

**Skin and Soft Tissue Infections Requiring
Hospitalization at an Academic Medical
Center: Opportunities for Antimicrobial
Stewardship**

Jenkins TC, et al
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Purpose

- Highlight the opportunities for antibiotic stewardship and healthcare resource utilization
- Detailed review of skin and soft tissue infections including;
 - Spectrum of disease
 - Treatment
 - Outcomes
 - Diagnostic work up

Methods

- Denver Health, an urban health care system
- Looked at patients discharged with principle diagnosis of ABSSTI during 2007 (Jan to Dec)
- Focus was community-associated infections
- Infections
 - cellulitis
 - abscess
 - erysipelas
 - acute lymphadenitis
 - necrotizing fasciitis
- Data collection
 - Demographics (comorbidities)
 - Inpatient and discharge antibiotics
 - Microbiology, radiology, and drainage procedures

Outcomes Assessment

- Severity of infections were divided into
 - Cellulitis (no micro evaluation due to lack of cultures)
 - Cutaneous abscess
 - SSTI with additional complicating factors (at or below the deep fascia) bacteremia, ICU, DFI, PVD and others
- Outcomes assessed
 - Clinical failure (primary)
 - Microbiologic etiology
 - Antimicrobial therapy
 - Diagnostic testing

Definitions

- Clinical failure
 - Treatment failure
 - Change in antimicrobials therapy, additional drainage, >7 days after start of Rx due to poor response
 - Recurrence
 - Worsening SSTI requiring a need to restart antibiotics after completion of an initial treatment course
 - Rehospitalization within 30 days due to SSTI

Demographics

Characteristic	Cellulitis (n=66)	Abscess (n=103)	SSTI with Complications (n=153)	p
Age, median	48	45	46	
IVDU	8 (12)	41 (40)	35 (23)	<0.001
Diabetes	12 (18)	14 (14)	47 (31)	<0.001
Prior SSTI	8 (12)	15 (15)	22 (14)	
Lower extremity	50 (76)	25 (24)	79 (52)	
Upper extremity	12 (18)	42 (41)	46 (30)	
Hands, face, or neck	1 (2)	7 (7)	14 (9)	
Duration of symptoms, median days	3	4	3	0.006
Fever at presentation	8 (12)	10 (10)	24 (16)	
Failed outpatient Rx	14 (21)	29 (28)	30 (20)	

* Data are No (%) of patients

Clinical Characteristics Resulting in Classification of SSTI

Characteristic	No (%) of patients (n=322)
Recent Hosp or surgery	43 (13)
Deep tissue infection	41 (13)
Severe cellulitis needing debridement	23 (7)
Diabetic or other chronic ulcer	19 (6)
Animal or human bite	14 (4)
Necrotizing fasciitis	9 (3)

Diagnostic Testing

- Inflammatory marker measured (56-70%)
- Microbiology (64-82%)
 - Superficial swabs
 - 15% of cellulitis and SSTI with complicating factors
 - Blood cultures
 - >50% of the three infections types
- Imaging of affected area (69-94%)
 - >50% with plain films
 - CT or MRI
 - 17-24% (cellulitis = abscess)

Microbiology of Abscess Material, Deep Tissue or Blood*

Isolate	Abscess (n=77)	SSTI with Complications (n=73)
<i>S aureus</i>	52 (68)	45 (62)
MRSA	34(44)	30 (41)
Streptococci	29 (38)	31 (42)
<i>S aureus</i> or Streptococcus	75 (97)	70 (96)
<i>S aureus</i> or Streptococcus only	59 (77)	52 (71)
Aerobic Gram negative bacteria	10 (13)	10 (14)
Anaerobes	13 (17)	16 (22)

* Data are No (%) of patients

Antimicrobial Therapy

Therapy	Cellulitis (n=66)	Abscess (n=103)	SSTI with Complications (n=153)
Inpatient Antibiotics (at least 1 dose administered)			
Vancomycin	52 (79)	75 (73)	112 (73)
B-lactam/ β -lactamase inhibitors	35 (53)	67 (65)	101 (66)
Clindamycin	17 (26)	19 (18)	50 (33)
Levofloxacin	7 (11)	5 (5)	21 (14)
Cefazolin	13 (20)	21 (20)	26 (17)
Broad spectrum Gram negative Rx	40 (61)	69 (67)	123 (80)
3 or more antibiotics	34 (52)	41 (40)	74 (48)
Discharge Antibiotics			
Bactrim	32 (48)	49 (48)	38 (25)
Amox/Clav	12 (18)	23 (22)	40 (26)
Median Duration Inpatient	4 (3-5)	4 (3-5)	5 (3-7)
Median Duration Outpatient Data are No. (% of patients)	7 (7-10)	10 (7-10)	9 (7-10)

Clinical Outcomes

Therapy	Cellulitis (n=66)	Abscess (n=103)	SSTI with Complications (n=153)
Clinical failure	8 (12.1)	5 (5)	14 (9.2)
Treatment failure	3 (4.6)	1	2 (1.3)
Recurrence	4 (6.1)	1	7 (4.6)
Rehospitalization due to SSTI	4 (6.1)	4 (3.9)	11 (7.2)
In hospital mortality	0	0	0
Duration of hospital stay, median	4	4	5
Patient Charges, median US \$	7332	8120	13,240

* Data are No (%) of patients

**Decrease Antibiotic Utilization After
Implementation of a Guideline for
Inpatient Cellulitis and Cutaneous
Abscess**

Jenkins TC, et al

Arch Intern Med 2011;Feb 28

Why Develop a Guideline for Cellulitis and Cutaneous Abscess

- Two of the most common infections in leading to hospitalization.
- The organisms causing these infections are known (*S aureus* and streptococcal spp.)
- Clinical trials and providers consistently use broad spectrum agents that cover Gram-negative bacilli or anaerobes
- Duration of treatment often exceeds 2 weeks

Modification of Risk Factors for CDI

- Antimicrobial use
 - Fluoroquinolones
 - Clindamycin
 - 3rd generation cephalosporins
- Prolonged antimicrobial therapy
- Unnecessary antimicrobial use
- Proton pump inhibitors?

Intervention

- Developed a multidisciplinary working group
- Standardized and streamline management of cellulitis and abscess
- Diagnostic work-up
 - Limited use of CRP, ESR, plain X-ray, MRI and CT
 - Blood cultures
- Antimicrobial
 - Vancomycin (deescalate to doxycycline, bactrim or clindamycin)
 - NSAID
 - Elevation of the affected area
- Antimicrobial duration
 - Total course of 7 days

Education

- Dissemination of guideline
 - E mail
 - Hard copy
 - Signs in work area
- Electronic order set for CPOE
- Education campaign
 - ED, adult urgent care, internal medicine, general surgery, ortho
- Audit and feedback to peer champions
 - Over the 12-month intervention period

Study Design

- Before after design
 - Jan through December 2007 and July 9 through July 8, 2010
- Cellulitis or cutaneous abscess (regardless of whether protocol followed)

Outcomes

- **Primary endpoint**
 - Change in antimicrobial therapy
 - Use of agents with broad Gram-negative and anaerobic activity
 - Duration of therapy
- **Secondary endpoints**
 - Clinical failure
 - Use of diagnostic test

Demographic and Clinical Characteristics

Characteristic	Baseline (n=169)*	Intervention (n=175)
Age, median	46	47
IVDU	49 (29)	42 (24)
DM	26 (15)	35 (20)
Alcohol abuse	27 (16)	22 (13)
Prior SSTI	23 (14)	29 (17)
Lower extremity	75 (49)	84 (53)
Upper extremity	54 (36)	52 (33)
Failed outpatient Rx	43 (25)	53 (30)
Fever at presentation	18 (11)	20 (11)
WBC > 10K	105 (62)	99 (57)

* Data are No (%) of patients

Outcomes

- Microbiological cultures (baseline versus intervention)
 - 80% versus 66% (p=0.003)
- Inflammatory marker measured
 - 66% versus 75% (p=0.006)
- Imaging of affected area
 - 79% versus 80%
- Request for consultations
 - 46% versus 30% (p=0.004)
- Use of CPOE order set during intervention
 - 9 of 175 (2%)

Culture Data

- Total of 196 abscess during the study period
 - I&D performed in all but 2 cases
 - *S aureus* (about 50% MRSA)
 - Streptococcus spp. were most common

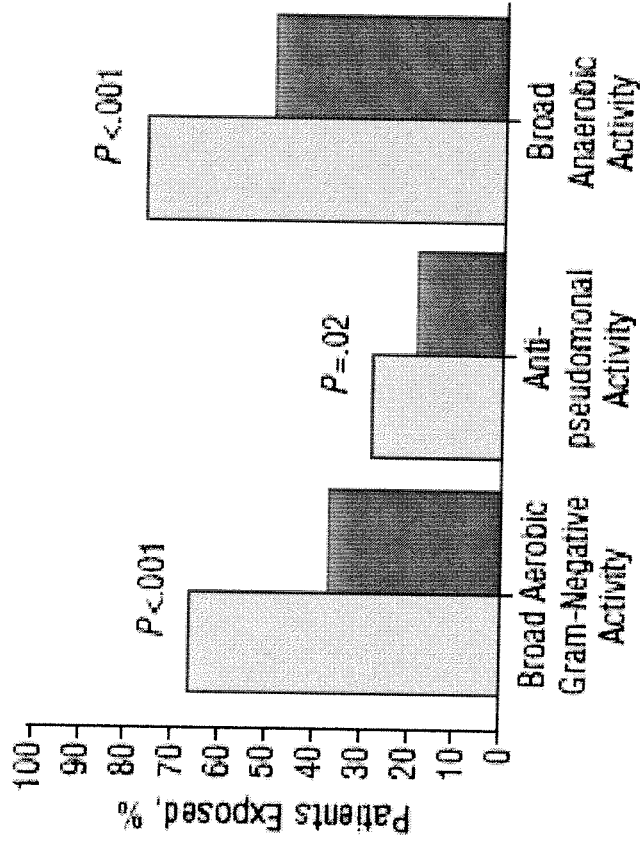
Antimicrobial Therapy

Therapy	Baseline (n=169)	Intervention (n=175)
Inpatient Antibiotics (at least 1 dose administered)		
Vancomycin	127 (75)	162 (93)
B-lactam/ β -lactamase inhibitors	102 (60)	49 (28)
Clindamycin	36 (21)	30 (17)
Levofloxacin	12 (7)	5 (3)
Cefazolin	34 (20)	25 (14)
Broad spectrum Gram negative Rx	40 (61)	69 (67)
NSAIDs	56 (33)	82 (47)
3 or more antibiotics	75 (44)	46 (26)
Discharge Antibiotics		
Bactrim	81 (48)	81 (49)
Amox/Clav	35 (21)	15 (9)
Total duration therapy, median	13	10
Total days of therapy, median	15	11

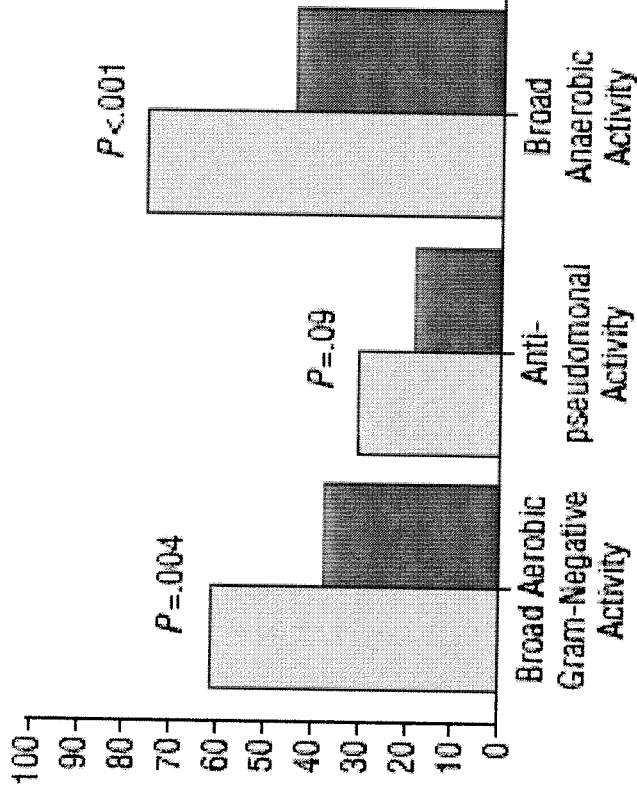
* Data are No (%) of patients

Exposure to Antimicrobial Classes by Period

A



B



Clinical Outcomes

Therapy	Baseline (n=169)	Intervention (n=175)
Clinical failure	13 (7.7)	13 (7.4)
Treatment failure	4 (2.4)	13 (1.7)
Recurrence	5 (3)	8 (4.6)
Rehospitalization due to SSTI	8 (4.7)	8 (4.6)
In hospital mortality	0	0
Duration of hospital stay, median	4	4

* Data are No (%) of patients