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Preferred Treatment and Prevention Strategies for Recurrent Community-Associated Methicillin-resistant *Staphylococcus aureus* Skin and Soft-Tissue Infections: A Survey of Adult and Pediatric Providers

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Abstract

Among pediatric and adult providers, 70% preferred trimethoprim-sulfamethoxazole for directed treatment of community-associated methicillin-resistant *Staphylococcus aureus* skin and soft-tissue infections, although a higher proportion of pediatric compared to adult providers favored clindamycin (36% vs. 8%, $p < 0.0001$). For recurrent infections, 88% of providers employed at least one topical decolonization strategy.

Keywords

Methicillin-Resistant *Staphylococcus aureus*; Skin infections; Soft-tissue infections; Questionnaire

Introduction

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a frequent cause of skin and soft-tissue infections (SSTIs) in the community, with incidence rates as high as 19.8 per

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100,000.^{1,2} Recurrent infections are common, with rates ranging from 9-18%.^{1,3} While the epidemiology of CA-MRSA SSTIs is well-described,² management strategies, especially for recurrent infections, remain undefined. Although SSTI treatment guidelines exist,^{4,5} recommendations specifically for CA-MRSA are vague, and uncertainties remain regarding optimal antimicrobial regimens, requirement for antibiotics following incision and drainage (I&D), and utility of decolonization. Two recent surveys among practicing physicians regarding management of CA-MRSA SSTIs demonstrated a lack of consensus in favored treatment strategies^{6,7}; however, one study surveyed only pediatric infectious disease (ID) providers⁶ while the other addressed only the question of the need for antibiotics in addition to I&D.⁷

In this study, we surveyed both adult and pediatric outpatient providers from multiple medical specialties to determine preferred treatment and prevention strategies used in clinical practice for primary and recurrent CA-MRSA SSTIs.

Methods

An internet-based survey was conducted in January 2009 at the University of Pennsylvania Health System (UPHS) and the Children's Hospital of Philadelphia (CHOP). Eligible individuals were all adult and pediatric providers at UPHS and CHOP within the divisions/departments of emergency medicine (ED), ID, dermatology, and primary care (family medicine, internal medicine, and general pediatrics) with an MD, DO, CRNP, or PA-C degree and a functional email address, who have ever seen an outpatient with recurrent skin or soft tissue infections. All study subjects were sent an introductory email with a hyperlink to an on-line questionnaire with 23 questions regarding provider demographics, number of recurrent CA-MRSA SSTIs seen monthly, approaches to treatment and prevention of these infections, and overall impressions of the burden of disease for patients. Recurrent CA-MRSA SSTIs were defined as furuncles, folliculitis, and/or skin and soft-tissue abscesses known or presumed to be caused by CA-MRSA that occur on more than one occasion. Differences in responses were assessed using Fishers exact test. All statistical calculations were performed using STATA v10.0 (Stata Corp, College Station, TX).

Results

Of 575 healthcare providers surveyed, 192 (32%) responded (Table 1). Ninety-four percent of respondents were physicians. A higher proportion of ID specialists compared to those in other specialties responded (72% vs. 30%, $p<0.0001$).

Treatment strategies reported by respondents are described in Table 1. Of responding ED and primary care providers (PCPs), 97% reported managing patients with recurrent CA-MRSA SSTIs in their own practice (vs. referring to a specialist). A greater proportion of adult compared to pediatric providers favored trimethoprim-sulfamethoxazole for empiric (75% vs. 40%, $p<0.0001$) and directed (84% vs. 59%, $p<0.0001$) treatment of acute CA-MRSA SSTIs. A higher proportion of pediatric compared to adult providers favored clindamycin for empiric (50% vs. 8%, $p<0.0001$) and directed (36% vs. 8%, $p<0.0001$) therapy. When prescribing antibiotics for acute CA-MRSA SSTIs, most respondents reported having culture data in less than a quarter of cases. In cases of recurrent infection, 53% of respondents reported treating recurrences with the same antibiotic for the same duration as prior infections, 14% used the same antibiotic for a longer duration, 14% used a different antibiotic for the same duration, and 6% used a different antibiotic for a longer duration.

Decolonization strategies reported by respondents are described in Table 2. Eighty-nine percent of providers who attempted decolonization used a combination of strategies, with the most popular combination being topical mupirocin with antiseptic bodywash which was used by 38%. ED providers were less likely than other providers to decolonize patients with recurrent CA-MRSA SSTIs (63% vs. 84%, $p=0.004$). Adult providers were less likely than pediatric providers to decolonize household members of patients with recurrent CA-MRSA SSTIs (46% vs. 80%, $p<0.0001$). Overall, 10% of respondents attempted decolonization of household pets of patients with recurrent CA-MRSA SSTIs. Considering the timing of decolonization, 81% of ID providers who attempted decolonization did so after the acute infection resolved, while 66% of non-ID providers did so while treating the active infection ($p<0.0001$). Overall, 53% of respondents thought their decolonization regimens were somewhat or very effective at preventing recurrent CA-MRSA SSTIs.

The most commonly reported behavioral modifications recommended by providers were: avoiding towel sharing (62%), laundering linens in hot water (54%), avoiding nose or skin picking (51%), avoiding intimate contact during active lesions (45%), long-term use of bodywash (31%), and long-term use of bleach baths (14%).

More than half of respondents reported that recurrent CA-MRSA SSTIs significantly impact patient quality of life due to missed work or school, inconvenience of medical treatment, or emotional distress and/or embarrassment.

Discussion

We found that CA-MRSA SSTIs are a challenging problem treated by both PCPs and specialists. There is considerable variation, especially between adult and pediatric providers, in preferred management strategies, including choice of antimicrobials, administration of antibiotics following I&D, and decolonization strategies for patients and households.

Most PCPs and ED providers manage patients with recurrent CA-MRSA SSTIs in their own practice without referring to a specialist. This “decentralized” nature of CA-MRSA SSTI care creates challenges for studying the epidemiology of these infections, and suggests that newer treatment guidelines should target a broad range of clinicians.

When considering the need for antimicrobials after I&D, most providers prescribe antibiotics in addition to such drainage, mirroring results from a recent survey.⁷ A large majority prefer trimethoprim-sulfamethoxazole as both empiric and directed therapy, which may reflect high trimethoprim-sulfamethoxazole susceptibility rates among CA-MRSA isolates and/or lower perceived risk for *Clostridium difficile* infection as compared to clindamycin. Interestingly, the observed reliance by most providers on trimethoprim-sulfamethoxazole as empiric therapy for purulent SSTIs may have unintended negative consequences if generalized to the treatment of nonpurulent infections such as erysipelas or cellulitis, which are frequently caused by *Streptococcus* species. This could lead to inadequate treatment of such infections due to the limited activity of trimethoprim-sulfamethoxazole against these organisms.⁸

Higher rates of clindamycin use among pediatricians mirror observations from a recent pediatric survey⁶ and may result from limited published data describing clindamycin use in children with CA-MRSA infections. It was interesting to observe that clindamycin remains a preferred empirical agent among many pediatric providers despite the recent emergence of clindamycin resistance in certain geographical areas.⁹

Decolonization is commonly used by most providers in cases of recurrent CA-MRSA SSTIs. Of note, mupirocin is used most frequently, despite debate regarding the role of nasal

colonization in CA-MRSA dynamics.¹⁰ Antiseptic bodywash, bleach baths, and environmental hygiene strategies are also common, likely reflecting recognition of the importance of nonnasal colonization and fomites in the spread of CA-MRSA.¹⁰ Decolonization of household members is less common, suggesting either a reluctance of providers to treat individuals who are not their patients, or that consideration of the household as a reservoir for CA-MRSA is an emerging concept.

Our overall response rate was low; however, by the inclusive design of our study we surveyed all providers in the targeted divisions/departments without knowledge of their clinical activities. We, thus, expected *a priori* that many surveyed individuals would not care for patients with CA-MRSA SSTIs and would be unable to answer our questionnaire. Additionally, our study is limited by its conduct within a single academic health system, which may limit generalizability, and by the voluntary, self-reported nature of the questionnaire, which may lead to recall and/or reporting bias. Also, a majority of respondents were physicians, making the generalizability of our findings to non-physician providers limited. Regardless, our study is the first, to our knowledge, to report practice patterns for recurrent CA-MRSA SSTIs among a broad range of adult and pediatric providers.

In summary, recurrent CA-MRSA SSTIs are a challenging problem encountered by both PCPs and specialists. There is considerable variability in treatment and prevention strategies used in clinical practice, highlighting a lack of available clinical data. Comparative studies are needed regarding optimal antimicrobial regimens, necessity of antibiotics following incision and drainage (I&D), and the effectiveness of decolonization strategies among patients and households.

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Treatment strategies for acute community-associated methicillin-resistant *Staphylococcus aureus* skin and soft-tissue infections (CA-MRSA SSTIs) reported by survey respondents

Table 1

	All Adult and Pediatric Providers (n=192)		Adult Providers				Pediatric Providers			
	ED (n=17)	Internal Medicine (n=27)	Family Medicine (n=18)	Infectious Disease (n=25)	Dermatology (n=8)	All Adults (n=95)	ED (n=20)	General Pediatrics (n=71)	Infectious Disease (n=6)	All Pediatrics (n=97)
Do you prescribe antibiotics following I&D?										
Yes, always	60%	58%	62%	32%	75%	45%	78%	75%	60%	74%
No	4%	4%	--	4%	12%	6%	--	1%	--	1%
Depends on size/location	34%	31%	38%	64%	12%	46%	22%	23%	40%	23%
Other	2%	8%	--	--	--	3%	--	1%	--	1%
Preferred empiric antibiotic choice for acute infections^a										
Amoxicillin/clavulanate	2%	4%	--	--	--	1%	--	4%	--	3%
Cephalexin	3%	12%	6%	12%	--	8%	--	3%	--	2%
Ciprofloxacin	2%	--	--	--	12%	1%	5%	1%	--	2%
Clindamycin	29%	12%	--	4%	12%	8%	79%	39%	80%	50%
Doxycycline	2%	--	--	4%	25%	3%	--	--	--	--
TMP/SMX	57%	69%	88%	72%	50%	75%	16%	48%	20%	40%
Other	5%	4%	6%	8%	--	4%	--	4%	--	3%
Preferred directed^b antibiotic choice for acute infections^a										
Ciprofloxacin	3%	--	--	--	12%	1%	6%	4%	--	4%
Clindamycin	22%	12%	6%	--	12%	8%	56%	30%	60%	36%
Doxycycline	1%	--	--	4%	--	1%	--	--	--	--
Linezolid	1%	--	--	--	--	--	--	--	20%	1%
Minocycline	1%	--	--	--	12%	1%	--	--	--	--
TMP/SMX	70%	77%	88%	96%	62%	84%	39%	66%	20%	59%
Other	4%	12%	6%	--	--	5%	--	--	--	--
Preferred duration of antibiotics for acute infections										

	All Adult and Pediatric Providers (n=192)	Adult Providers				Pediatric Providers					
		ED (n=17)	Internal Medicine (n=27)	Family Medicine (n=18)	Infectious Disease (n=25)	Dermatology (n=8)	All Adults (n=95)	ED (n=20)	General Pediatrics (n=71)	Infectious Disease (n=6)	All Pediatrics (n=97)
<7 days	4%	--	8%	6%	12%	12%	8%	6%	--	--	1%
7-10 days	76%	100%	50%	62%	52%	12%	59%	94%	93%	100%	94%
11-14 days	15%	--	35%	19%	32%	50%	26%	--	6%	--	4%
>14 days	3%	--	4%	6%	4%	25%	5%	--	1%	--	1%
Other	1%	--	4%	6%	--	--	2%	--	--	--	--

ED=emergency department, I&D=incision and drainage, TMP/SMX=trimethoprim/sulfamethoxazole

^aOnly antibiotic agents chosen by at least one respondent are shown

^b"Directed" is defined as an antibiotic choice made based on culture results, when available

Table 2
Decolonization strategies for recurrent CA-MRSA SSTIs reported by survey respondents

	All Adult and Pediatric Providers (n=192)	Adult Providers				Pediatric Providers					
		ED (n=17)	Internal Medicine (n=27)	Family Medicine (n=18)	Infectious Disease (n=25)	Dermatology (n=8)	All Adults (n=95)	ED (n=20)	General Pediatrics (n=71)	Infectious Disease (n=6)	All Pediatrics (n=97)
Do you decolonize patients with recurrent infections?											
Yes	80%	53%	73%	60%	92%	88%	73%	72%	90%	100%	87%
No	20%	47%	27%	40%	8%	12%	27%	28%	10%	--	13%
Do you decolonize the household of patients with recurrent infections?											
Yes, always	28%	12%	12%	7%	17%	38%	15%	44%	43%	--	41%
Yes, if family has SSTI	35%	18%	19%	36%	54%	25%	31%	28%	39%	100%	39%
No	37%	71%	69%	57%	29%	38%	54%	28%	19%	--	20%
Timing of decolonization											
During treatment of the acute infection	57%	89%	58%	50%	23%	75%	52%	54%	68%	--	62%
After the acute infection is resolved	43%	11%	42%	50%	77%	25%	48%	46%	32%	100%	38%
Preferred decolonization regimens for patients with recurrent infections ^a											
Oral TMP/SMX	9%	11%	21%	22%	32%	29%	24%	--	9%	--	8%
Oral rifampin	6%	--	10%	11%	23%	29%	15%	--	2%	--	1%
Topical mupirocin	88%	100%	100%	100%	82%	57%	89%	100%	94%	100%	96%
Antiseptic bodywash	73%	100%	79%	78%	100%	57%	89%	77%	67%	100%	71%
Bleach baths	34%	22%	--	--		29%	6%	92%	55%	75%	62%
Other	10%	11%	5%	--	18%	14%	8%	15%	8%	25%	10%

ED=emergency department, SSTI=skin and soft-tissue infection, TMP/SMX=trimethoprim/sulfamethoxazole

^aProviders could select more than one favored decolonization regimen