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# Predominance of Methicillin-Resistant *Staphylococcus aureus* among Pathogens Causing Skin and Soft Tissue Infections in a Large Urban Jail: Risk Factors and Recurrence Rates[▽]

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**In the 1990s, community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA) strains emerged as pathogens outside of the health care environment. Epidemic foci of CA-MRSA infections were reported in jails and prisons, but risk factors for MRSA infection there are not known. All skin and soft tissue infections (SSTIs) cultured in the Cook County Jail in March 2004 to August 2005 were reviewed. Demographic and clinical risk factors were compared among patients with methicillin-susceptible *S. aureus* (MSSA) SSTIs and those with MRSA SSTIs. Antibiotic susceptibilities were recorded, and we performed multilocus sequence typing on a sample of MRSA isolates. There were 378 SSTIs from different patients requiring culture, of which 240 (63.5%) were of MRSA and 43 (11.4%) were of MSSA; 84.8% of *S. aureus* isolates were MRSA. MRSA- and MSSA-infected patients were similar with regard to age, gender, ethnicity, previous exposure to the jail, and comorbidities. In the 12 months prior to the index culture, MRSA patients were more likely to have received a β-lactam antibiotic (25% versus 9%; $P = 0.02$). Among 26 MRSA strains, 24 (92%) had the sequence type 8 (ST8) genotype. Within 6 months, 14% (95% confidence interval, 8.7% to 22.3%) of MRSA SSTI patients in the jail had a recurrent SSTI compared with 8.8% (95% confidence interval, 2.1% to 32.6%) of MSSA SSTI patients ($P = 0.004$). MRSA is the predominant cause of SSTIs requiring culture in the jail. Few risk factors differentiated MRSA from MSSA SSTIs, and detainee patients with MRSA SSTIs are at high risk for recurrent SSTIs.**

Since the late 1990s, methicillin-resistant *Staphylococcus aureus* (MRSA) infections have been described for patients with no known exposure to the health care environment and with onset in the community (10). Subsequently, in many medical centers, the incidence of these community-associated MRSA (CA-MRSA) infections, particularly skin and soft tissue infections (SSTIs), has increased rapidly (6, 12, 17, 24), often caused by newly recognized MRSA strains (15).

Outbreaks of CA-MRSA infections in correctional facilities in 2000 and 2001 (3, 4) suggested that contact with these facilities was a risk factor for CA-MRSA. This notion has gained acceptance from the subsequent recognition of endemic disease and colonization among detainees at several correctional facilities (13, 23). Taken together, these observations imply that MRSA is easily transmitted in places of incarceration, that it has a selective advantage in incarcerated populations, or both (5, 14, 15, 24).

Studies at large medical centers have demonstrated that African-American race, young age, recent antibiotic use, homelessness, and exposure to places of incarceration were more commonly associated with CA-MRSA than with CA-MSSA infections (9, 11, 14, 18, 20). In contrast, the risk factors for a MRSA SSTI compared with a MSSA SSTI among detainee patients are not defined; they may include poor hygiene, African-American race, younger age, fewer years of education, longer duration of jail stay, outdoor work, and sharing of personal items (3, 4, 22). Other risk factors noted in the literature for CA-MRSA infection not related to incarceration include participation on athletic teams, military enlistment, having family contacts with MRSA lesions, sexual activity of men who have sex with men, and Native American ethnicity.

The incidence and etiology of SSTIs and the role played by MRSA in American urban jails have not been described. Jails house and release millions of Americans each year, and, if they are common sites of MRSA transmission, they may serve as a focus of dissemination of MRSA into urban communities. Additionally, it has been suggested that recurrent MRSA SSTIs may be common than recurrent MSSA SSTIs (14, 19, 21), but few data are available to assess the actual rate of recurrence.

We therefore examined the spectrum of causative agents of bacterial SSTIs in Chicago's Cook County Jail, the largest single-site pretrial detention facility in the United States. We compared potential demographic and clinical risk factors among detainees with MRSA and MSSA SSTIs and determined the rate of recurrence among *S. aureus* SSTI patients.

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TABLE 1. Overview of the SSTI detainee patient culture results

| Culture result | No. (%) of detainee patients with indicated result ($n$ = 378) |
|---|---|
| MRSA alone | 222 (58.5) |
| MRSA and another pathogen | 18 (5.0) |
| MSSA alone | 38 (10) |
| MSSA and another pathogen | 5 (1.3) |
| Other pathogens | 18 (4.8) |
| Unspecified mixed floras | 42 (11.1) |
| No growth[a] | 35 (9.3) |

[a] Included six cultures yielding coagulase-negative staphylococcal species and one yielding diphtheroids.

## MATERIALS AND METHODS

The Cook County Jail houses 9,000 to 10,500 detainees, with 100,000 new admissions each year. Cermak Health Services, a county-run medical facility, provides primary and emergency medical care services to detainees. The jail is composed of 15 detention divisions and an infirmary. Two medical divisions house approximately 10% of the detainees, including those with medical problems requiring regular medical surveillance. The mean and median lengths of stay in the jail in 2003 were approximately 37 and 9 days, respectively. Each detainee undergoes a medical screening on entry; the data from this screening are maintained in a paper medical chart.

Information was collected regarding every patient in the Cook County Jail who presented to a jail health care provider between March 2004 and August 2005 with an SSTI requiring culture in the opinion of the treating clinician. The information was gathered prospectively and reviewed retrospectively. Detainee patient medical charts were reviewed to collect data on comorbidities, the use of antibiotics in the jail during the 12 months prior to culture, previous SSTIs while in jail, details of the presentation of and therapy for the SSTI, bacteria cultured, and the antibiotic susceptibilities of these bacteria. A psychiatric disease was included when a clinician assigned a DSM-IV diagnosis. Outcomes of therapy for the SSTI, information regarding recurrent SSTIs through August 2006, and self-reported use of intravenous or inhalational drugs and tobacco were recorded.

The dates of previous jail stays within 4 years prior to the SSTI culture date, the dates of entry and discharge, and the detention division in which the detainee patient was confined at the time of treatment for the SSTI were obtained from the jail's electronic record system.

The County's pharmacy database was consulted to determine the start date and the duration of all the systemic antibacterial, antifungal, and steroid prescriptions given in the jail within the 12 months before and after the SSTI culture. Data were entered into an Excel (Microsoft, Redmond, WA) spreadsheet.

A convenience sample of 67 MRSA isolates from SSTIs in the study was obtained from the commercial laboratory serving the jail from March to September 2004. A subset from this collection underwent multilocus sequence typing (MLST) performed as described previously (7). A D-zone test for inducible clindamycin resistance was performed on isolates that were reported to be resistant to erythromycin and susceptible to clindamycin.

Demographic data and potential risk factors for SSTIs were collected for all detainee patients with *S. aureus* cultured from an SSTI. If a detainee had more than one SSTI culture in the study period, any additional SSTI cultures identified after the first were excluded from the analysis. Included SSTI patients are referred to hereafter as first-culture detainee patients. MRSA- and MSSA-positive detainee patients were compared for each risk factor by the chi-square test, the Fisher exact test, the $t$ test, or the Wilcoxon rank-sum test as appropriate. Kaplan-Meier failure estimates were calculated for SSTI recurrence in *S. aureus* patients and stratified into MRSA- and MSSA-infected patient strata, and these estimates were compared for equality. All calculations were performed using Stata 9.0 (StataCorp, College Station, Texas).

## RESULTS

During the 18-month surveillance period, first SSTIs from 378 detainees were cultured in the Cook County Jail. Among the 378 first-culture detainee patient cases, another pathogen, usually a gram negative, was isolated in 18 (4.8%) instances. "Unspecified mixed flora" was reported for 42 (11.1%) patients, and there was no growth for 35 (9.3%) patients (Table 1), 4 of whom had been prescribed an antibiotic within 14 days of the index culture. If the cases with no growth or "unspecified mixed flora" are eliminated from consideration, *S. aureus* was recovered from 94.0% (283/301) of detainee patients with an SSTI, and MRSA accounted for 79.7% (240/301) of these.

*S. aureus*, either alone or together with another pathogen, was cultured from samples from 283 (74.9%) of the 378 first-culture detainee patients. The *S. aureus* isolate was resistant to methicillin (MRSA) in 240 (84.8%) of these and susceptible in 43 (15.2%). Subsequent analyses were performed on the 283 detainee patients whose first SSTI culture yielded MSSA or MRSA. These two SSTI detainee patient strata did not differ significantly by age, gender, or ethnicity (Table 2). They did not differ significantly in the numbers of days of incarceration or in the numbers of discrete jail stays either in the year prior to the index culture (Table 2) or in the 2 or 4 years prior to the index culture (data not shown). They did not differ significantly in lengths of stay prior to culture during the index stay (Table 2). The mean and median lengths of jail stay at the time of diagnosis were much longer among detainee patients with *S. aureus* SSTIs (mean, 132 days; median, 53 days) (Table 2) than were the corresponding lengths of stay among the general population of detainees.

Detainee patients with MRSA and MSSA SSTIs did not differ significantly with respect to known exposure to an antibiotic during the year prior to the index culture (34% versus 26%; $P = 0.29$). They also did not differ significantly in terms of exposure any class of antibiotics, with the exception of rifampin (0% versus 5%; $P = 0.02$) and β-lactams (25% versus 9%; $P = 0.02$).

Among detainee patients with an *S. aureus* SSTI, 56.5% had a medical or psychiatric comorbidity. The prevalence of comorbidities did not differ significantly among MRSA- and MSSA-infected patients regardless of whether comorbidities were grouped into organ systems or analyzed by the presence of any known comorbidity (56.7% versus 55.8%; $P = 0.92$) (Table 2). MRSA- and MSSA-infected patients did not differ significantly by self-reported intravenous (6% versus 11%; $P = 0.3$) or inhalational (17% versus 16%; $P = 0.92$) substance abuse, tobacco use (57% versus 68%; $P = 0.22$), exposure in the previous 12 months to systemic antifungal (2% versus 0%; $P = 1.0$) or steroid (2% versus 5%; $P = 0.26$) therapy, known history of a gunshot wound (4% versus 3%; $P = 0.7$), anatomic locations of SSTIs ($P = 0.62$; data not shown), or incarceration division (Table 2).

Most *S. aureus* SSTIs were described as skin abscesses in the medical record, but other distinct clinical SSTI syndromes were diagnosed (Table 2). Of 243 *S. aureus* SSTI patients with ascribed syndromes, 9 had had a recent surgical procedure (e.g., for gunshot wounds, cancer, or other trauma), and in each case the SSTI was a complication of a surgical wound (Table 2). MRSA was more likely to be isolated from an abscess than MSSA ($P = 0.05$), whereas MSSA was more likely to be isolated from a surgical wound infection ($P = 0.03$). Abscess and surgical infection accounted for 89.7% of SSTIs among patients with ascribed SSTI syndromes (Table 2).

Of the convenience sample of 26 MRSA single-detainee

TABLE 2. Characteristics of first-culture detainee patients with SSTIs requiring culture and with *S. aureus* isolated

| Characteristic | No. (%) of indicated first-culture detainee patient group showing indicated characteristic (or other indicated datum) | | | *P* value |
|---|---|---|---|---|
| | All ($n$ = 283) | MRSA ($n$ = 243) | MSSA ($n$ = 43) | |
| Demographic characteristics | | | | |
| Age in yrs (mean ± SD)[a] | 33.6 ± 10.2 | 33.3 ± 10.4 | 34.8 ± 8.9 | 0.37[b] |
| Sex | | | | |
| Male | 225 (80) | 192 (80) | 33 (77) | 0.63[c] |
| Female | 58 (21) | 48 (20) | 10 (23) | |
| Ethnicity[d] | | | | |
| African-American | 202 (71) | 169 (70) | 33 (77) | 0.88[e] |
| Hispanic | 36 (13) | 32 (13) | 4 (9) | |
| White | 42 (15) | 36 (15) | 6 (14) | |
| Unknown | 3 (1) | 3 (1) | 0 | |
| Jail exposure characteristics[f] | | | | |
| Duration of jail stay prior to culture, in days | | | | |
| Mean ± SD | 132 ± 223 | 129 ± 240 | 150 ± 198 | 0.42[g] |
| Median (range) | 53 (0–2,906) | 51 (0–2,906) | 88 (0–846) | |
| No. of days in jail during past year | | | | |
| Mean ± SD | 124 ± 113 | 122 ± 112 | 136 ± 121 | 0.62[g] |
| Median (range) | 86 (0–365) | 82 (1–365) | 109 (0–365) | |
| No. of jail stays during past year | | | | |
| Mean ± SD | 0.6 ± 1.0 | 0.6 ± 0.9 | 0.6 ± 1.1 | 0.51[g] |
| Median (range) | 0 (0–6) | 0 (0–6) | 0 (0–5) | |
| Comorbidities/past medical history[h] | | | | |
| Human immunodeficiency virus infection | 4 (1) | 3 (1) | 1 (3) | 0.46[e] |
| Cancer, any[i] | 2 (1) | 2 (1) | 0 (0) | 1.0[e] |
| Pulmonary[j] | 63 (24) | 51 (23) | 12 (32) | 0.20[c] |
| Cardiovascular[k] | 31 (12) | 30 (13) | 1 (3) | 0.10[e] |
| Dermatological[l] | 63 (24) | 57 (25) | 6 (16) | 0.23c |
| Abscess, furuncle, or boil | 29 (11) | 25 (11) | 4 (11) | 1.0[e] |
| Chronic condition[m] | 8 (3) | 8 (4) | 0 (0) | 0.61[e] |
| Neurological[n] | 21 (8) | 20 (9) | 1 (3) | 0.33[e] |
| Psychiatric[o] | 44 (17) | 35 (16) | 9 (24) | 0.19[c] |
| Renal[p] | 4 (2) | 4 (2) | 0 (0) | 1.0[e] |
| Diabetes | 12 (5) | 11 (5) | 1 (3) | 1.0[e] |
| Indwelling catheter[q] | 2 (1) | 2 (1) | 0 (0) | 1.0[e] |
| Rheumatological[r] | 4 (2) | 2 (1) | 2 (5) | 0.10[e] |
| Hematological[s] | 4 (2) | 4 (2) | 0 (0) | 1.0[e] |
| Gastrointestinal[t] | 17 (7) | 17 (8) | 0 (0) | 0.14[e] |
| Any listed comorbidity | 160 (56.5) | 136 (56.7) | 24 (55.8) | 0.92[c] |
| Type of SSTI[h] | | | | |
| Abscess/furuncle[u] | 211 (74.6) | 184 (76.7) | 27 (62.8) | 0.05[c] |
| Surgical wound | 9 (3.2) | 5 (2) | 4 (9.3) | 0.03[e] |
| Cellulitis | 8 (2.8) | 6 (3) | 2 (4.7) | |
| Decubitus ulcer | 2 (0.7) | 1 (0.4) | 1 (2.3) | |
| Ulcer | 2 (0.7) | 1 (0.4) | 1 (2.3) | |
| Paronychia | 2 (0.7) | 1 (0.4) | 1 (2.3) | |
| Folliculitis | 2 (0.7) | 2 (0.8) | 0 | |
| Other | 7 (2.5) | 6 (3) | 1 (2.3) | |
| Unknown | 40 (14.1) | 34 (14.2) | 6 (14.0) | |
| Division of incarceration | | | | |
| Men ($n$ = 225) | | | | |
| Minimum security | 51 (18.0) | 37 (19.6) | 4 (9.3) | 0.54[e] |
| Medium security | 34 (12.0) | 29 (12.1) | 5 (11.6) | |
| Maximum security | 69 (24.4) | 59 (24.6) | 10 (23.3) | |
| Drug program | 15 (5.3) | 14 (5.8) | 1 (2.3) | |
| Boot camp | 15 (5.3) | 13 (5.4) | 2 (4.7) | |
| Women ($n$ = 58) | | | | |
| General | 33 (11.7) | 26 (10.8) | 7 (16.3) | |
| Medical | 26 (9.2) | 21 (8.8) | 5 (11.6) | |
| Medical | 40 (14.1) | 31 (12.9) | 9 (20.9) | |

*Continued on following page*

TABLE 2—*Continued*

| Characteristic | No. (%) of indicated first-culture detainee patient group showing indicated characteristic (or other indicated datum) | | | *P* value |
|---|---|---|---|---|
| | All ($n$ = 283) | MRSA ($n$ = 243) | MSSA ($n$ = 43) | |
| Type of division | | | | |
| Medical | 66 (23.3) | 52 (21.7) | 14 (32.6) | 0.12[c] |
| Nonmedical | 217 (76.7) | 188 (78.3) | 29 (67.4) | |

[a] Age available for 282 patients, including 42 MSSA and 240 MRSA patients.
[b] *t* test.
[c] Chi-square test.
[d] Determined by jail staff at time of booking.
[e] Fisher's exact test.
[f] Data were available for only 280 patients, including 237 MRSA and 43 MSSA patients.
[g] Wilcoxon rank-sum test.
[h] Two hundred sixty-two detainee patients with *S. aureus* SSTIs had charts available for review, including 225 MRSA and 37 MSSA patients.
[i] Teratoma (one patient) and pituitary cancer (one patient).
[j] Asthma (58 patients), tuberculosis (1 patient), asthma and tuberculosis (3 patients), and bronchitis (1 patient).
[k] Coronary artery disease (3 patients), congestive heart failure (1 patient), rheumatic heart disease (1 patient), and hypertension (26 patients).
[l] History of abscess, furuncle, or boils or other current skin condition (35 patients), folliculitis history (6 patients), dermatitis (2 patients), decubitus ulcer (3 patients), acne (2 patients), cellulitis (3 patients), eczema (2 patients), onychomycosis (2 patients), pilonidal cyst (1 patient), psoriasis (1 patient), recurrent vaginitis (1 patient), genital herpes simplex virus (HSV) infection (2 patients), genital HSV infection and abscesses (1 patient), tinea pedis (3 patients), genital warts (1 patient), recent gunshot wound (3 patients), recent stab wound (1 patient), warts (1 patient), recent toenail removal (1 patient), tinea versicolor (1 patient), tinea cruris (1 patient), scabies (1 patient), scalp infection (1 patient), "rash" (2 patients), "oral abscess" (1 patient), laceration (1 patient), "foot infection" (1 patient), colostomy (1 patient), and conjunctivitis (1 patient).
[m] Psoriasis (one patient), chronic decubitus ulcer (one patient), dermatitis (two patients), eczema (two patients), and genital HSV (two patients).
[n] Seizure disorder (15 patients), delirium tremens (1 patient), deafness (1 patient), paraplegia (2 patients), radiculopathy (1 patient), and gunshot wound to head (1 patient).
[o] Depression (17 patients), depression with previous suicide attempt (3 patients), anxiety disorder (4 patients), opioid withdrawal (3 patients), depressive disorder not otherwise specified (1 patient), schizophrenia or paranoid schizophrenia (8 patients), adjustment disorder (1 patient), bipolar disorder or "manic depression" (4 patients), panic disorder (1 patient), and schizoaffective disorder (2 patients).
[p] End-stage renal disease (two patients), history of nephrectomy (one patient), and nephrolithiasis (one patient).
[q] Suprapubic catheter (one patient) and hemodialysis catheter (one patient).
[r] Arthritis (three patients).
[s] Deep venous thrombosis (two patients), anemia (one patient), and sickle-cell anemia (one patient).
[t] Peptic ulcer disease (five patients), "liver disease with ascites" (one patient), hepatitis B virus (HBV) infection (one patient), HBV and HCV infection (two patients), HBV infection and peptic ulcer disease (one patient), HCV infection (five patients), gastroesophageal reflux disease (one patient), and chronic pancreatitis (one patient).
[u] One lesion was referred to as a "furuncle" in the medical record; 210 were termed "abscesses."

patient isolates that underwent genotyping, 24 (92.3%) were sequence type 8 (ST8), which is likely USA300. One isolate was ST1 and one was ST474, a single-locus variant of ST1 (Table 3).

Comparing MRSA isolates obtained from detainee patients in the medical and nonmedical divisions of the jail, isolates from the medical divisions were more likely to be resistant to several non-β-lactams. All three MRSA isolates from medical divisions that underwent MLST were ST8 (Table 3).

A variety of antibiotic regimens were used to treat *S. aureus* SSTIs. Five patients (three infected with MRSA and two with MSSA) received no antibiotic therapy. Nearly half (121 [42.7%]) of the *S. aureus* SSTIs were treated with a single antimicrobial agent (31 SSTIs) or the fixed combination of trimethoprim-sulfamethoxazole (90 SSTIs). For 10 detainee patients with a MRSA SSTI, only a β-lactam was prescribed.

Outcomes were available for 58 detainee patients with an *S. aureus* SSTI who had a follow up visit at a jail medical facility within 30 days. These visits occurred a mean 13.8 days after initial presentation. At these visits, 53 detainee patients (91%) had an improved or resolved SSTI. Four had no change and one had a worsening lesion (Table 4).

A recurrent SSTI was defined as an SSTI, at an anatomic site distinct from the index SSTI, that was first noted more than 6 days after initial presentation. Among the 283 detainee patients with *S. aureus* grown from their index cultures, 20 recurrent SSTIs were diagnosed within 6 months. Of these, five were recorded within 30 days, five at 31 to 60 days, and the rest at 61 to 180 days after the index lesion was cultured. Ninety-five percent (19/20) of the recurrences were among the detainee patients who initially had MRSA SSTIs. This higher recurrence rate of MRSA SSTIs cannot be explained by a difference in lengths of jail stay after the index culture (mean 140.2 ± 168.9 versus 157.7 ± 204.3 days; $P = 0.49$) (Table 4).

The majority of recurrent SSTIs in detainee patients diagnosed within 6 months after the testing of index lesions caused by *S. aureus* were not cultured. The single detainee patient with an MSSA index SSTI had a recurrence after 35 days; this recurrent lesion was among those not cultured. Of the 19 detainee patients with an SSTI recurrence who had MRSA isolated from the index lesion, 6 (32%) had the recurrent lesion cultured: of these, 5 (83%) cultures grew MRSA and 1 (17%) culture grew MSSA.

The known SSTI recurrence rate for MRSA patients was 14.0% (95% confidence interval, 8.7% to 22.3%) within 6 months after the performance of the index culture. Too few detainee patients were followed longer to estimate the rate of recurrences after that time. The comparable rate for SSTI recurrences among MSSA detainee patients within 6 months was significantly lower, at 8.8% (95% confidence interval, 2.1% to 32.6%) ($P = 0.004$).

Detainee patients with a recurrent SSTI did not differ from detainee patients without a recurrent SSTI in the median number of antibiotic prescriptions received to treat the index SSTI (1.8 versus 1.6). We defined inappropriate antibiotic therapy as an antibiotic regimen to which the *S. aureus* isolate was not

TABLE 3. Susceptibilities and MLSTs of MRSA isolates obtained from detainee patients in the medical and nonmedical divisions

| Isolate characteristic or test method | No. of isolates with indicated isolate characteristic from indicated division/total no. of isolates (%) | | *P* value |
|---|---|---|---|
| | Medical | Nonmedical | |
| Susceptibility to: | | | |
| Clindamycin | | | |
| Single agent[a] | 33/37 (89.2) | 146/149 (98.0) | 0.03[f] |
| D-zone[b] | 2/2 (100) | 36/39 (94.7) | N/A[g] |
| Total | 33/37 (89.2) | 143/149 (96.0) | |
| Erythromycin | 8 (15.7) | 15 (8.0) | 0.1[h] |
| Ciprofloxacin | 38 (74.5) | 172 (91.9) | 0.001[h] |
| Levofloxacin | 44 (86.3) | 175 (93.6) | 0.09[h] |
| Gentamicin | 48 (94.1) | 187 (100) | 0.009[f] |
| Rifampin | 49 (96.1) | 187 (100) | 0.05[f] |
| Tetracycline[c] | 22 (91.7) | 88 (97.8) | 0.20[f] |
| Trimethoprim-sulfamethoxazole[d] | 47 (92.2) | 185 (99.5) | 0.008[f] |
| Vancomycin[e] | 51 (100) | 185 (99.5) | 1.0[f] |
| Resistance to >2 non-β-lactam antibiotics | 8 (15.7) | 13 (7.0) | 0.05[h] |
| Total | 51 | 187 | |
| MLST | | | |
| ST1 | 0 | 1 (4.4) | 1.0[f] |
| ST8 | 3 (100) | 21 (91.3) | |
| ST474 | 0 | 1 (4.4) | |
| Total | 3 | 23 | |

[a] One hundred eighty-six isolates were tested for clindamycin susceptibility.
[b] D-zone testing was performed on 41 MRSA isolates.
[c] One hundred fourteen isolates underwent tetracycline susceptibility testing.
[d] Two hundred thirty-eight isolates were tested for susceptibility to trimethoprim-sulfamethoxazole.
[e] Two hundred thirty-seven isolates were tested for vancomycin susceptibility; 1 was found to have intermediate susceptibility.
[f] Fisher's exact test.
[g] N/A, not applicable.
[h] Chi-square test.

susceptible. Among MRSA patients, there was no significant difference in the percentages of those with and without recurrences who were prescribed inappropriate antibiotic therapy (6% versus 7.7%; $P = 0.69$).

## DISCUSSION

The predominant etiology of cultured SSTIs in the Cook County jail during the study period was MRSA. The emergence of MRSA in this role occurred recently. Jail medical staff anecdotally reported that MRSA infections were rare prior to 2001. MRSA isolate genotyping suggests that the most common strain causing SSTIs in the jail was ST8, the predominant genotype among CA-MRSA strains in Chicago and the United States. MRSA SSTIs recurred frequently and more commonly than MSSA SSTIs. The frequent recurrence of lesions suggests the need for close follow-up of detainee patients with MRSA SSTIs.

Limited evidence suggests that MRSA infections have been common in other large urban county jails (4, 7) since 2001. For example, a recent study found frequent MRSA colonization or infection among detainees transferred from jail to a hospital in Maryland (23) and among detainees newly arriving to jail in Baltimore (8). In the Los Angeles County Jail, 1,697 MRSA SSTIs were recorded between January 2002 and June 2003. The median time from incarceration to culture was 45 days (range, 1 to 1,160 days) (4), similar to the finding in our study. In the San Francisco County Jail, the rate of MRSA increased from 29% to 74% among *S. aureus* isolates from 1997 to 2002 (16). Data from this period are not available from the Cook County Jail, but we documented an even higher percentage (84.8%) of MRSA among *S. aureus* isolates from the jail in 2004 and 2005.

The explanation for these high MRSA rates in jails is unclear but probably reflects crowding and suboptimal hygienic practices (22). In a case control study, detainees with prison stays of longer than 60 days were more likely to be colonized with MRSA (3); this observation suggests that the length of exposure to prison and the likelihood of MRSA carriage are positively correlated (4). However, we found that the durations of previous exposure to the jail did not differ for patients with MSSA and MRSA SSTIs. This suggests that certain exposures or habits in the incarcerated population are risk factors for an SSTI caused by *S. aureus* irrespective of methicillin susceptibility but does not explain why MRSA rates have increased.

The high incidence of MRSA SSTIs in the jail has several ramifications. The empirical use of β-lactams in the Cook County Jail is no longer appropriate. It also raises concern that severe forms of CA-MRSA disease, including sepsis, necrotizing pneumonia, necrotizing fasciitis, and Waterhouse-Friderichsen syndrome (1) may occur. The rapid turnover of detainees in the jail may fuel the community epidemic of MRSA infection in Chicago.

We found few demographic or clinical risk factors to distinguish MRSA from MSSA SSTIs, similar to what was found in

TABLE 4. Outcomes and recurrences for first-episode *S. aureus* SSTIs

| SSTI type | No. (%) of patients with indicated SSTI type with known 30-day outcome of[a]: | | | | Time to outcome (days) | | Recurrence | | |
|---|---|---|---|---|---|---|---|---|---|
| | Resolution | Improvement | No change | Worsening | Mean ± SD | Median (range) | No. of recurrences | Time to recurrence (days) | |
| | | | | | | | | Mean ± SD | Median (range) |
| All *S. aureus* | 32 (55) | 21 (36) | 4 (7) | 1 (2) | 13.8 ± 7.5 | 13.5 (1–30) | 20 | 73 ± 57.0 | 67 (7–184) |
| MRSA | 29 (56) | 19 (37) | 3 (6) | 1 (2) | 12.9 ± 7.0 | 13 (1–28) | 19 | 67.9 ± 47.4 | 67 (7–184) |
| MSSA | 3 (50) | 2 (33) | 1 (18) | 0 | 17.7 ± 10.2 | 18 (2–30) | 1 | 35 | 35 |

[a] Outcome data were available for 62 of 283 first-culture detainee patient *S. aureus* infections (21.9%); for 58 of 283 (20.5%) of these patients, outcome data within 30 days of the index culture were available.

other clinical settings (11, 14, 18, 20). An exception was the use of a β-lactam antibiotic in the 12 months prior to index culture, which was more common among MRSA- than MSSA-positive patients in this study. Similarly, at an academic medical center in Dallas, the use of any antibiotic in the 6 months prior to an *S. aureus* SSTI drainage culture was more common among those with a MRSA SSTI (20). The explanation for this is unclear. It is possible that patients with a MRSA SSTI were treated in the previous 6 months with an inappropriate antibiotic and suffered a recurrent or unresolved MRSA infection during the study. Alternatively, perhaps antibiotic use in the previous 6 months selected for MRSA colonization.

Medical division detainees, compared to those in nonmedical divisions, were at high risk for an SSTI caused by a MRSA isolate resistant to non-β-lactam antibiotics (Table 3). However, the three isolates we tested from detainee patients in these medical divisions were of ST8. If these three isolates were representative, then the presence of ST8 isolates that carry additional resistance genes, as has recently been reported from San Francisco and Boston (5), is suggested.

Jails and prisons are a central focus for the transmission of and infection by MRSA outside of the health care setting. It is essential that infection control practices (2) be assessed and improved to protect detainees and to stem the spread of MRSA in this population.

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