Risk Factors for Methicillin-Resistant *Staphylococcal aureus* Skin and Soft Tissue Infections Presenting in Primary Care: A South Texas Ambulatory Research Network (STARNet) Study

Michael L. Parchman, MD, MPH, and Abel Munoz, MD

Purpose: **To examine skin and soft tissue infections presenting at 4 primary care clinics and assess if historical risk factors and examination findings were associated with a positive methicillin-resistant *Staphylococcus aureus* (MRSA) culture.**

Methods: **During the 10-month observational study (April 2007 through January 2008), physicians in 5 practices across South Texas collected history, physical examination findings, culture results, and antibiotic(s) prescribed for all patients presenting with a skin or soft tissue infection. Analyses were conducted to determine the relationship between historical indicators, location of lesions, and examination findings with a positive MRSA culture.**

Results: **Across 4 practices, 164 cases of skin and soft tissue infections were collected during 10 months. Of the 94 with a culture, 63 (67%) were MRSA positive. Patients working in or exposed to a health care setting were more likely to have a culture positive for MRSA, as were those presenting with an abscess. MRSA-positive lesions were also significantly smaller in size.**

Conclusions: **Because of the high prevalence of MRSA skin and soft tissue infections among patients presenting to family physicians, presumptive treatment for MRSA may be indicated. However, increasing levels of resistance to current antibiotics is concerning and warrants development of alternative management strategies. (J Am Board Fam Med 2009;22:375–9.)**

Skin and soft tissue infections caused by methicillin-resistant *Staphylococcus aureus* (MRSA) are a growing problem in the United States and Europe.[1,2] MRSA no longer dominates just the hospital setting; it is quickly impacting communities as well.[3,4] One recent study noted that the incidence of skin and soft tissue infections in physician offices and hospital outpatient and emergency departments has nearly doubled during the past 9 years.[5]

Commonly reported outbreak settings for infections with MRSA in the community—identified as being caused by community-associated–type MRSA strains sharing certain characteristics traits such as carriage of Panton Valentine leukocidin toxin genes, the staphylococcal cassette chromosome mec IV element, being broadly susceptible to non-beta lactam antibiotics, etc—have included places of incarceration, day care centers, military barracks, athletic facilities, Native American and Native Alaskan communities, and others.[1,3,4] More recently, these MRSA isolates have also spread to the health care setting, eg, hospitals, nursing homes, etc, making simple distinctions between community-acquired and hospital-acquired MRSA based on locale of care difficult.[1,3] Given the growing incidence and prevalence of MRSA infections, it is unclear how useful exposure to these traditional settings are for identifying patients with an MRSA infection.

Most studies about the prevalence of MRSA infections have occurred in hospital or emergency department settings.[6] Moreover, the active population-based surveillance for invasive MRSA conducted by the US Centers for Disease Control and Prevention is a laboratory-based surveillance sys-

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From the Department of Family and Community Medicine, University of Texas Health Science Center, San Antonio (MLP); the VERDICT Health Services Research Program, South Texas Veterans Health Care System, Austin (MLP); and the Munoz Family Medicine Clinic, Austin, Texas (AM).
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Corresponding author: Michael L. Parchman, MD, MPH, VERDICT (11C6), South Texas Veterans Health Care System, 7400 Merton Minter Blvd, San Antonio, TX 78229-4404 (E-mail: parchman@uthscsa.edu).

tem and only collects isolates from a normally sterile body site, such as urine, pleural fluid, or peritoneal fluid, not from the most common site of infection that presents in the primary care setting: skin or soft tissue.[1] To date there are few studies of MRSA presenting in community primary care settings.[7]

Methods

Study Design, Setting, and Patients

This was an observational study conducted in 4 primary care clinic settings in the South Texas Ambulatory Research Network from April 2007 through January 2008. Participants included a rural health clinic staffed by a family nurse practitioner; 2 solo, private family physician offices; and a minor emergency clinic staffed by a general internist. The latter 3 settings were located within a large metropolitan area in the Southwest United States.

Data collection

We asked clinicians in these settings to complete a data card for any patient who presented with a skin or soft tissue infection during the data collection period. The definition of skin or soft tissue infection was left to the judgment of the individual clinician. Data about history, physical examination findings, culture results, and antibiotic(s) prescribed for each patient were collected using a "card" format; data collection cards were placed in each practice for the physician to complete for each patient who presented with a skin or soft tissue infection.

Our definition of "MRSA" was any isolate reported back as "methicillin-resistant *Staphylococcus aureus*." Thus it is possible that, by a stricter definition, especially among those who work in health care settings, that some of these isolates were hospital acquired, not community acquired. No molecular or genetic testing was done on isolates to further define them. Selection of treatment was left to the judgment of the clinician.

Analyses

Descriptive statistics were used to evaluate frequency, percentages, means, and medians for each variable. Because of the small numbers in the sample, relationships between categorical variables such as a positive MRSA culture result and the presence of a specific historical risk factor were examined using Fisher's exact test. Differences between the presence or absence of a positive MRSA culture result for continuous variables such as size of the lesion were evaluated with a *t* test. This study was approved by the Institutional Review Board at the University of Texas Health Science Center, San Antonio.

Results

During a period of 10 months, data on 164 cases of skin and soft tissue infections across the 4 primary care practices were collected. Cultures were collected in 94 (57%) of the cases. Of those, 63 cultures (67%) were MRSA positive. Of those remaining, 12 cultures were "other *Staphylococcus*," 13 were no growth, 2 were group A beta-hemolytic Streptococcus viridans, 2 were *Pseudomonas*, and there was one case each of Klebsiella sp. and Proteus sp. The most frequent antibiotic prescribed was trimethoprim-sulfamethoxazole (56.1%), followed by clindamycin (19.5%), doxycycline (4.9%), and cephalexin (4.3%). The remainder of the results are limited to those for which the lesion was cultured (n = 93).

Table 1 presents the results of the historical risk factors and a positive culture for MRSA. Only work in or exposure to a health care setting was found to be associated with a positive MRSA culture; 12 of 13 health care worker wounds (92.3%) were MRSA positive compared with 51 of 80 of non-health care worker wounds (63.8%; Fisher's exact test = 0.05). The mean, median, and range for number of days the patient had noted the lesion before their visit to a primary care clinic were 5.3, 4.0, and 1 to 30, respectively. Among those with a culture result there was no association between the duration of lesion and culture results.

Table 2 presents the results of examination findings and risk of a positive culture for MRSA. Location of the lesion was not associated with MRSA. If an abscess was present, culture results were more likely to be MRSA positive than if there was no abscess. In addition, lesions that were MRSA positive were smaller in size than those that were not (3.61 cm [SD, 1.58] versus 6.67 cm [SD, 3.05]; $P = .02$).

Discussion

Among those who had a culture, two-thirds of all patients presenting to these primary care settings

Table 1. History of Risk Factor Exposure and Proportion with a Methicillin-Resistant *Staphylococcal Aureus* (MRSA)-Positive Culture (n = 94)

	MRSA Positive (%) (n = 63)	MRSA Negative (%) (n = 31)	Fisher's Exact Test
Recurrence	78.1	61.7	0.16
Caused by spider bite	72.2	66.7	0.78
Family exposure	81.2	64.5	0.25
School exposure	50.0	74.3	0.46
Work exposure	100.0	68.8	0.55
Prison exposure	60.0	67.4	1.00
Pets	61.5	708	0.46
Work with animals	100.0	66.7	1.00
Health care worker*	92.3	63.8	0.05
Diabetes	77.8	65.3	0.41
Immunosupressed	50.0	69.8	0.38

*$P < .05$.

with a skin or soft tissue infection who received a culture showed results that were positive for MRSA. The only historical risk factor that was significantly associated with an MRSA infection was if the patient provided health care to others. If the skin lesion presented with an abscess, it was 3.4 times more likely to be an MRSA infection. This finding is limited and needs to be interpreted with caution; only 4 of the 37 patients who presented without an abscess were cultured. In addition, lesions with positive MRSA culture results had significantly smaller lesions than those without a positive MRSA culture.

The prescriptions provided for the patients with a positive MRSA culture suggest that these clinicians were operating under the assumption that these skin and soft tissue infections were MRSA until proven otherwise. Seventy-six percent of these patients were given an antibiotic that is typically effective against MRSA: either trimethoprim-sulfamethoxazole or clindamycin. Given the lack of historical and physical examination findings associated with the presence or absence of MRSA with skin and soft tissue infections presenting to these primary care settings and the high prevalence of MRSA infections (two-thirds of all lesions), this particular antibiotic strategy seems to be appropriate.

There are several limitations in the interpretation of findings from this study. First and most

Table 2: Examination Findings Associated with a Methicillin-Resistant *Staphylococcal Aureus* (MRSA)-Positive Culture (n = 94)

	MRSA Positive (%) (n = 63)	MRSA Negative (%) (n = 31)	Fisher's Exact Test
Ulcer	66.7	67.6	1.00
Drainage	59.5	72.2	0.26
Abscess*	70.9	0.0	<0.01
Multiple lesions	75.0	69.4	1.00
Cellulitis present	68.3	65.4	0.80
Location			0.63(χ^2)
Lower extremity	28.4	24.1	
Upper extremity	17.0	15.5	
Trunk	22.7	25.9	
Buttock	21.6	24.1	
Head	10.2	10.3	

*$P < .05$.

obvious is the limited sample size, both in numbers of patients and number of primary care settings. In several analyses conducted there were empty cells because of the low number of observations. In addition, the method used to collect the data, the "card system," was not tested for reliability and validity across study sites. Nor was there any assessment of the original medical records to verify the results recorded by the practitioners. In addition, the historical risk factor data, such as exposure to day care settings or animal care, are not routinely assessed in the health care setting and were assessed specifically for the study. Because there was no standard script or training for asking these questions, considerable variability from patient to patient and across sites and providers may exist. Regarding physical examination findings, definition of the term "abscess" was not specified and was left to the judgment of the individual clinician. Having said this, a unique strength of this study was its limitation to community primary care clinic settings and collection of data by a variety of primary care clinicians including family physicians, general internists, and family nurse practitioners.

MRSA skin and soft tissue infections are now highly prevalent in the community studied. Recent studies suggest that this may be true for most communities in the United States, although rates may vary by community and by age group.[8–10] The prevalence of MRSA among patients with skin and soft tissue infections presenting to the primary care clinic settings in the community setting for this study is approaching that previously reported in the emergency department setting: 74%.[6] Unlike the results of patients presenting to the emergency department, in this study patients with MRSA were *not* more likely to have a history of a similar infection, have close contact with someone with a similar infection, or report a history of a spider bite. Both patients presenting to the emergency department and to these primary care settings were more likely to have MRSA if they presented with an abscess.

Because of the growing prevalence of MRSA infections in the primary care setting, increased attention needs to be given to physician and patient education as well as research examining effective diagnosis and treatment options. Recommendations regarding outpatient management of MRSA skin and soft tissue infections are currently based on expert opinion because there is a paucity of studies regarding optimum management strategies.[8] Questions that should be addressed include, What percent of these patients are chronic carriers? Is single-drug or multiple-drug therapy more effective in treatment? Are adjunctive therapies such as bathing in chlorhexadine effective in preventing recurrence? In addition, there is a lack of studies examining the effectiveness of community-based MRSA prevention and control methods.

For the community family physician, general internist, or family nurse practitioner, history and physical examination findings—with the exception of lesion size and presentation with an abscess—are not good predictors of which patients with a skin or soft tissue infection have MRSA. As in this study, treatment with trimethoprim-sulfamethoxazole or clindamycin, as though the responsible pathogen is MRSA, may be prudent. However, reports of increasing levels of resistance to these antibiotics, especially trimethoprim-sulfamethoxazole, are of concern and warrant further investigation into more conservative management options to avoid the development of further antibiotic resistance.[11]

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