant Staphylococcus Aureus** or **MRSA**, have become resistant to standard antibiotic treatment (including methicillin and penicillin), making MRSA much harder to treat. Staph and MRSA Staph also may lead to more serious infections, such as infections of the bloodstream, surgical sites, or pneumonia.

Overview of MRSA Infection

Infection with MRSA has long been associated with exposure to a health care environment, particularly the inpatient hospital setting; known as **"hospital-acquired MRSA"** (**HA-MRSA**). MRSA infections affecting persons who have not been recently (within the past year) hospitalized or had a medical procedure (such as dialysis, surgery, and catheters) are known as **"community-acquired MRSA"** (**CA-MRSA**) infections. MRSA strains have evolved to affect previously healthy persons without direct or indirect contact with health care facilities. These community-acquired MRSA infections have particularly affected athletes in close-contact sports, military recruits, men who have sex with men, and inmate populations which is the focus of this report. Persons with complicating medical conditions such as diabetes, HIV infection, chronic skin conditions, indwelling catheters, post-surgical wounds, and bedsores are at increased risk of MRSA infections; however, *even otherwise healthy individuals can develop very serious MRSA infections.* Invasive MRSA infections, where the organism invades the bloodstream, are very dangerous and require intravenous antibiotics.

MRSA in Correctional Facilities

Correctional Officers and inmates are now at risk of acquiring MRSA infections not only during hospitalizations, but also within the jail setting, despite the absence of traditional risk factors for MRSA infection, such as a history of recent hospitalization, prior antibiotic usage, injection drug use, or long-term inpatient care. Correctional system CA-MRSA infections have been associated with illicit, unsanitary tattoo practices and poor inmate hygiene, inmates sharing towels, linens, razors, soap or other personal items contaminated by wound drainage, as well as inmates lancing their own boils or other inmates' boils with fingernails or tweezers.

Transmission of Staph/MRSA

Anyone can get a Staph/MRSA infection. People are more likely to get a Staph infection if they have:

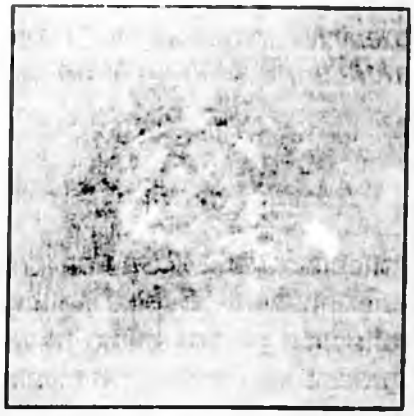
- **Skin-to-skin contact with someone who has a Staph infection**
- **Contact with items and surfaces that have Staph on them**
- **Openings in their skin such as cuts or scrapes**
- **Crowded living conditions**
- **Poor hygiene**

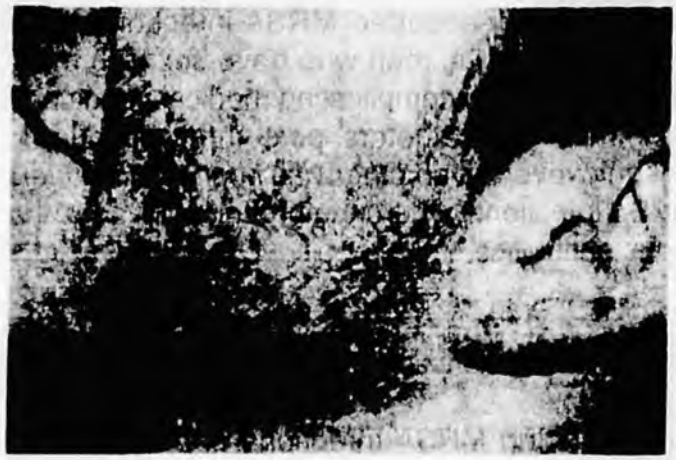
STAPH/MRSA SYMPTOMS

Correctional Officers or inmates with MRSA skin infections may have or complain of an **infected boil, an insect bite, a spider bite, or a sore or lesion** that may occur spontaneously without an obvious source. Staph bacteria, including MRSA, can cause skin infections that can be red, swollen, painful, or have pus or other drainage. Many MRSA infections cause minor inflammation without pain and ***infected inmates may not seek medical attention***. Symptoms can appear in 1-10 days.

In 2005, more than 18,000 deaths are attributed to MRSA according to the Center for Disease Control.

MRSA can begin like this...





... and develop into severe cases that may become life threatening.

PREVENTION OF MRSA
(CORRECTIONAL ENVIRONMENT)

- ***Routinely wash your hands during your entire shift.***
- ***Always wear gloves during pat-down searches, strip searches and area searches.***
- ***When conducting pat down or strip searches, change gloves between each prisoner.***
- ***Use appropriate personal protective equipment when you expect contact with any blood or other body fluids, including saliva. (Gloves, booties, gowns, face and eye protection.)***
- ***Always wear gloves when handling soiled linen or clothes. Sheets, towels, prison uniforms, and under clothing should be laundered with hot water and detergent. Dry on the hottest setting or use a disinfectant detergent.***
- ***Regularly clean all hard surfaces and high traffic areas like sinks, showers and toilets.***
- ***Disinfect fitness equipment after each use.***
- ***Disinfect handcuffs, leg irons, or other restraints after each use.***
- ***Never share any personal items. Do not allow prisoners to share personal items, such as razors or towels.***
- ***All bandages should be handled as medical waste and listed as biohazard.***
- ***Remove your uniform and shower as soon as possible after each shift.***
- ***Carry with you and use hand sanitizer regularly.***
- ***Keep your fingernails cut short. This will minimize bacteria growing under nails.***
- ***Launder your uniforms daily.***
- ***See your doctor immediately if you experience any swelling; pain; redness or red streaks radiating from the wound site; fever; or a general ill feeling.***
- ***Report all injuries, including small cuts, incurred at work to your supervisor on the appropriate forms.***

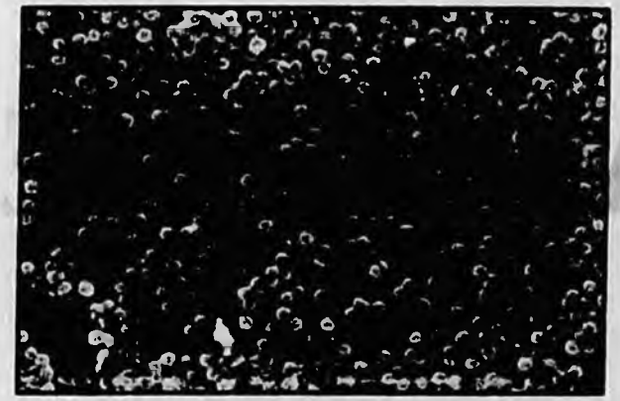
MANAGEMENT OF MRSA

(CORRECTIONAL ENVIRONMENT)

- ***Upon admittance to a Correctional Center all remands should be searched and examined for skin eruptions, such as lesions, pervasive acne, eczema, seborrhea, or insect bites.*** [14] [15] [16]
- ***Offenders with abscesses or other draining skin lesions should be referred to a mid-level practitioner or a doctor immediately.*** [17] [18]
- ***Incision and drainage should be performed <u>before</u> antibiotics are administered.*** [19] [20]
- ***Prisoners diagnosed with MRSA with wounds larger than one (1) cm should be isolated. (Administrative or Medical Segregation or housed with like offenders.)*** [21] [22]
- ***Outbreaks should be reported immediately to the Institutional and Departmental Health Care Officers.*** [23]
- ***Areas should be sanitized and disinfected after an outbreak or cluster has been identified.*** [24] [25]
- ***All potential opportunities for prisoners to have close physical contact or share communal items should be carefully scrutinized within each facility.*** [25] [27] [28]
- ***All cases should be reported to the state epidemiology lab.*** [29] [30]
- ***All cases of possible MRSA cases should be cultured.*** [31] [32] [33] [34]
- ***Bacterial cultures should be kept for thirty (30) days.*** [35]
- ***All inmates with suspected or confirmed MRSA infections should be systematically tracked in order to assess case clusters and help identify common source transmission.*** [36]
- ***Personal protection equipment should be provided to all staff.***
- ***Contact precautions for all KNOWN cases of MRSA (see policies and procedures).*** [37] [38] [39] [40]
- ***Linen should be exchanged every other day.*** [41]
- ***Laundry should be washed in a bleach solution for twenty minutes at 160° Fahrenheit.*** [42]
- ***Airborne and droplet precautions should be used when handling soiled linen and clothing to prevent the spread of the organism.*** [43] [44]
- ***Universal precautions should be used when conducting any barbering or hair dressing.*** [45]

STATISTICS AND FACTS ABOUT MRSA

- **MRSA is a bacteria commonly found on the skin, in the nose, in urine, and blood.**
- **MRSA is colonized on about 30% of the population (meaning that it lives on the skin without causing infection).** [1] [2]
- **2 million Americans contract MRSA each year.** [3]
- **318 out of 100,000 Americans are diagnosed each year with MRSA.** [4]
- **There were 18,650 deaths from MRSA and there were only 12,500 deaths from HIV/AIDS in 2005.** [5]
- **There are two types of MRSA - hospital acquired MRSA (HA-MRSA) and community acquired MRSA (CA-MRSA). They are treated differently and HA-MRSA is harder to treat.** [6] [7]
- **Correctional Officers are exposed to both types of MRSA.** [8]
- **MRSA can live for 24 hours on any non-porous surface.** [9]
- **MRSA can live in cotton for up to 3 months.** [10]
- **Symptoms appear in 1 – 10 days.** [11]
- **Common infections of the skin such as impetigo, abscesses, and lesions are generally uncomplicated and resolved with topical antibiotics. MRSA is much more difficult to treat.** [12]
- **More serious infections, where the organism invades the bloodstream, are very dangerous and require intravenous antibiotics.** [13]



Electron micrograph of MRSA

ALASKA CORRECTIONAL OFFICERS ASSOCIATION

PROPOSED POLICY AND PROCEDURES ON MRSA MANAGEMENT

Alaska Correctional Officers Association Proposed Policy for Managing MRSA Infections	Effective date	NUMBER:
	Replaces:	
	Formulated:	
***STAPH AUREUS* & METHICILLIN-RESISTANT *STAPH AUREUS* (MRSA)**		

POLICY

To provide guidelines for preventing the transmission of ***Staphylococcus aureus*** skin and soft tissue infection, and procedures for the clinical management and housing of offenders with ***Staphylococcus aureus*** infections, both methicillin sensitive (MSSA) and resistant strains (MRSA).

DISCUSSION

When following this policy, the clinician should keep three goals in mind: 1) proper treatment of the offender with MRSA or MSSA infection, 2) prevention of the emergence of drug resistant staphylococci, and 3) prevention of the spread of staphylococci. At times, more aggressive treatment than is indicated for the first goal will be necessary for attaining the other two goals.

DEFINITION

Staphylococcus aureus has remained a major human pathogen that colonizes and infects both hospitalized offenders with decreased host defenses and healthy immunologically competent offenders within the correctional facilities.

Humans can become intermittently colonized by ***Staphylococcus aureus*** by harboring the organism in their nasopharynx or on their skin and clothing. From these sites, ***Staphylococcus aureus*** can contaminate any site on skin or mucous membranes or other individuals by interpersonal transfer by direct contact. ***Staphylococcus aureus*** may adhere to skin and mucous membrane. If the integrity of the latter (i.e. skin or mucous membranes) are breached due to trauma, underlying dermatologic disorders, etc.; ***Staphylococcus aureus*** may gain access to the underlying tissue creating its characteristic local abscess lesion(s).

Methicillin-resistant Staphylococcus aureus (MRSA) is historically a nosocomial (hospital-acquired) pathogen, although there are recent reports of MRSA acquired in the community. MRSA in Department of Corrections (DOC) resembles community-acquired more closely than hospital acquired MRSA, particularly in that it retains susceptibility to many other antibiotics. Individuals **colonized** with ***Staphylococcus aureus*** have no signs of active disease but can transmit ***Staphylococcus aureus*** to others.

Alaska Correctional Officers Association Proposed Policy for Managing MRSA Infections	Effective date	NUMBER:
	Replaces:	
	Formulated:	
***STAPH AUREUS* & METHICILLIN-RESISTANT *STAPH AUREUS* (MRSA)**		

PROCEDURES:

I. OFFENDERS SHALL BE SEEN WITHOUT CO-PAY IF THEY ARE PRESENTING WITH A DRAINING SKIN LESION OR BOIL.

II. OFFENDERS PRESENTING WITH SKIN ERUPTIONS (dry skin, bites, eczema, seborrhea, etc)

A. These offenders are at increased risk for staphylococcal infections because the integrity of their skin is compromised by the underlying condition.

B. Offenders should be **identified promptly** and referred to the facility physician or mid-level practitioner (i.e. nurse practitioner or physician assistant) as soon as possible for aggressive management.

C. Offender **education** must be provided to minimize scratching of lesions and to alert offenders to seek medical attention as soon as abscesses or furuncles (boils) are detected.

D. Physicians/mid-level practitioners should **manage** skin eruptions **aggressively** and should be alert to the presence of early abscesses.

E. Individuals who fail to respond to management at the DOC facility may be referred to a **Dermatology Clinic**.

III. OFFENDERS PRESENTING WITH ABSCESSES OR OTHER DRAINING SKIN LESIONS:

A. Any offender with a draining skin lesion or abscess must be identified and referred to the facility physician/mid-level practitioner as soon as possible.

B. If uncertain whether to incise and drain (I&D), the physician/mid-level practitioner should **aspirate** any questionable abscess or draining skin lesion, and perform I&D if pus is present and lesion is too large to manage with moist heat. If I&D is performed, administration of prophylactic antibiotics one hour before the procedure is recommended. (See Section V., "Treatment.")

C. A **culture and sensitivity** (C&S) must be obtained whenever pus or drainage is obtained from a skin lesion or abscess.

IV. OFFENDERS PRESENTING WITH OTHER SKIN INFECTIONS USUALLY CAUSED BY OTHER ORGANISMS BUT IN WHICH *STAPHYLOCOCCUS AUREUS* MUST BE CONSIDERED A POSSIBLE CAUSE (e.g., cellulitis or impetigo)

A. Consider the possibility of staphylococcal infection when choosing an antibiotic. Generally, use of an antibiotic expected to cover both streptococci and staphylococci is appropriate. TMP/SMX is not recommended for streptococcal infections.

V. Treatment

A. For suspected MSSA or MRSA when treatment with antibiotics is planned

1. Based on culture surveillance, most MRSA isolated in DOC will be susceptible to TMP/SMX (e.g., Bactrim-DS®). If the offender is unable to take TMP/SMX, or there is a treatment failure on this drug, consider a combination of doxycycline and rifampin, or consulting an ID specialist for recommendations. Directly Observed Therapy is essential for rifampin containing regimens because of the risk for developing resistance if the drugs are not taken appropriately.

2. Resistance to clindamycin is increasingly common in DOC, so this drug is no longer recommended as a single agent for empiric therapy. The risk of developing resistance to clindamycin is greater if the organism is resistant to erythromycin. Clindamycin should only be used when necessary and when susceptibility is demonstrated by culture and sensitivity. If the organism is resistant to erythromycin, consider asking the lab to perform a "D test" for inducible clindamycin resistance before using this drug as a single agent.

3. **If prophylactic antibiotics are used before I&D**, the offender should be given one dose of TMP/SMX (e.g., Bactrim-DS®) and one dose of rifampin 600 mg p.o. or clindamycin 300 mg orally, if (s)he has no known allergies to these drugs. Please note the use of rifampin may cause body fluids to turn orange. Offenders should refrain from wearing contact lenses while on rifampin therapy. Also note that rifampin activates the cytochrome P-450 system, so the possibility of interactions with other medications should be considered.

4. Rifampin should not be used as a single agent for the treatment of staphylococcal infections because resistance develops quickly when it is used as monotherapy.

5. For treatment when antibiotic therapy is indicated, TMP/SMX (eg., Bactrim-DS, one BID) is recommended for initial therapy pending receipt of C&S results, usually within two-three days. Consider treating initially with wound care, heat and drainage rather than initiating empiric antibiotic therapy pending culture results, if clinically indicated. Continue treatment with an appropriate antibiotic based on drug susceptibility results.

6. Because of the prevalence of resistance to these drugs, treatment of suspected S. aureus infections with a cephalosporin or erythromycin is not recommended.

B. In offenders with 1) MRSA, 2) serious MSSA infection, or 3) with diabetes or HIV infection and either MRSA or MSSA infection, all anti-**Staphylococcal** antibiotics must be administered under a program of **Directly Observed Therapy**, as in the case of active TB cases. An acceptable alternative for these offenders is to dispense the medications at the pill line with daily or every other day compliance monitoring. If an offender receiving his medication in the pill line misses >10% of the expected total number of doses of antibiotic they must be placed on Directly Observed Therapy.

C. Anti-***Staphylococcal*** antibiotics may be **KOP** (Kept On Person) only in the case of minor MSSA infections or for non-draining, uncultured skin infections being presumptively treated for MSSA, in offenders who do not have diabetes or HIV infection.

D. **Follow-up antibiotic therapy** should be guided by the sensitivity report and the clinical situation. Duration of therapy is based on clinical judgment, but generally should not be less than 7 days, and should extend several days past clinical resolution, once the decision to start antibiotics has been made.

VI. MANAGEMENT OF OFFENDERS WITH RECURRENT *STAPHYLOCOCCUS* SKIN AND SOFT TISSUE INFECTIONS.

A. An offender shall be considered to have recurrent ***Staphylococcus*** skin and soft tissue infection when they have > 3 infections in a six month period. These 3 or more infections should be based on both clinically diagnosed and culture proven cases, since some infections, such as cellulitis, may not have positive cultures.

B. The acute infection should be diagnosed and treated as outlined in section IV.

C. Make an evaluation of and treat any dermatologic diseases.

1. Diagnose and treat any underlying skin disease.
2. Refer to dermatology clinic as indicated.

D. Decolonization.

1. Culture of the external nares to document colonization. (The laboratory request **must** state that the specimen is to be cultured for MRSA.) Although other body sites may be colonized, about 95% of persons with colonization of other body sites will also have nasal colonization.
2. Have offender shower with chlorhexidine containing soap (i.e. Hibiclens) for five days. Note: obtain non-formulary approval for chlorhexidine soap.
3. Apply mupirocin 2% ointment to external nares twice a day for five days (obtain non-formulary approval). Rifampin may act in concert with topical antimicrobial agents for **decolonization** of the carrier state. Most offenders being decolonized should also receive rifampin at 600 mg PO q day for 5 days under a program of **directly observed therapy.**
4. Two weeks after decolonization, repeat the nasal culture to verify that decolonization was successful. If the nasal culture is still positive after decolonization, the process may be repeated once. If decolonization fails twice, it is unlikely to be successful with additional treatments.

E. Other factors to consider in the management of offenders with recurrent ***Staphylococcus*** skin and soft tissue infections.

1. Evaluation of personal hygiene.

   a. Offenders should be evaluated for adequacy of showering and bathing; offenders should generally have a **daily** bath or shower with soap and water.
   b. During therapy all clothing including socks, underwear, towels, bath cloths and items including bedding should be replaced with clean items daily. Contact security for authorization to obtain clean linen for daily bedding change.
   c. Obese offenders with skin folds need to keep the skin in these folds dry to prevent maceration of the skin. This may require use of powder applied after bathing.

F. Evaluation of offenders for underlying systemic disease/condition.

1. ***Staphylococcus*** skin and soft tissue infections are associated with underlying diseases including diabetes mellitus, obesity, HIV infection, and other diseases and/or drugs causing immunosuppression.

2. Offenders with recurrent infection should be evaluated for underlying predisposing diseases and conditions as indicated.

   a. History and physical exam.
   b. Urine glucose, fasting blood sugar.
   c. HIV test.
   d. Referral to specialty clinics as indicated.

3. Control underlying disease.

   a. Obtain good control of blood glucose for diabetics.
   b. Encourage weight reduction for obese offenders.
   c. Optimize therapy for offenders with HIV infection/AIDS.
   d. Use alternate drugs in place of glucocorticoids where possible.

4. A one-on-one education counseling session should be conducted with the offender to minimize the dissemination (i.e. spread) of microorganism by colonized offenders. (See Attachment B - ***Staphylococcus aureus*** Fact Sheet)

VII. HOUSING AND ISOLATION

A. Offenders with an active MRSA infection must be managed under contact isolation precautions when they are treated in a medical setting such as an infirmary or dialysis unit.

B. Offenders with MRSA infections who are outpatient offenders may be housed in the general population if their lesion is small (less than 1 cm), easily covered, and the offender understands the treatment regimen and is compliant (eg, infected ingrown toenail).

C. **Special Housing** (single cell or housed with another offender(s) with like condition and **sensitivity**) shall be instituted under the following circumstances:

1. Any offender **unwilling/unable to understand follow-up** management, or who is non-compliant with antibiotic treatment or therapy;
2. Any offender with a **large abscess** or draining skin lesion that cannot be adequately covered and kept dry and clean (eg, scalp, decubitus, etc.);
3. Any offender who is **immunocompromised** or who has cellulitis, lymphangitis, or sepsis as a complication. (Offender should be **hospitalized** or placed in an infirmary setting as his or her level of care warrants.)

D. Offenders on special housing should be assigned to **infection showers** rather than showering with the general population. This is not necessarily a separate shower facility. Infection showers are differentiated from standard showers in that:

1. Offenders on contact isolation do not shower at the same time as the general population.
2. The shower and dressing areas are cleaned with a detergent and disinfected with an antistaphylococcal disinfectant (e.g., bleach or Double-D) according to DOC policy after the infection shower period is over, before the general population uses the facility again.
3. Offenders are issued two towels and are instructed to use one to sit upon as a barrier when using the bench in the dressing area.

E. Special housing may be **discontinued** when:

1. The lesion is clinically resolved; or
2. There is no longer cellulitis, lymphangitis, or drainage from a clinically open lesion (eg, decubitus) and the offender has completed a minimum of 3 days (72 hours) of the course of antibiotics.

F. Upon completion of special housing the offender's cell should be thoroughly cleaned and disinfected.

VIII. HOUSING AND JOB ASSIGNMENT CONSIDERATIONS FOR COLONIZED OFFENDERS AND THOSE WITH RECURRENT *STAPHYLOCOCCUS* SKIN AND SOFT TISSUE INFECTION

A. Offenders who meet the definition of recurrent ***Staphylococcus*** skin and soft tissue infection (i.e. >3 infections in a six month period), and offenders who fail decolonization procedures twice, should be housed according to the guidelines set forth in Section VII.C, Special Housing (single cell or housed with another offender(s) with like condition and **sensitivity**).

B. Offenders who fail decolonization should generally not be assigned to work in the following areas.

- Medical department
- Barber shop
- Food handlers/processors

IX. PERSONAL PROTECTIVE EQUIPMENT

A. **Gloves** must be worn prior to touching any offender with abscesses or open, draining skin lesions.

B. Upon removal, gloves must be properly discarded and hands must be **washed** no less than 10 seconds using proper hand washing techniques.

C. **Gowns** should be worn for close contact when clothing is likely to be soiled.

D. Whether **dressing changes** are done in the infirmary or by the offender, provisions must be made for appropriate disposal of contaminated materials.

X. REPORTING

A. All cases of methicillin sensitive ***Staphylococcus aureus*** (MSSA) and methicillin resistant ***Staphylococcus aureus*** (MRSA) **must** be reported to the Medical Director by the facility nurse utilizing the appropriate Surveillance Form (Attachment A).

B. Reports must be submitted within 7 days of receipt of the culture result on the facility.

Attachment A

Staph Aureus Surveillance Reporting Form

Upon receipt of a positive MSSA or MRSA culture report, complete **all fields on this form** and promptly FAX it **along with a copy of the laboratory report** to the Medical Director for the Department of Corrections.

Last name: _____ **First name:** _____

DOC #: _____ **Unit:** _____

DOB: ___/___/___ **Race: B H W O Sex: M F**

Date cultured: _____

Culture result (check one): Methicillin-Resistant Staph Aureus **(MRSA)** ❑

Methicillin-Sensitive Staph Aureus **(MSSA)** ❑

Was this culture for (check one): **Infection** ❑ **Nasal Colonization** ❑

If this was an infection:

Date onset signs/symptoms: ___/___/___

Location of skin lesion: ❑ **N/A (not skin infection)** ❑ **Head and neck**

❑ **Upper extremity** ❑ **Torso** ❑ **Genitorectal** ❑ **Lower extremity**

❑ **Other** _____

Type of Infection: ❑ **Minor skin/soft tissue** ❑ **Serious skin/soft tissue**

❑ **Cellulitis** ❑ **Impetigo** ❑ **Pneumonia** ❑ **Sepsis**

❑ **Other (specify)**_____

Attachment B

Staph aureus and Methicillin-Resistant Staph aureus Offender Education Fact Sheet

Clinical evidence has led your healthcare provider to conclude that you do (or may) have an infection of staph aureus (S. aureus) or methicillin-resistant Staph aureus (MRSA).

Staph aureus is a common organism found on human skin that causes no harm under normal circumstances. If the bacteria enters the body through the skin, such as a cut or ingrown hair, it can cause an infection which appears as a boil or abscess. The boil can be as small as a pimple or become a large draining sore on any part of the body. The size and location of the boil or abscess will determine what type of care is needed.

In the past, penicillin was used to treat staph infections. Then, after a time, some strains of the bacteria became resistant to penicillin and a new drug, called methicillin, was developed to treat those infections resistant to penicillin. Once again, some strains of the bacteria began to find ways to resist methicillin. This is why methicillin-resistant staph aureus (or MRSA) infections are now being seen. For those individuals who have a resistant infection there are limited antibiotics available; therefore, it is extremely important that you take all medications prescribed for you. You will not be able to keep these medications on your person. A nurse or other medical worker will need to watch you while you take each dose. Failure to take all antibiotic dosages prescribed for you, helps increase resistance of the S. aureus bacteria.

There are other ways to prevent the spread of S. aureus and it is everyone's responsibility to help in this effort. S. aureus spreads easily by direct skin-to-skin hand contamination. Therefore, HANDWASHING is the most effective and important method in preventing its spread when there is more than incidental contact with someone who has the infection.

Incidental contact for security staff would be simply touching someone under normal circumstances (like pat searching). If there is more contact than this, and there is likelihood of soilage, gloves should be worn. Articles and objects handled by people who have MRSA are not as likely to transmit the bacteria as someone who fails to use good handwashing technique. Good handwashing technique means using soap and water and really washing for 10 seconds, then drying your hands thoroughly.

People with recurrent staph infections should take special precautions to contain the spread of the disease. It's important that you bathe or shower daily with soap and water. All clothing, including socks, underwear, towels, bath cloths and items including bedding should be replaced with clean items daily. Obese offenders with skin folds need to keep their skin in these folds dry to prevent breakdown of the skin. This may require applying powder after bathing.

Offenders who have underlying diseases, such as HIV, diabetes, skin disorders and/or obesity, are especially prone to staph infections and need to closely follow the instructions of their physicians to obtain good control of their underlying diseases. In other words, diabetics should try to maintain excellent control of their blood sugars, weight reduction is encouraged for obese offenders, HIV/AIDS offenders should take all medications prescribed for them without fail.

If you have any questions, or for more information, contact your unit medical department.

RISK FACTORS FOR ACQUIRING CA-MRSA

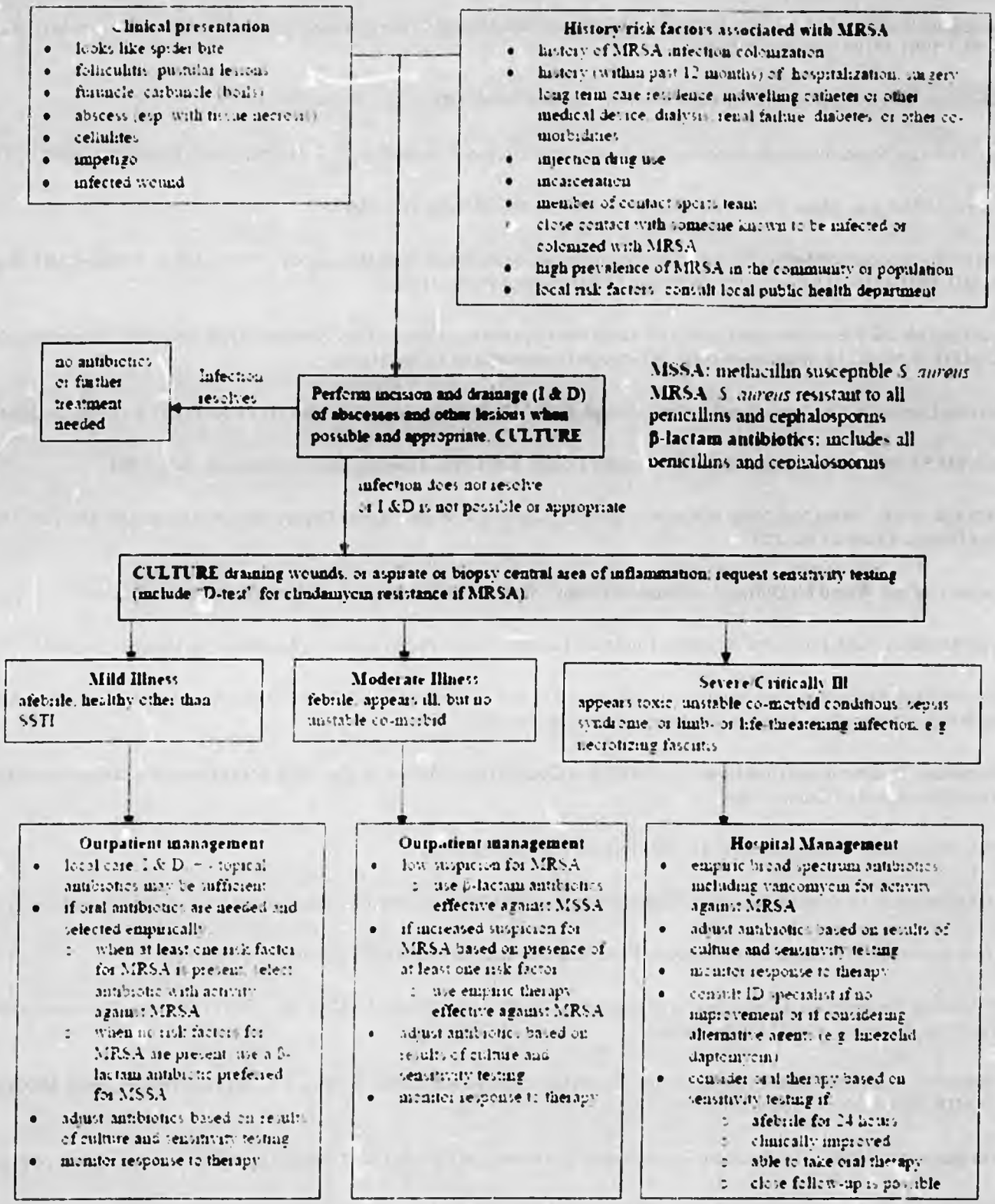
The following risk factors should increase suspicion for CA-MRSA in offenders presenting with compatible signs and symptoms:

- History of MRSA infection or colonization in offenders or close contact
- High prevalence of CA-MRSA in local community or offender population
- Recurrent skin disease
- Crowded living conditions (e.g. homeless shelters, correctional facilities)
- History of incarceration
- Participation in contact sports
- Skin or soft tissue infection with poor response to B-lactam antibiotics
- Recent and/or frequent antibiotic use
- Injection drug use
- Member of Native American, Pacific Island, Alaskan Native populations
- Child under 2 years of age
- Male with history of having sex with men
- Shaving of body hair

COMPARISON OF HOSPITAL-ACQUIRED MRSA (HA-MRSA) AND COMMUNITY-ACQUIRED MRSA (CA-MRSA)

	HA-MRSA	CA-MRSA
Health Care Contact	Yes	No
Mean Age at Infection	Older	Younger
Skin and Soft Tissue Infections	35%	75%
Antibiotic Resistance	Many Agents	Some Agents
Resistance Gene	SCC*mec* Types I, II, III	SCC*mec* Types IV, V
Strain Type	USA 100 and 200	USA 300 and 400
PVL Toxin Gene	Rare (5%)	Frequent (almost 100%)

Guidelines for management of suspected *Staphylococcus Aureus* skin and soft tissue infections (SSTI).



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