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Factors associated with emergency department methicillin-resistant *Staphylococcus aureus* coverage in patients with skin and soft tissue infections in an urban, tertiary care emergency department

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ABSTRACT

Introduction: Skin and soft tissue infections (SSTIs) are common and contribute significantly to morbidity and healthcare costs in emergency departments (EDs). The rise of antimicrobial resistance, particularly due to community-acquired methicillin-resistant *Staphylococcus aureus* (MRSA), complicates treatment decisions. Objective physical examination findings suggesting need for empiric MRSA coverage are sometimes ignored. Improving initial antimicrobial selection in the ED, especially regarding MRSA, could enhance antimicrobial stewardship.

Methods: We conducted a retrospective review of patient records for those who presented with SSTIs to an urban tertiary care ED between January 1, 2017, to December 31, 2019. Patients admitted during their initial visit were excluded. Data collected included demographics, vital signs, and laboratory results. Logistic regression was used to assess factors associated with the decision to provide MRSA coverage at presentation, reporting odds ratios with 95 % confidence intervals.

Results: Among 1675 patients, 42.2 % received empiric MRSA coverage. Factors associated with MRSA coverage included male gender, white race, intravenous drug use, immunocompromised status, systemic symptoms, tachycardia, presence of abscess, and surgical consultation. After adjusting for confounders, male gender, history of intravenous drug use, immunocompromised status, systemic symptoms, tachycardia, surgical consultation, and recent antibiotic use remained significantly associated.

Conclusion: Several factors, not always aligned with clinical guidelines, influenced the decision to initiate MRSA coverage in the ED. Understanding these determinants may improve antimicrobial stewardship and reduce costs. Future research should focus on patient outcomes based on methicillin-sensitive *S. aureus* (MSSA) versus MRSA coverage decisions and educational initiatives to improve guideline compliance.

1. Introduction

1.1. Background

Skin and soft tissue infections (SSTIs) comprise a large number of emergency department (ED) visits each year, tripling in recent decades [1,2]. Bacterial SSTIs are commonly seen in ED patients and can present as cellulitis, a non-purulent skin infection, or abscess, distinguished by the accumulation of purulent fluid. Methicillin-resistant *Staphylococcus aureus* (MRSA) and methicillin-sensitive *S. aureus* (MSSA) are among the most common causative pathogens, with MRSA having a predilection for causing abscesses and posing a particular challenge due to its resistance in standard antibiotic therapies [3].

SSTIs are a frequent reason for ED visits, accounting for 3–30 % of all hospital visits, and represent major sources of morbidity [4]. Many of these visits require treatment with antibiotics both in the ED and after discharge. In the US, the International Classification of Diseases (ICD) codes "cellulitis and abscesses" as 5.5 billion dollars in annual costs

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[5]. The increasing prevalence of MRSA as a leading cause of skin and soft-tissue infections (SSTIs) in major metropolitan areas across the United States has influenced empiric treatment protocols for these conditions [6]. Clinic practice guidelines from organizations such as the Infectious Diseases Society of America (IDSA) provide recommendations for the management of SSTIs and stipulate when to provide MRSA coverage. However, these guidelines often leave room for clinical judgment, particularly when deciding antibiotic choice (MRSA vs MSSA coverage in the outpatient setting) in select patients. Notably, a significant portion of patients with MRSA-associated SSTIs receive empiric antimicrobial therapy that is ineffective, presumably due to antimicrobial resistance, highlighting the need for careful antibiotic selection, especially in regions with a high prevalence of community-associated MRSA (CA-MRSA) [7]. Identifying factors that are associated with empiric MRSA coverage, and therefore understanding physician decision-making, is important to improve antibiotic selection and antimicrobial stewardship.

1.2. Importance

Previous studies have investigated the decision-making processes of physicians regarding risk factors for colonization or infection with MRSA, but few have specifically investigated predictors of MRSA coverage in SSTIs at the emergency department [8-10]. To our knowledge, this is the first study that has examined factors associated with MRSA coverage upon presentation to the ED with SSTIs. Understanding the factors that influence physicians' antibiotic prescribing practices is important, particularly with the overall increase in antimicrobial resistance, as 32 % of *S. aureus* isolates are methicillin-resistant in our healthcare system [11]. Given the prevalence of MRSA in our patient population, our study aims to fill a gap in the literature by identifying the predictors of physician decision-making to provide MRSA coverage in patients with SSTIs after discharge from our urban, tertiary care emergency department.

1.3. Goals of this investigation

The goal of this study is to identify key factors that influence the decision to prescribe MRSA coverage, providing insight that could enhance guideline adherence, optimize antibiotic use, and reduce the burden of MRSA-related complications in urban emergency departments.

2. Methods

The study complied with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

2.1. Study design and setting

This was a retrospective cohort study from January 1, 2017 to December 31, 2019 and included patients treated in the adult ED at Virginia Commonwealth University Health System in Richmond, Virginia. The hospital is an urban, tertiary care center with approximately 78,644 annual visits during the first year of the study period and serves a predominantly African American population.

2.2. Selection of participants

The cohort was identified initially for a quality improvement initiative. The study was approved by the Institutional Review Board (Protocol Number HM20023552). Patients aged ≥18 years were selected based on International Classification of Disease Revision 10 (ICD-10) codes indicating SSTI. For ICD-10 codes chosen, see Supplemental Table S1. Patients who were admitted to the hospital at index visit were excluded.

2.3. Cohort selection

A total of 1970 patients presented to the ED with ICD-10 codes for SSTI. 28 patients were excluded for inappropriately applied ICD-10 code/misdiagnosis (7), leaving before receiving medical treatment (8), wound recheck (11), and other (2 - medication refill and a throughput misunderstanding). This resulted in 1942 patients. Of these patients, a final analysis was performed on 1675 patients presenting with cellulitis and abscess, excluding patients with paronychia or felon, conditions that were less relevant to the clinical question addressed herein. See Fig. 1 for a detailed breakdown of included and excluded patients for this study.

2.4. Measurements

Data were abstracted from the electronic medical record (Cerner). Demographic data, including age, self-identified race/ethnicity, past medical history (i.e. diabetes mellitus (DM), history of intravenous drug use (IVDU), history of immunocompromise (defined as active chemotherapy, history of HIV/AIDS, history of organ transplantation with immunosuppressive medication prescriptions, etc.), pre-index visit antibiotics,

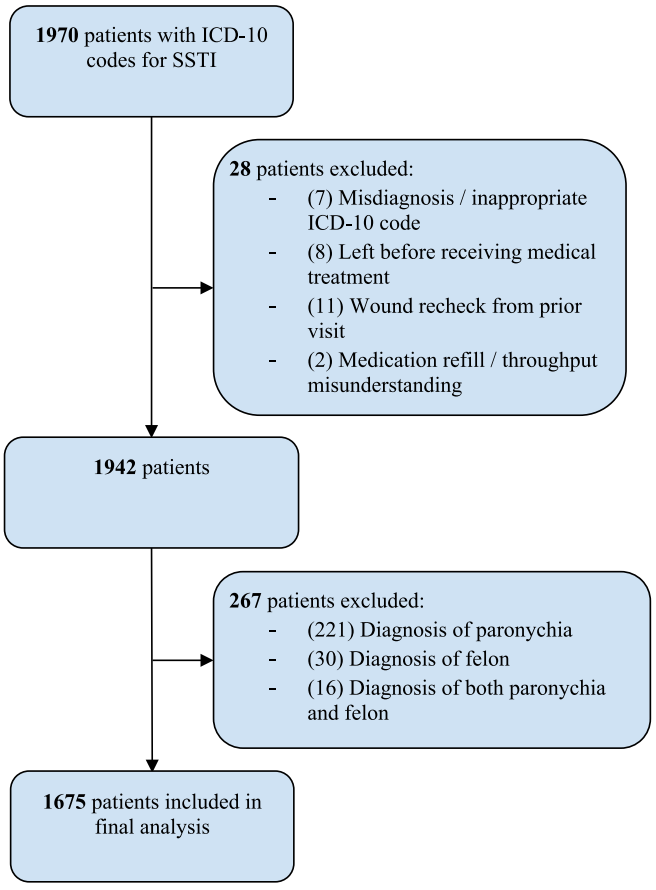

Fig. 1. Schematic representation of the patients included in this retrospective cohort study. 1970 patients were derived from ICD-10 codes from 2017 to 2019 indicating SSTI. 28 patients were excluded from the final analysis for various reasons, listed above. The remaining 1942 patients consisted of patients with cellulitis, abscess, paronychia, and felon. Patients whose primary diagnosis was paronychia or felon were excluded, leaving 1675 patients to be included in the final analysis.

clinical parameters (including vital signs, laboratory values, location of SSTI), as well as aspects of clinical management (whether or not antibiotics were administered in the ED, and if so, which ones, whether incision & drainage was performed, whether surgical consultation was ordered in the emergency department, etc.) were obtained and recorded. Supplemental Table S2 provides a list of extracted variables. Variables were downselected to those included in the models to minimize missing data (all included variables had <0.5 % missing data). Abstractors (BS, KH, SY) were monitored periodically for data accuracy by one of the co-principal investigators (JL), with a subset of charts reviewed to confirm agreement. Abstractors were not blinded to the study purpose.

2.5. Subgroup selection

A total of 300 patients presented to the ED with a report of prior oral/IV antibiotic administration, representing the population of interest for this study. 21 patients were excluded from this group for unknown/unreported antibiotics within the medical record. Of the remaining 279 patients, 101 patients reported receiving an MSSA-covering antibiotic, while 166 were on a MRSA-covering antibiotic, and 12 were on an antibiotic without *S. aureus* coverage. See Fig. 2 for a detailed breakdown of those patients receiving pre-index visit antibiotics. The group of patients on prior MSSA coverage was further analyzed for factors associated with upgraded coverage to MRSA coverage.

2.6. Outcomes

The primary outcome measure was ED MRSA coverage both in the primary cohort and the subgroup. ED MRSA coverage was defined as having received at least one MRSA covering antibiotic while in the ED or observation unit.

2.7. Data analysis

All numerical measurements were summarized as mean ± standard deviation and 95 % confidence intervals or as median (range), depending on the distributions they followed. Categorical measures were summarized with frequencies and percentages. The total and number of missing observations are reported for each item. Temperature and heart rate were dichotomized into normal and abnormal (abnormal here defined as heart rate ≥ 100 beats per minute, temperature ≥ 38 °C) to more accurately correspond to clinician decision-making. Simple logistic regression models were used to investigate bivariate associations of each measurement with ED MRSA coverage. A multiple logistic regression model was used to adjust the model for demographics and other measurements. Significant associations at the 5 % level are reported as odds ratios with 95 % confidence intervals. These statistical tests were performed by a biostatistician blinded to study hypotheses. All summaries and analyses were performed in R 4.4.0.

3. Results

3.1. Cohort descriptive statistics

The study identified 1675 patients who presented with SSTI to the ED from 2017 to 2019. Table 1 presents descriptive statistics of the cohort, including age, sex, race/ethnicity, as well as past medical history and clinical characteristics. The cohort was 57.1 % male ($n = 957$), with a mean age of 45.5 ± 15.4 years. With respect to self-reported race/ethnicity, 56.4 % ($n = 944$) identified as Black. A total of 42.2 % ($n = 707$) were provided MRSA coverage upon presentation to the ED. With respect to comorbidities and medical history, 19.8 % ($n = 331$) had a history of DM, while 8.1 % ($n = 135$) had a history of

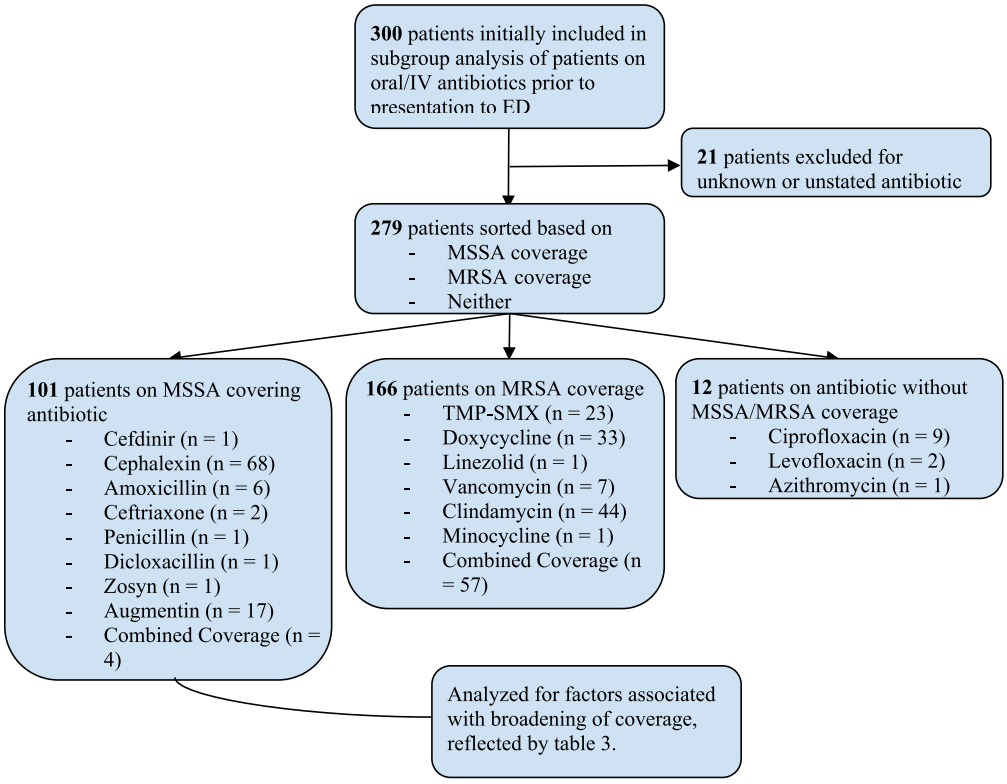

Fig. 2. A diagrammatic representation of the patients included in the subgroup analysis; Patients who presented to the ED with a subjective report of taking MSSA covering antibiotics (n = 101), specific antibiotics listed above. 4 patients presented with combined coverage, including cephalexin + amoxicillin-clavulanate ($n = 2$), cephalexin + clotrimazole ($n = 1$), and cephalexin + ceftriaxone (n = 1).

Table 1
Summary of patient characteristics.

Characteristic	Category	Frequency (%)
Sex	Female	718 (42.9 %)
	Male	957 (57.1 %)
Age	Mean (SD)	45.5 (15.4)
Race	Black	944 (56.4 %)
	White	635 (37.9 %)
	Other	96 (5.7 %)
Diabetes	No	1344 (80.2 %)
	Yes	331 (19.8 %)
Obesity	No	945 (56.4 %)
	Yes	730 (43.6 %)
Intravenous drug use	No	1540 (91.9 %)
	Yes	135 (8.1 %)
Immunocompromised	No	1551 (92.6 %)
	Yes	124 (7.4 %)
Subjective report of systemic illness	No	1505 (89.9 %)
	Yes	170 (10.1 %)
ICD-10	Lower extremity	883 (52.7 %)
	Upper extremity	316 (18.9 %)
	Head, Neck	239 (14.3 %)
	Trunk	130 (7.8 %)
	Unspecified location	98 (5.9 %)
	Missing	9 (0.5 %)
Abscess	No	1532 (91.5 %)
	Yes	143 (8.5 %)
Obesity	No	945 (56.4 %)
	Yes	730 (43.6 %)
HR ≥ 100	No	1331 (79.5 %)
	Yes	339 (20.2 %)
	Missing (%)	5 (0.3 %)
Temperature ≥ 38	No	1649 (98.5 %)
	Yes	17 (1.0 %)
	Missing (%)	9 (0.5 %)
MRSA upon Presentation	No	968 (57.7 %)
	Yes	707 (42.2 %)
MRSA upon Discharge	No	685 (40.9 %)
	Yes	990 (59.1 %)

IVDU, and 7.4 % ($n = 124$) had a history of immunocompromising conditions. Most patients, 71.5 % ($n = 1199$), had cellulitis of their extremities.

3.2. Unadjusted logistic regression analysis

To determine factors associated with MRSA coverage upon presentation to the ED, simple logistic regression models were fitted to investigate bivariate associations of each measurement with ED MRSA coverage. The results are summarized in the left part of Table 2. Statistically significant factors increasing odds of MRSA coverage at presentation included gender (OR 1.36, 95 % CI 1.12–1.66, $p = 0.0023$), white race (OR 1.34, 95 % CI 1.09–1.64, $p = 0.0049$), IV drug use (OR 2.50, 95 % CI 1.75–3.62, $p < 0.0001$), immunocompromised status (OR 1.56, 95 % CI 1.08–2.25, $p = 0.0181$), subjective report of systemic illness, (OR 2.35, 95 % CI 1.70–3.27, $p < 0.0001$), heart rate ≥ 100 (OR 1.34, 95 % CI 1.05–1.70, $p = 0.0178$), temperature ≥ 38 (OR 3.30, CI 1.22–10.42, $p = 0.0254$), abscess (OR 1.43, CI 1.01–2.02, $p = 0.0416$), seen at OSH for same complaint (OR 1.66, 95 % CI 1.29–2.13), antibiotics given prior to index presentation (OR 1.64, 95 % CI 1.28–2.11, $p = 0.0001$), and surgical consultation (OR 2.78, 95 % CI 2.12–3.66, $p < 0.0001$) or incision and drainage (I&D) by surgical consultants (OR 2.39, 95 % CI 1.24–4.77, $p = 0.0104$). Statistically significant factors that reduced odds of MRSA coverage at presentation included unspecified location (OR 0.32, 95 % CI 0.18–0.55, $p < 0.0001$) and duration of symptoms (OR 0.99, 95 % CI 0.98–1.00, $p = 0.0406$).

3.3. Adjusted multiple logistic regression analysis

A multiple logistic regression model was fitted to adjust for the demographics and other variables outlined in Table 1. Results from this model are summarized in the right half of Table 2. Of the variables identified above, male gender (OR 1.34, 95 % CI 1.08–1.68, $p = 0.0094$), history of IV drug use (OR 2.03, 95 % 1.36–3.04, $p < 0.0001$), immunocompromised status (OR 1.59, 95 % CI 1.07–2.38, $p = 0.0223$), subjective report of systemic illness (OR 1.97, 95 % CI 1.38–2.83, $p < 0.0001$), HR ≥ 100 (OR 1.33, 95 % CI 1.02–1.74, $p = 0.0360$), surgical consult (OR 2.56, 95 % CI 1.86–3.54, $p < 0.0001$), and antibiotic administration given prior to visit (OR 1.65, 95 % CI 1.05–2.60, $p = 0.0306$) remained statistically significant predictors of MRSA coverage at presentation. Unspecified location (OR 0.27, 95 % CI 0.14–0.48, $p < 0.0001$) remained a statistically significant factor that reduced the odds of MRSA coverage at presentation. Odds ratios are depicted in Fig. 3.

Table 2
Simple and multiple logistic regression models for ED MRSA coverage upon presentation.

Characteristic	Unadjusted Analysis		Adjusted Analysis	
	OR (95 % CI)	*P*-Value	OR (95 % CI)	P-Value
Age at visit	1.00 (0.99, 1.01)	0.7923	1.00 (0.99, 1.01)	0.7367
Gender (M)	1.36 (1.12, 1.66)	0.0023*	1.34 (1.08, 1.68)	0.0094*
Obesity	0.88 (0.73, 1.07)	0.21	1.00 (0.80, 1.26)	0.9967
Race (Other)	0.96 (0.62, 1.46)	0.8371	1.16 (0.71, 1.86)	0.547
Race (White)	1.34 (1.09, 1.64)	0.0049*	1.22 (0.97, 1.53)	0.0822
Diabetes	1.20 (0.94, 1.53)	0.133	1.21 (0.91, 1.61)	0.189
Intravenous drug use	2.50 (1.75, 3.62)	<0.0001*	2.03 (1.36, 3.04)	<0.0001*
Immunocompromised	1.56 (1.08, 2.25)	0.0181*	1.59 (1.07, 2.38)	0.0223*
Subjective report of systemic illness	2.35 (1.70, 3.27)	<0.0001*	1.97 (1.38, 2.83)	<0.0001*
Lower extremity SSTI	0.90 (0.68, 1.21)	0.4969	0.87 (0.64, 1.20)	0.4003
Trunk SSTI	0.71 (0.46, 1.10)	0.1274	0.64 (0.39, 1.05)	0.0801
Unspecified location	0.32 (0.18, 0.55)	<0.0001*	0.27 (0.14, 0.48)	<0.0001*
Upper extremity SSTI	1.30 (0.93, 1.83)	0.1237	1.09 (0.75, 1.58)	0.6523
HR ≥ 100 beats/min	1.34 (1.05, 1.70)	0.0178*	1.33 (1.02, 1.74)	0.0360*
$T \geq 38$ °C	3.30 (1.22, 10.42)	0.0254*	2.53 (0.87, 8.49)	0.1038
Abscess	1.43 (1.01, 2.02)	0.0416*	1.42 (0.87, 2.33)	0.1623
Days of symptoms	0.99 (0.98, 1.00)	0.0406*	0.99 (0.98, 1.00)	0.0635
Surgical consult	2.78 (2.12, 3.66)	<0.0001*	2.56 (1.86, 3.54)	<0.0001*
I&D by ED	1.40 (0.94, 2.06)	0.0939	1.27 (0.75, 2.14)	0.3616
Surgery I&D	2.39 (1.24, 4.77)	0.0104*	0.76 (0.35, 1.69)	0.4941
Seen at outside hospital for same complaint	1.66 (1.29, 2.13)	<0.0001*	1.26 (0.88, 1.82)	0.206
Antibiotics given prior to visit	1.64 (1.28, 2.11)	0.0001*	1.65 (1.05, 2.60)	0.0306*
The antibiotics had MRSA coverage	1.38 (1.00, 1.90)	0.0508	0.70 (0.42, 1.15)	0.1602

* : P-value is significant at 0.05 significance level.

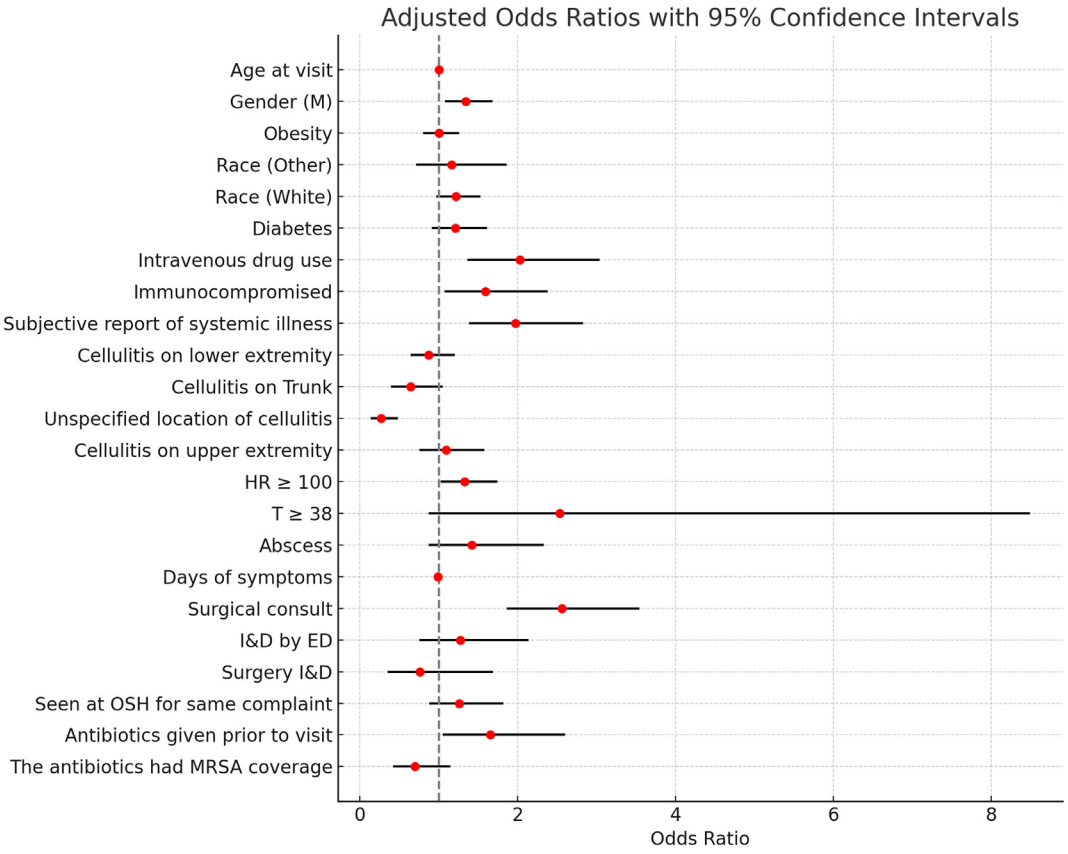

Fig. 3. Multiple Logistic Regression Models for ED MRSA Coverage Upon Presentation.

3.4. Subgroup analysis

A subgroup analysis was performed on 101 patients who presented to the ED who had been seen by OSH and placed on MSSA covering antibiotics to determine factors associated with escalation of coverage. Subgroup selection is demonstrated in Fig. 2. A series of simple logistic regression models were used to investigate bivariate associations of each factor with ED MRSA coverage upon presentation, summarized in Table 3 as OR +/− 95 % CI with *p* values and represented by Fig. 4. Male gender (OR 2.72, 95 % CI 1.19–6.21) was the only statistically significant factor associated with escalation of coverage from MSSA antibiotics to MRSA antibiotics.

4. Discussion

The study described herein identified multiple factors that increased the odds of ED MRSA coverage for patients presenting with SSTIs. These data could be interpreted as factors that influence ED physician decision-making regarding patient disposition and severity of clinical presentation. These data should be discussed and compared to the data that represents current clinical practice guidelines for providing MRSA coverage, outlined by the IDSA guidelines and discussed by Stevens et al. 2008 [12]. Empiric MRSA coverage is indicated in the setting of severe sepsis, certain patient-specific MRSA risk factors, known MRSA colonization, IV drug use, high-risk neutropenia, purulent wound drainage, and in patients who have increased morbidity if suboptimal antibiotics are selected, among other risk factors [12]. The IDSA has provided treatment guidelines for empiric MRSA coverage in cellulitis and soft tissue infections, advising that infections first be categorized as necrotizing, purulent, or non-purulent. For non-necrotizing, non-purulent infections, such as uncomplicated cellulitis, obtaining cultures is often impractical, so antibiotics are typically selected to cover beta-hemolytic streptococci. The presence of purulence on exam suggests the need for empiric coverage with drugs effective against MRSA. Outside of findings on exam, various historical factors might support MRSA coverage, including history of penetrating trauma, especially

Table 3
Subgroup analysis on patients with prior MSSA coverage using simple logistic regression model evaluating for ED MRSA coverage upon presentation.

		Unadjusted Analysis	
Category	Variable	OR (95 % CI)	P-Value
Vital Signs			
	Heart Rate (HR)	0.55 (0.21, 1.43)	0.227
Laboratory Data & Clinical Presentation			
	Subjective report of Systemic Illness	1.11 (0.30, 4.08)	1.00
	Days of Symptoms prior to ED visit	1.00 (0.97, 1.04)	0.653
	Presence of Abscess	4.07 (0.47, 35.19)	0.2439
	Location of SSTI		
	Upper Extremity	1.68 (0.49, 5.79)	0.5573
	Lower Extremity	0.75 (0.32, 1.77)	0.6679
	Trunk	1.47 (0.47, 4.6)	0.5855
	Unspecified Location	0.40 (0.06, 2.51)	0.3715
Patient Demographics and Comorbidities			
	Age at visit	0.98 (0.95, 1.01)	0.255
	Gender (M)	2.72 (1.19, 6.21)	0.0226*
	Race (Other)	1.98 (0.38, 10.36)	0.480
	Race (African American)	0.60 (0.27, 1.35)	0.225
	Race (White)	1.38 (0.62, 3.09)	0.5401
	Obesity	0.87 (0.39, 10.36)	0.8381
	Diabetes Mellitus (I or II)	1.15 (0.36, 3.74)	1.00
	Immunocompromised Status	0.29 (0.05, 1.67)	0.202
	History of IV Drug Use	Infinity	N/A
Hospital Course			
	Surgical consult for I&D	1.10 (0.47, 2.56)	1.00

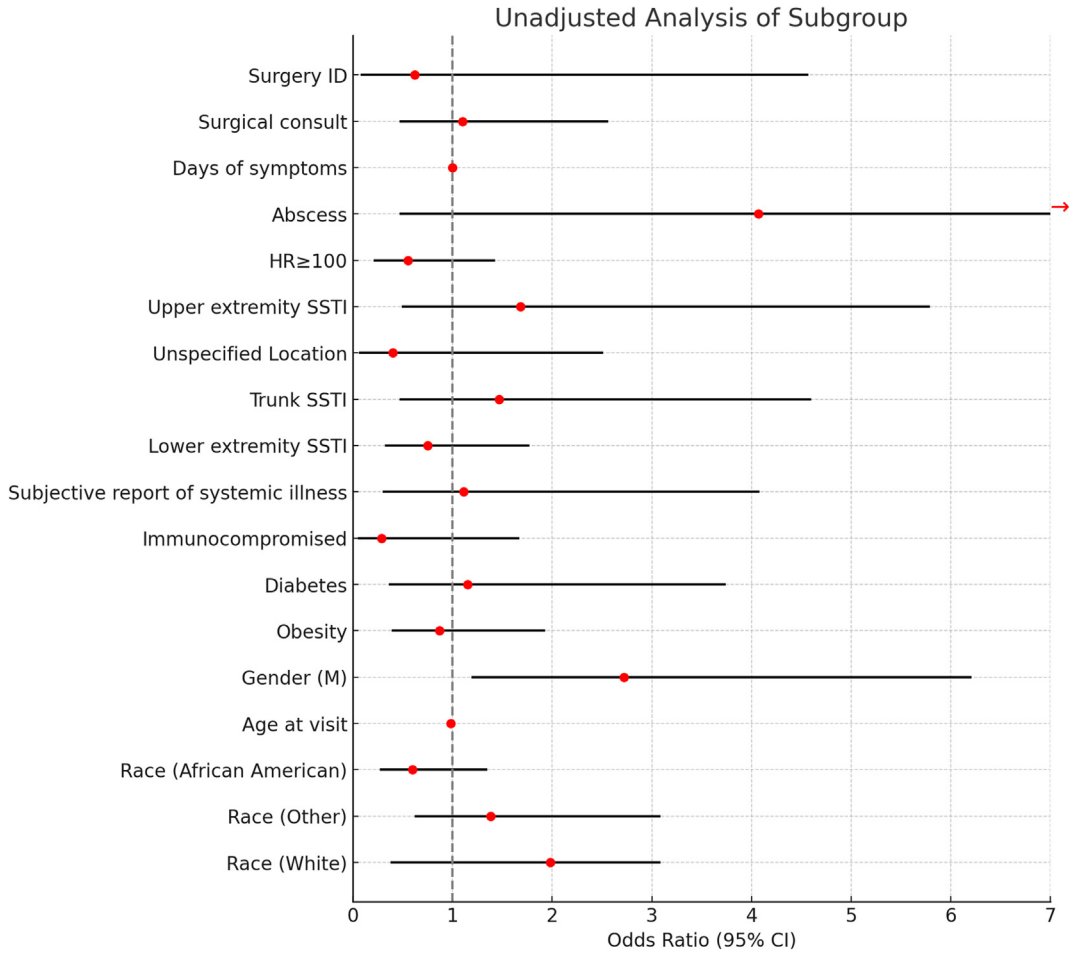

Fig. 4. A subgroup analysis of patients presenting to the ED already on MSSA covering antibiotics using simple logistic regression models for ED MRSA Coverage Upon Presentation. Arrows represent confidence intervals that exceed the X axis for simplicity. Confidence intervals that cross the dotted line represent non-significant factors. The only factor of significance was male gender.

from intravenous drug use, evidence of MRSA infection elsewhere, known nasal colonization with MRSA, or SIRS criteria, among other factors. These are outlined further in Table 4, as are the areas of concordance and divergence identified in the present study. We observed a statistically significant increased odds of ED MRSA coverage with a history of IV drug use, immunocompromised status, subjective report of systemic illness, and some SIRS (systemic inflammatory response syndrome) criteria (HR ≥ 100 bpm on adjusted analysis, temperature ≥ 38 °C on unadjusted analysis), demonstrating concordance with IDSA guidelines. Moreover, we observed increased odds of ED MRSA coverage for those patients receiving previous antibiotics to treat their current infection. To further explore why prior antibiotic administration prompted

Table 4
Comparison of IDSA guideline recommendations for empiric MRSA coverage vs. factors identified in this cohort.

IDSA Guidelines	Study Incorporated Clinical Factors
Concordant Factors	
Systemic signs of toxicity (fever, hypotension, sustained tachycardia)	Subjective report of systemic illness (OR 1.97, p < 0.0001), tachycardia (OR 1.33, $p < 0.0360$)
Injection drug use	Injection drug use (OR 2.03, $p < 0.0001$)
Immunocompromised status	Immunocompromised status (OR 1.59, p = 0.0223)
Failed initial antibiotics (mentioned in context of purulent SSTIs)	Antibiotics given prior to visit (OR 1.65, p = 0.0306)
Discordant Factors	
Cellulitis with purulent wound drainage	Abscess present (OR 1.42, $p = 0.1623$)
	Surgical consultation for I&D (OR 2.56, p < 0.0001)
	Male gender (OR = 1.34, p = 0.0094)
Factors Not Directly Assessed in Present Study	
Recent hospitalization	
High risk neutropenia	
Recurrent abscesses, including hidradenitis	
Surgical wound infections at high MRSA prevalence hospitals	
Known MRSA colonization or prior MRSA infection	

ED MRSA coverage, a subgroup analysis was conducted on patients already receiving MSSA-covering antibiotics before ED presentation, with the primary outcome representing escalation of ED MRSA coverage. We found that male gender was the only factor significantly associated with the shift to MRSA-targeted antibiotics, although the small cohort size ($n = 101$) and wide confidence intervals likely prevented other variables from being statistically significant.

While our findings were mostly concordant with prior clinical practice guidelines, we also found increased odds of ED MRSA coverage with male gender and surgical consultation, and did not observe statistically significant differences based on presence of abscess, a finding that, by guidelines, ought to prompt consideration of empiric MRSA coverage. It is unclear why male gender, in both the entire cohort and subgroup, increased the odds of ED MRSA coverage. Some studies have attempted to describe SSTI severity and found that the female gender was 2× more likely to require hospitalization [13], while another study, although not significant, found the male gender to have a higher relative risk of hospital admission (RR 1.25, 95 % CI 0.83–1.88) [14]. Other studies have found no impact of gender on the need for hospitalization for SSTI [15]. Variation in clinical practice based on gender potentially represents implicit bias on the part of providers, raising questions about why such variation exists in the first place. Additionally, prior to adjustment, white race was a factor associated with increased odds of ED MRSA coverage, although not corroborated after statistical adjustment. Some studies have correlated white race with SSTI severity, specifically for hospital admission [14], although other studies have failed to correlate white race with SSTI severity, specifically for observation unit failure [15]. Another study corroborates the finding that white patients were more likely to be admitted to the hospital than their nonwhite counterparts for SSTI, specifically cellulitis [16]. In this same study, they found that black and Hispanic patients were on average younger, more likely to present to an urban teaching hospital, have Medicaid, and live in neighborhoods with lower median income. It should be noted that although hospital admission does not directly imply a need for MRSA-targeted antibiotics, it often serves as an indicator for the requirement of IV antibiotics, which typically includes empiric coverage for MRSA. Altogether, these findings raise the question of how gender and race should impact antimicrobial choice for SSTI in the ED, if at all. Thus, identifying risk factors and utilizing them in the determination of empiric antibiotic regimens for patients presenting with cellulitis in the ED, particularly in communities where CA-MRSA strains are increasingly prevalent, is important.

The present study is limited in the sense that it is retrospective, and data that might have been valuable (size and distribution of SSTI, patient's housing status, additional data regarding insurance status, etc.) were not available from the medical record in a reliable and consistent manner. The study is single-center, limiting its generalizability compared to other multi-center studies and trials, although it represents, to our knowledge, the first study of predictors of ED MRSA coverage for patients with SSTI. Laboratory studies were not ordered with enough frequency to include lab values like serum lactate, white blood cell count, and inflammatory markers in statistical analysis, limiting the ability to determine if such values significantly influence odds of ED MRSA coverage. We also considered clindamycin as an antibiotic that covers MRSA, although 31 % of *S. aureus* isolates were resistant to clindamycin in the VCU health system [11]. It is possible that the VCU Health ED physicians were aware of this data and used clindamycin as an antibiotic targeting MSSA rather than MRSA, which could have influenced the results of this study. Regardless, it is illustrative that the antimicrobial susceptibility landscape is a dynamic one, and that tried and true antibiotics will inevitably become less useful as our pathogens coevolve with us. Thus, antimicrobial stewardship strategies that advocate for conscientious approaches to antimicrobial utilization will be one of the mainstays in our collective fight against antimicrobial resistance.

The present study lays a foundation for additional studies in the future that can further characterize the care of SSTI and other infectious diseases, especially in the context of escalating rates of antimicrobial resistance. Future studies should aim to describe patient-specific outcomes for those given MSSA versus MRSA coverage at presentation. The differences in practice patterns observed in this study, which deviate from current guidelines, highlight an opportunity for provider education and broader dissemination of these guidelines beyond the infectious disease specialty. This may involve tailoring the guidelines to be more accessible and practical for frontline providers in emergency medicine. Additionally, it raises the question of whether certain aspects of emergency department care differ in ways that might challenge the applicability of existing guidelines. By examining practice patterns across multiple institutions, we may identify early signals indicating areas where guideline updates or modifications could be considered.

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CRediT authorship contribution statement

Brady Simpson: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Kevin Han:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Steven Yee:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Rasha Alsaadawi:** Writing – review & editing, Formal analysis. **Roy Sabo:** Writing – review & editing, Supervision, Formal analysis. **Taruna Aurora:** Writing – review & editing, Supervision, Project administration. **Joseph Lykins:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors have no conflicts of interest to report.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ajem.2024.11.035.

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