

# Evaluation of Prescribed Empiric Cellulitis Therapy at an Academic Medical Center Emergency Department

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## INTRODUCTION

- Cellulitis accounts for the majority of skin and skin structure infection (SSSI) in emergency departments in the United States
  - Characteristics: diffuse, spreading skin infection of dermis, subcutaneous tissue, sometimes deep muscle tissue
  - Patient presentation: rapidly spreading areas of heat, redness, and edema.
  - Common pathogens: Group A *β*-hemolytic *Streptococcus pyogenes*, *Staphylococcus aureus*, *Haemophilus influenzae*, and other species of *β*-hemolytic streptococci
  - Antibiotics for community-acquired methicillin resistant *Staphylococcus aureus* cellulitis include clindamycin, trimethoprim-sulfamethoxazole (TMP-SMX), doxycycline, linezolid, and vancomycin
- The objective of this study was to evaluate the appropriateness and cost-effectiveness of common antibiotics prescribed to treat cellulitis at a tertiary care, academic medical center
  - Clindamycin alone or the combination of cephalexin and TMP-SMX are commonly prescribed empiric therapy for cellulitis for patients seen in the emergency department or urgent care
- Few studies have assessed the effectiveness and cost of combination therapy with cephalexin and TMP-SMX versus single drug therapy for cellulitis
- Appropriateness of therapy was evaluated through analysis of drug and dose (renal function), route, culture results (if applicable), patient allergies, patient concurrent infections and co-morbid conditions

## HYPOTHESIS

- Empiric cellulitis therapy (drug and dose) has been appropriately prescribed based on culture results, patients' allergies, and patients' estimated renal function
- More than 80% of clindamycin or TMP-SMX plus cephalexin prescribed empiric regimens at time of discharge will be identical
- There will be no significant difference in the treatment failure rates or change in antimicrobial therapy rates due to adverse drug events between patients prescribed clindamycin alone and the combination of cephalexin and TMP-SMX
- Direct cost of the medication with clindamycin alone will be higher than that of the combination treatment with cephalexin and TMP-SMX for the duration of therapy

## SPECIFIC AIMS

- Specific Aim #1:** Determine the incidence that antimicrobial cellulitis empiric therapies are prescribed

For patients who were prescribed either clindamycin, TMP-SMX, and/or cephalexin as empiric cellulitis therapy only (Specific Aims 2-4):

- Specific Aim #2:** Determine the incidence that clindamycin, TMP-SMX, cephalexin are prescribed and evaluate prescribed doses, frequency, and duration of therapy
- Specific Aim #2:** Compare the incidence of repeat visits within 30 days to the emergency department, urgent care center, or hospital associated ambulatory clinics for change in antimicrobial therapy for cellulitis
- Specific Aim #3:** Compare the direct costs of the empirical therapy used for cellulitis

## METHODS

### Project Design

- Institutional Review Board approved, retrospective cohort chart review
  - Inclusion criteria:
    - Potential subjects were identified based on ICD-9 codes (681 or 682) for cellulitis for patients evaluated in the emergency department of an academic medical center between October 2010 and November 2010
    - Subjects over 18 years old
  - Exclusion criteria
    - Subjects presented with necrotizing fasciitis, orbital cellulitis, or diabetic foot infection
    - Subjects that required hospitalization or surgical intervention in an operating room

### Data Collected Includes

- Patient demographics, patient characteristics related to medical conditions
- Site of cellulitis, size and documentation of debridement of abscess(es)
- Empiric cellulitis therapy prescribed in the emergency department (drug, dose, route)
- Empiric cellulitis therapy prescribed at time of discharge
- Changes in empiric cellulitis therapy if applicable in subsequent emergency department or clinic visits
- Culture results, if applicable
- Reported adverse drug events associated with empiric therapy or issues with adherence

### Data Analysis

- Descriptive statistics used for the analysis of the demographics of the subjects
- Inferential statistics used for the analysis of outcomes and cost
- Data analysis was performed in STATA (version 11)

## RESULTS

### Demographics (N = 156)

- Mean (±SD) age: 38 ± 16 years
- Race: 87% were White race with 23% identified as Hispanic, 13% Other
- Insurance status includes: 54% Medicaid/Medicare, 32% Private, 14% No insurance
- Allergies included: beta-lactam (N=23), sulfonamides (N=12), clindamycin (N=2)
  - Of the patients reporting a beta-lactam, cephalexin was prescribed to 7 subjects

### Cellulitis Diagnosis and Culture Results

- Abscesses were reported in 75 (48%) of subjects
- Incision and draining of abscess(es) in 68 (44%) of subjects
  - Isolates were identified from samples in 38 (24%) of subjects
  - Staphylococcus aureus* was identified in 37 (24%) of subjects
    - Of these isolates, 26 were methicillin-resistant *Staphylococcus aureus* (MRSA)
    - All *Staphylococcus aureus* isolates were classified as susceptible to TMP-SMX, clindamycin, and vancomycin (MIC ≤ 1 mcg/ml)

**Table1.** Antibiotics Administered in the Emergency Department

Antibacterial Agent <sup>1</sup>	Percent of Patients	Dose in mg (%)	Frequency (%)	Treatment Days (%)
Clindamycin	26%	300 (5%) 450 (1%) 600 (12%) 900 (8%)	Once (20%) Q 6 h (1%) Q 8 h (5%)	1 (26%)

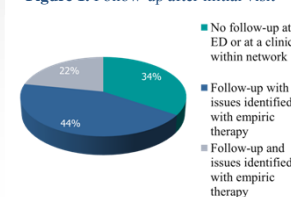
<sup>1</sup> Other therapy prescribed : SMX-TMP (N=2), cephalexin (N=2), vancomycin (N=1), piperacillin-tazobactam (N=1)

**Table 2.** Antibiotics Prescribed at Time of Discharge from Emergency Department

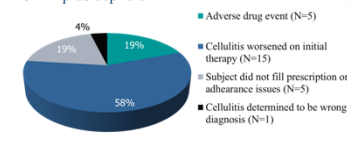
Antibacterial Agent <sup>1</sup>	Percent of Patients	Dose in mg (%)	Frequency (%)	Treatment Days (%)
Clindamycin	37%	150 (4%) 300 (30%) 450 (3%)	Q 6 h (32%) Q 8 h (4%) Q 12 h (1%)	7 (4%) 10 (33%)
TMP-SMX plus	40%	160-800 (40%)	Q 12 h (40%)	7 (6%) 10 (33%) 14 (1%)
Cephalexin		500 (35%) 1000 (5%)	Q 6 h (31%) Q 8 h (3%) Q 12 h (6%)	5 (1%) 7 (9%) 10 (30%)

<sup>1</sup> Other therapy prescribed : cephalexin only (N=9), amoxicillin-clavulanic acid (N=9), ciprofloxacin (N=2), doxycycline (N=1), clindamycin plus cephalexin (N=1), cephalexin plus metronidazole (N=1)

**Figure 1.** Follow-up after initial visit



**Figure 2.** Empiric therapy complications in subjects who received clindamycin or TMP-SMX plus cephalexin<sup>1</sup>



<sup>1</sup> No statistical difference between groups (p = 0.51)

**Table 3.** Cost Analysis

Antibacterial Agent <sup>1</sup>	Dosing Schedule	Cost/ Dose	Cost / Treatment	Total Cost/ Treatment
Clindamycin	300 mg Q 6 h x 10 days	\$1.20	\$47.90	\$47.90
TMP-SMX plus	160-800 mg Q 12 h x 10 days	\$0.38	\$7.58	\$18.50
Cephalexin	500 mg Q 6 h x 10 days	\$0.27	\$10.92	

<sup>1</sup> 2010 Average Wholesale Price - Redbook

## ASSUMPTIONS AND LIMITATIONS

- Assumed proper diagnosis of cellulitis was made in the emergency department
- Assumed cellulitis was caused by Group A *β*-hemolytic *Streptococcus pyogenes* and/or *Staphylococcus aureus* unless otherwise indicated by culture results
- Adherence assumed to be sufficient unless indicated in follow-up clinical notes
- Treatment failure rates may have been underestimated.
- Results may not apply to other geographic areas. Antibiotic resistance rates may also vary by institution.

## CONCLUSION

The majority of patients were given a prescription for either clindamycin only (37%) or TMP-SMX plus cephalexin (40%) as appropriate empiric therapy when discharged from the emergency department. While follow-up (either repeat emergency department visit or clinic visit within the academic medical healthcare network) was only available in 78% of subjects, there was no statistical difference in therapy outcomes between these two empiric therapy options. Although there was no significant differences in therapy outcomes, clindamycin was \$29.40 more expensive than TMP-SMX plus cephalexin for total duration of therapy.

## DISCLOSURE STATEMENT

Authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation.