Published in final edited form as:

J Emerg Med. 2018 October ; 55(4): 512–521. doi:10.1016/j.jemermed.2018.06.036.

Effectiveness of Outpatient Antibiotics Following Surgical Drainage of Abscesses in Reducing Treatment Failure

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Abstract

Background: The optimal approach to outpatient antibiotic use following surgical drainage of abscesses is unclear given conflicting clinical trial results.

Objective: Our primary objective was to evaluate the real world effectiveness of outpatient antibiotic prescribing after surgical drainage of cutaneous abscesses on reducing treatment failure.

Methods: We performed a retrospective observational study using data extracted from the EHR of a single academic healthcare system. All emergency department (ED) visits that resulted in discharge with a surgical drainage of a cutaneous abscess procedure code were included in the sample. All visits were categorized into having received or not having received an antibiotic prescription at the index visit. Outcome frequencies were compared using Pearson's chi-square test. A multivariable logistic regression model was used to estimate the odds of treatment failure among those who did and did not receive an antibiotic prescription at their index ED visit.

Results: The final sample consisted of 421 index ED visits of which 303 (72%) received an antibiotic prescription. Treatment with antibiotics following drainage did not significantly reduce the odds of composite treatment failure within 30 days when controlling for sociodemographic and clinical encounter variables (OR=0.52, 95% CI: 0.23 to 1.21).

Conclusions: This real world, comparative effectiveness analysis did not demonstrate any significant reduction in treatment failure with the use of antibiotics following drainage of abscesses in the ED. It is unclear if the clinical benefit observed under controlled trial conditions will carry over to routine clinical practice where varied antibiotic regimens are the norm and local bacterial resistance patterns vary.

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Declarations of interest: none

Keywords

Antimicrobial Stewardship; Antibiotics; Abscess; Emergency Department; Incision and Drainage

Introduction

Skin and soft tissue infections (SSTI) are frequently managed in the emergency department (ED) and have been identified by emergency physicians as one of the most frequent reasons they prescribe antibiotics.[1,2] Although the Infectious Diseases Society of America has published guidelines for the management of SSTIs[3], observed antibiotic usage in the ED for these infections remains highly variable and poorly targeted to the most common causative organisms.[2,4–7] More specifically, antibiotics are frequently used after surgical drainage of abscesses despite multiple clinical trials demonstrating no clinical benefit.[8] This led the American College of Emergency Physicians to select avoiding routine antibiotic use for abscesses as one of its initial Choosing Wisely® recommendations.[9] However, two large randomized controlled trials (RCT) recently demonstrated a statistically significant improvement in clinical cure rates with discharge antibiotics following surgical drainage for abscesses. Observed cure rates in the placebo groups was high in both studies, approximately 70%, and therefore the clinical significance and implications of these results are unknown.[10,11] These findings indicate the need for effectiveness research to facilitate a clear consensus on the optimal approach to antibiotic utilization in the real world management of abscesses.

The implications of a new standard of care that emphasizes antibiotic therapy for all abscesses, regardless of size or presence of established high-risk clinical features, should not be underestimated. Based on 2014 National Hospital Ambulatory Medical Care Survey data on incision and drainage procedures performed in the ED, such a recommendation would expose an approximately 1 million patients annually to antibiotics that are unnecessary to resolve their infection.[12] This is particularly concerning given the fact that outpatient prescribing trends are directly linked to local bacterial resistance.[13] This could ultimately accelerate a reduction in efficacy for the few remaining antibiotics with reliable activity against methicillin-resistant *Staphylococcus aureus* (MRSA), the most common causative organism for abscesses.[7,14]

The primary purpose of this observational study was to investigate the impact of antibiotic prescribing following surgical drainage on repeat ED visits, rescue antibiotic prescribing, and repeat drainage procedures in a real world setting. The secondary purpose was to demonstrate the potential of data extracted from the electronic health record (EHR) to conduct comparative effectiveness research related to the management of bacterial infections in the ED.

Materials and Methods

Study Design and Setting:

We performed a retrospective observational study using data extracted from patient electronic health records at a level 1 trauma, academic medical center ED with over 60,000 visits per year. This tertiary care, urban ED is a regional referral center located in a metropolitan area with a total population of approximately 260,000. All ED visits between January 1, 2013 and June 30, 2016 with a Current Procedural Terminology (CPT) code for incision and drainage of abscess (e.g., carbuncle, suppurative hidradenitis, cutaneous or subcutaneous abscess, cyst, furuncle, or paronychia); simple or single (10060), complex or multiple (10061); or puncture aspiration of abscess, hematoma, bulla, or cyst (10160) that resulted in discharge were included in the sample of index ED visits (Figure 1). A CPT case identification strategy was selected based on a known flaw in the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) which combines abscess and cellulitis in the same diagnostic codes (681 and 682).[15] Patients <8 years old were excluded as the majority of published trials did not include young children and this is the recommended age limit for prescribing doxycycline. Patients for whom an antibiotic was prescribed less than 10 days prior to the ED visit, had an ED visit for cutaneous abscess in the past 30 days, had an antibiotic administered during the ED visit but were not discharged on an antibiotic, or had a diagnosis of non-cutaneous abscess (onychia, paronychia, dental, tonsillar/peritonsillar, salivary gland) were excluded. The Institutional Review Board approved all study activities and approved a waiver of informed consent. None of the funding agencies played any role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; and preparation, review, or approval of the manuscript.

Outcome Measures:

All visits were categorized based on having either received or not received a discharge antibiotic. Our primary outcomes of interest were subsequent antibiotic prescriptions, repeat drainage procedures, and return SSTI-related ED visits within 10 and 30 days of the index visit. Antibiotic prescriptions and repeat procedures occurring at any setting within the entire healthcare system were captured. Subsequent, outpatient antibiotic prescribing events involving agents not routinely used in the management of SSTIs (e.g. azithromycin) were excluded on a case-by-case basis from the outcome measure in order to ensure the antibiotic prescriptions were for SSTIs and not for other conditions.

The following socio-demographic variables were extracted: gender (male or female), race/ethnicity, age (years), insurance status, census tract (as a proxy for education and income), and receiving primary care within the healthcare system (i.e. established primary care provider at the time of the index ED visit). The following variables were used to describe the medical encounter: mode of ED arrival, Emergency Severity Index (ESI) triage score[16], Elixhauser comorbidity index[17], history of diabetes, and CPT code. Several variables were used to describe the antibiotics that were given during an index ED visit including route of administration (parenteral, enteral, or both), antibiotic class, antibiotic dose/frequency, and prescription duration in days.

To validate the extracted data, we employed multiple best practice strategies for the use of operational EHR data in comparative effectiveness research.[18,19] This includes comparing to a gold standard data source by creating a data subset of patients that had health care claims data available and compared each ED encounter to the health care claim with respect to definition, diagnosis, and procedures codes. We also applied standard cleaning algorithms to correct obvious data errors, compared variable distributions against expected distributions and distributions from other internal data sources, and conducted manual validity checks to screen for aberrant values.

Data Analysis:

Group comparisons on socio-demographic and medical encounter variables were performed using Pearson's chi-square test, t test, and the Wilcoxon Mann-Whitney test, as appropriate. For the outcome measures, we calculated the differences in subsequent antibiotic prescribing, repeat drainage procedures, and return SSTI-related ED visits at 10 and 30 days both as unique variables and as a combined treatment failure variable (i.e. a composite outcome). For the combined variable, we defined treatment failure as anyone who had either a repeat ED visit for a SSTI, subsequent SSTI related antibiotic prescription, or repeat surgical drainage procedure within 30 days of index ED visit.

For index ED visits where an antibiotic was prescribed, we counted the number of different antibiotics prescribed or administered during the ED encounter. We calculated the frequency of each parenteral antibiotic given during the ED encounter and ranked the antibiotics from highest to lowest in terms of frequency. We characterized all prescribed antibiotics and antibiotic combinations by frequency and duration and then ranked from highest to lowest according to frequency.

A multivariable logistic regression model was used to estimate the odds of treatment failure among those who did and did not receive a discharge antibiotic at their index ED visit. We controlled for gender, race, age, insurance status, ED arrival mode, Emergency Severity Index triage score, Elixhauser Comorbidity Index, diabetes, and surgical drainage CPT code. To ensure we captured follow visits and to eliminate potential bias, the regression was limited to the subset of our cohort who received primary care within the study health care system and had a complete set of demographic variables (n=176). Including this subset ensured that we had complete demographic and comorbidity data available for inclusion in the model. We conducted a post-hoc power calculation to understand what effect size our final sample could detect for our composite outcome measure. The post hoc power calculation accounted for the unequal distribution of subjects in the two groups and indicated our data could provide 80% power to detect a difference of ~12% at a significant level of $P=.05$.

Results

The final sample included 421 index ED visits (Figure 1). Table 1 is a description of the sociodemographic and medical encounter variables overall and by antibiotic group (received an antibiotic vs. did not receive an antibiotic). An antibiotic was prescribed during 303 of the index ED visits (72%). The majority of visits (81%) involved a simple incision and drainage

(CPT code = 10060). Patients were similar in both groups with regard to age, race/ethnicity, insurance status, and presenting factors. Overall, only 7% of patients had a previous diabetes diagnosis.

A detailed description of the antibiotics that were administered and prescribed during the index ED visit for those patients who received an antibiotic is presented in Table 2. Among the patients who received an antibiotic, 93 (31%) of patients were given an antibiotic dose during their ED visit. Of these, 34 (37%) received a parenteral dose, 55 (59%) received an enteral dose, and 4 (4%) were given both. Clindamycin, ampicillin-sulbactam, and vancomycin were the three most common parenteral antibiotics administered. Cephalexin and trimethoprim/sulfamethoxazole (TMP/SMX) combined was the most commonly prescribed outpatient antibiotic regimen (23%). Clindamycin, TMP/SMX, cephalexin, amoxicillin-clavulanate, and doxycycline as single agents were the next most common outpatient antibiotic regimens prescribed. The mean prescription duration for the most commonly used regimens was ~9 days.

Of the 421 subjects in the overall sample, 87 (21%) received a rescue antibiotic prescription, 18 (4%) had a repeat drainage procedure, and 36 (9%) had SSTI-related ED visits at 30 days. Of these return ED visits, 13 resulted in admission with 10 of these subjects having received discharge antibiotics at their index ED visit. Comparisons of subsequent antibiotic prescriptions, repeat drainage procedures, return ED visits, and the combined treatment failure variable are presented in Table 3. Overall, there were no significant differences in 10 or 30-day antibiotic prescribing, drainage procedures, or ED visits between subjects treated with or without outpatient antibiotics at the index ED visit. At day 10, 29 of 118 subjects (24.6%) in the no antibiotic group versus 57 of 303 subjects (18.8%) in the antibiotic group met the combined treatment failure definition (difference, 5.7 percentage points, 95% CI, -3.2 to 14.7; $P=.188$). At day 30, 32 of 118 subjects (27.1%) in the no antibiotic group versus 70 of 303 subjects (23.1%) in the antibiotic group met the combined treatment failure definition (difference, 4.0 percentage points, 95% CI, -5.3 to 13.3; $P=.388$).

Table 4 describes the results from the multivariable logistic regression analysis. Forty-seven subjects (27%) were in the no antibiotic group and 129 (73%) were in the antibiotic group. Overall, 50 (29%) patients met criteria for our composite outcome measure which was defined as a repeat SSTI related ED visit, rescue antibiotic prescription, or repeat surgical drainage within 30 days of the index ED visit. This included 17 subjects in the no antibiotic group (36%) and 33 in the antibiotic group (26%). Overall, patients who received an antibiotic at their index ED visit did not have a significantly decreased odds of having a treatment failure within 30 days when controlling for other sociodemographic and medical encounter variables (OR = 0.52, 95% CI: 0.23 to 1.21).

Discussion

In this real world, comparative effectiveness study, we failed to detect any significant difference in clinical outcomes with the use of outpatient antibiotics following surgical drainage of abscesses in the ED. Avoidance of routine antibiotic prescribing following surgical drainage of abscesses has been a core component of ED based antimicrobial

stewardship efforts since the release of the initial ACEP Choosing Wisely recommendations. [9] This recommendation was based on a series of RCTs and subsequent meta-analysis that also failed to demonstrate a statistically significant improvement in clinical cure rates with antibiotic use.[8,20–22] Despite the available evidence and national best practice recommendation, a study characterizing national level ED antibiotic use patterns in the management of abscesses demonstrated significant variability in antibiotic selection and overall high rates (87%) of prescribing following surgical drainage.[2] Our findings are consistent as nearly three-fourths of all patients with an abscess in our sample were prescribed outpatient antibiotics. Additionally, even within a single institution, a wide variety of antibiotic regimens and prescription durations were observed (Table 2).

The two recently published RCTs examining this topic each had sample sizes greater than all of the trials included in the 2014 meta-analysis combined. Although these two trials examined different antibiotic doses and agents (TMP/SMX vs clindamycin vs placebo), both observed statistically significant improvements in clinical cure rates with antibiotics following surgical drainage.[10,11] In contrast, we failed to detect any significant increase in repeat ED visits, antibiotic prescriptions or repeat surgical drainage procedures when abscesses were managed without antibiotics. Our observed rate of treatment failure for infections managed without antibiotics (27%) was very similar to that observed in the placebo groups at the test-of-cure visit in the Talan and Daum trials (26.4% and 31.1% respectively). However, the treatment failure rate we observed for subjects managed with antibiotics was slightly higher (23%) as compared to rates observed by both Talan (TMP/SMX 19.5%) and Daum (TMP/SMX 18.3% and clindamycin 16.9%). The wide range of antibiotic regimens (drug, dose, duration) utilized in our sample could have resulted in increased rates of treatment failures as compared to the regimens studied in the RCTs. Both trials utilized antibiotics typically recommended for management of abscesses following surgical drainage in the era of CA-MRSA. The potential impact of antibiotic regimen was demonstrated in the Daum study, which observed a non-significant treatment benefit with clindamycin over TMP/SMX. This is further supported by the fact that nearly 25% of regimens in our sample included antibiotics without in vitro activity against MRSA and another 20% were clindamycin, to which over 20% of our local MRSA isolates are resistant. This highlights the need for careful consideration of local antibiotic resistance patterns when assessing the generalizability of available clinical trial data.

Although antibiotics have now been clearly established to provide some degree of treatment benefit following surgical drainage of abscesses, these findings are generated from trials involving carefully selected populations and conditions (e.g. antibiotic regimens). As the absolute magnitude of benefit towards reducing treatment failure in the available trials is relatively small (range 7–14%) with corresponding numbers needed to treat (NNT) ranging from 7 to 15, it is not surprising that our effectiveness data suggest these observed benefits may be reduced in actual clinical practice. Our findings suggest that practice variability is a major factor even within one physician group and that national application of trial data is incredibly challenging when considering the various antibiotic regimens employed in uncontrolled conditions (e.g. drug(s), dose, duration).

The available data also indicate the need for broad discussion about what effect size should be required to justify a change in the standard of care when antibiotics are involved. For example, best practice guidelines universally oppose antibiotic prescribing for upper respiratory tract conditions despite data that indicate the NNT to prevent a one pneumonia ranges from 39 to 119 depending on patient age.[23] While the NNT for abscesses is substantially lower (7 to 15) in trial conditions, our finding suggest it would increase substantially in real world conditions (NNT = 25). Additionally, abscesses have a high overall rate of treatment success without antibiotics and no cases of invasive infections or related mortality were observed in either of the recent trials. As such, the decision to withhold antibiotic when close follow up can be arranged seems to be a reasonable course of action. Alternative strategies could include use of watch and wait (i.e. delayed) antibiotic prescribing or engaging patients in shared decision-making. Given the role of antibiotic prescribing in community level antimicrobial resistance and serious adverse drug reactions (e.g. anaphylaxis and *Clostridium difficile* infection), professional consensus is needed to help guide clinicians trying to balance the potential benefit from antibiotics for individual patients with the risk of adverse effects and public health consequences of antibiotic overprescribing.[24–27]

As attention on EDs is steadily increasing as part of the new CMS requirement for hospital based antimicrobial stewardship programs, it will become increasingly important to establish methods of tracking provider level antibiotic prescribing and associated outcomes of interest that do not rely on manual chart abstraction. Our findings support the ability of observational analyses, solely using clinical variables and endpoints extracted from the EHR without manual review, to produce effectiveness data that complement efficacy results from controlled trials. This type of analysis answers calls from the biomedical community to explore clinical dilemmas by leveraging the large amounts of real world practice data contained within the EHR for comparative effectiveness research.[28,29] The fact that our results are consistent with national database studies examining prescribing patterns and large-scale efficacy trials supports the utility of this approach for both comparative effectiveness research and internal quality improvement efforts. Additionally, our methods should be easily replicated at institutions with similar EHR systems.

Limitations

As this was an observational study using administrative EHR data, we did not control for factors that were unavailable by automated extraction. This includes clinical variables that may have been available through manual chart review and could have influenced the decision to prescribe antibiotics (e.g. infection size, location, or adequacy of the drainage procedure). Secondly, given the retrospective methodology we were unable to randomize patients, which can also lead to unmeasured systematic differences between groups. Third, this study was conducted at a single center, which limits external validity. Additionally, although there was no difference in the proportion of medically homebound patients in the two groups, patients who presented to other healthcare facilities for follow-up care would have been missed in our assessment of clinical outcomes. We did limit the multivariate analysis to those who received primary care without the system to reduce this potential for bias. Lastly, although all EHR encounter data available to the study team were utilized, post hoc power

calculations show that we were only able to detect a difference of 12% between groups. Any difference less than that may have existed but remained undetected (type II error). However, this difference is within the range of what published RCTs used to define a clinically significant difference (7–15%) as part of the prospective power calculation.

Conclusions

Using a retrospective analysis of clinical practice data extracted from the EHR, we did not detect a statistically significant difference in treatment failure between abscesses managed with our without antibiotics following surgical drainage in the ED. Observed treatment failure rates were similar to recently published clinical trials for subjects in the no antibiotic group; however, treatment failure rates were higher in the antibiotic group. This likely resulted from utilization of antibiotic regimens that do not have in vitro activity against MRSA or involved high rates of local resistance. The relatively small margin of benefit on treatment failure observed with antibiotics observed in available trials is unlikely to translate to real world practice unless providers tailor their regimens based on local *Staphylococcus aureus* resistance patterns. The question of whether or not antibiotics should become standard of care following surgical drainage of abscesses remains a clinical dilemma that will require thoughtful deliberation as we strive to reach a consensus that balances individual patient outcomes and public health implications related to increased use of antibiotics.

Acknowledgements:

We would like to acknowledge the work that Dr. Emmanuel Sampene did in helping complete the power calculation for this project. This project was supported by the Agency for Healthcare Research and Quality (award numbers K08HS024342 and K08HS024558), the National Institute for Diabetes and Digestive and Kidney Diseases (K08DK111234), the National Institute on Aging (K24AG054560), and the Health Innovation Program, the UW School of Medicine and Public Health via The Wisconsin Partnership Program, and the Community-Academic Partnerships core of the University of Wisconsin Institute for Clinical and Translational Research (UW ICTR) through the National Center for Advancing Translational Sciences (NCATS), grant UL1TR000427. The research reported in this publication is solely the responsibility of the authors and does not represent the official views of the Agency for Healthcare Research and Quality or the National Institutes of Health.

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Article Summary

- 1) Why is this topic important? Skin and soft tissue infections, including abscesses, are commonly managed in the emergency department. Conflicting trial results has led to uncertainty in regards to optimal antibiotic utilization following incision and drainage of abscesses.
- 2) What does this study attempt to show? The purpose of this study is to generate effectiveness data on antibiotics following drainage of abscesses that complements efficacy data generated from controlled trials.
- 3) What are the key findings? In a real world setting, which included various antibiotic regimens, antibiotics did not significantly reduce treatment failure following drainage of abscesses.
- 4) How is patient care impacted? The relatively small margin of benefit derived from prescribing antibiotics following drainage of abscesses observed in trial settings may not translate into actual practice if prescribing is not guided by local bacterial resistance patterns.

Figure 1:
Case Selection Flow Diagram

Table 1.

Baseline characteristics of the participants, n (%)

	Overall (n=421)	Antibiotic (n=303)	No Antibiotic (n=118)	P-value*
Female	190 (45.1)	129 (42.6)	61 (51.7)	0.091
Race				0.770
White	283 (67.2)	202 (66.7)	81 (68.6)	
African American	86 (20.4)	60 (19.8)	26 (22.0)	
Hispanic	22 (5.2)	16 (5.3)	6 (5.1)	
Asian	13 (3.1)	10 (3.3)	3 (2.5)	
North American Native	6 (1.4)	6 (2.0)	0 (0)	
Other	6 (1.4)	5 (1.7)	1 (0.9)	
Unknown	5 (1.2)	4 (1.3)	1 (0.9)	
Mean Age (sd)	36.8 (16.1)	37.0 (16.1)	36.2 (16.0)	0.661
Median neighborhood Income (\$)	60,121	59,948	62,484	0.609
Insurance Type				0.689
Commercial/Worker's Comp	220 (52.6)	64 (54.7)	156 (51.8)	
Medicaid	94 (22.3)	22 (18.8)	72 (23.9)	
Medicare	57 (13.6)	16 (13.7)	41 (13.6)	
Self-pay	47 (11.2)	15 (12.8)	32 (10.6)	
Primary Care Provider (In System)	186 (44.2)	137 (45.2)	49 (41.5)	0.765
Mode of Arrival to ED				0.119
Family/Friends	261 (62.0)	195 (64.4)	66 (55.9)	
Self	133 (31.6)	87 (28.7)	46 (39.0)	
EMS	27 (6.4)	21 (6.9)	6 (5.1)	
Triage Acuity Score				0.403
2 or 3	291 (69.1)	213 (70.3)	78 (66.1)	
4 or 5	130 (30.9)	40 (33.9)	90 (29.7)	
Mean Elixhauser Comorbidity Index (sd)	1.1 (1.6)	1.0 (1.5)	1.2 (1.8)	0.492
Diabetes	31 (7.4)	18 (5.9)	13 (11.0)	0.073
CPT Code				0.547
10060: incision and drainage - simple	342 (81.2)	250 (82.5)	92 (78.0)	
10061: incision and drainage - complicated	23 (5.5)	15 (5.0)	8 (6.8)	
10160: incision and drainage - puncture or aspiration	56 (13.3)	38 (12.5)	18 (15.3)	

ED = emergency department; EMS = emergency medical service; SD = standard deviation; CPT = Current Procedural Terminology.

* Comparing between group that had antibiotics prescribed and group that did not have antibiotics prescribed, use chi-square to test differences across categorical variables, t test to see if there are differences in means and a Wilcoxon Mann Whitney test to see if there are differences in medians

Table 2.

Description of the Antibiotics Administered and Prescribed During the Index ED visit among Antibiotic Group (n=303)

n (%)	
# Different Antibiotics Administered and/or Prescribed	
1	190 (62.7)
2	98 (32.3)
3	15 (5.0)
Received Antibiotic during ED Visit	93 (30.7)
Parenteral	34 (36.6)
Enteral	55 (59.1)
Both	4 (4.3)
Antibiotic Frequency and Duration	
<u>Parenteral</u>	n (%)
Clindamycin	14 (36.8)
Ampicillin Sulbactam	8 (21.1)
Vancomycin	6 (15.8)
Cefazolin	5 (13.2)
Ceftriaxone	3 (7.9)
Piperacillin	2 (5.3)
Miscellaneous Antibiotics *	4 (10.5)
<u>Prescribed at Discharge</u>	n (%) Duration Range (days) Duration Average (days, sd)
Cephalexin & TMP/SMX **	71 (23.4) 5–14 8.9 (1.7)
Clindamycin	60 (19.8) 5–14 8.9 (2.2)
TMP/SMX	56 (18.5) 3–14 8.4 (2.7)
Cephalexin	42 (13.9) 5–10 8.1 (2.0)
Amoxicillin Clavulanate	25 (8.3) 5–10 8.7 (1.9)
Doxycycline	21 (6.9) 5–10 8.6 (1.7)
Cephalexin & Doxycycline	6 (2.0) 7–10 9.5 (1.2)
Clindamycin & Doxycycline	3 (1.0) 5–10 8.3 (2.9)
Ciprofloxacin	2 (0.7) 7 7 (0)
Doxycycline & TMP/SMX	2 (0.7) 7–10 8.5 (2.1)
Miscellaneous Antibiotics Regimens***	15 (4.9)

* Includes Cefepime, Cefuroxime, Ciprofloxacin, and Metronidazole

** TMP/SMX is Trimethoprim/Sulfamethoxazole

*** Miscellaneous regimens involved some combinations of the following antibiotics: Amoxicillin Clavulanate, Cefuroxime, Cephalexin, Ciprofloxacin, Clindamycin, Doxycycline, Penicillin and TMP/SMX

Table 3.

Combined treatment Failure, Return Visits, Changes in Antibiotics and Repeat Incision and Drainage at 10 and 30 Days Overall and by Antibiotic Group

	Overall (n=421)	No Antibiotic Prescribed (n=118)	Antibiotic Prescribed (n=303)	Difference (95% CI) [‡]	P-value *
		<i>no./total no. (%)</i>		<i>percentage points</i>	
Combined Treatment Failure w/in 10 days [‡]	86/421 (20.4)	29/118 (24.6)	57/303 (18.8)	5.7 (−3.2 to 14.7)	0.188
Combined Treatment Failure w/in 30 days [‡]	102/421 (24.2)	32/118 (27.1)	70/303 (23.1)	4.0 (−5.3 to 13.3)	0.388
Returned to ED w/in 10 days	32/421 (7.6)	11/118 (9.3)	21/303 (6.9)	2.4 (−3.6 to 8.4)	0.406
Returned to ED w/in 30 days	36/421 (8.6)	11/118 (9.3)	25/304 (8.3)	1.1 (−5.0 to 7.2)	0.724
Change in Antibiotic w/in 10 days (any setting)	68/421 (16.2)	21/118 (17.8)	47/303 (15.5)	2.3 (−6.7 to 10.3)	0.567
Change in Antibiotic w/in 30 days (any setting)	87/421 (20.7)	27/118 (22.9)	60/303 (19.8)	3.1 (−5.7 to 11.9)	0.483
Repeat Surgical Drainage w/in 10 days (any setting)	13/421 (3.1)	5/118 (4.2)	8/303 (2.6)	1.6 (−2.5 to 5.7)	0.395
Repeat Surgical Drainage w/in 30 days (any setting)	18/421 (4.3)	6/118 (5.1)	12/303 (4.0)	1.1 (−3.4 to 5.6)	0.609

* Used a chi-square test to compare between group that had antibiotics prescribed and group that did not have antibiotics prescribed

[‡]Treatment Failure is defined as a repeat ED visit, Change in Antibiotic or Repeat Incision and Drainage within 30 days

[‡]CI denotes confidence Interval

Table 4.

Unadjusted and Adjusted Odds of Composite Treatment Failure within 30 days by Antibiotic Status, Socio-demographic Variables and Medical Encounter Variables among Patients with In System Primary Care Provider (n=176)

	Unadjusted Odds Ratio	Adjusted Odds Ratio	Confidence Interval
Prescribed Antibiotic at Index visit	0.61	0.52	0.23–1.21
Female	0.67	0.54	0.24–1.21
Race			
White	ref	ref	ref
Black	0.58	0.95	0.32–2.88
Other	0.84	0.76	0.25–2.32
Mean Age	1.01	1.01	0.98–1.03
Median neighborhood Income (\$)	1.00	1.00	1.00–1.00
Insurance Type			
Commercial/Worker's Comp	ref	ref	ref
Medicaid	0.41	0.48	0.15–1.54
Medicare	1.25	1.10	0.33–3.63
Self-pay	1.70	2.34	0.62–8.86
Arrived to ED with Family/Friends	1.14	1.34	0.57–3.12
Triage Acuity Score			
2 or 3	ref	ref	ref
4 or 5	0.55	0.56	0.25–1.27
Elixhauser Comorbidities	0.98	1.00	0.75–1.32
Diabetes	0.68	0.51	0.13–1.95
CPT Codes			
10060 or 10160	ref	ref	ref
10061	2.73	3.14	0.99–9.91