American Journal of Emergency Medicine 33 (2015) 1780–1785

Contents lists available at ScienceDirect

American Journal of Emergency Medicine

journal homepage: www.elsevier.com/locate/ajem

Original Contribution

Treatment of bacterial skin infections in ED observation units: factors influencing prescribing practice☆,☆☆,★,★★

John P. Haran, MD [a,*], Gregory Wu, MD [a], Vanni Bucci, PhD [b], Andrew Fischer, MD [a], Edward W. Boyer, MD, PhD [a], Patricia L. Hibberd, MD, PhD [c]

[a] Department of Emergency Medicine, University of Massachusetts Medical School, Worcester, MA
[b] Department of Biology, University of Massachusetts Dartmouth, North Dartmouth, MA
[c] Department of Pediatrics and Division of Global Health, Massachusetts General Hospital, Boston, MA

ARTICLE INFO

Article history:
Received 7 August 2015
Received in revised form 16 August 2015
Accepted 17 August 2015

ABSTRACT

Objective: The Infectious Disease Society of America (IDSA) publishes evidence-based guidelines for the treatment of skin and soft tissue infections. How closely physicians follow these guidelines is unknown, particularly in the emergency department observation unit (EDOU) where increasing numbers of patients are treatment for these infections. Our objectives were to describe (1) the antibiotic treatment patterns EDOU patients, (2) physicians' adherence to the IDSA guidelines, and (3) factors that influence physician's prescribing practices.

Methods: This prospective cohort enrolled adult patients discharged from an EDOU at an academic medical center after treatment for a skin or soft tissue infection. Information was collected from chart review and patient interview pertaining to the patient's sociodemographic characteristics, presenting illness, and antibiotic treatment regimens. Treatment regimens were compared with national guidelines.

Results: The study included 193 patients of which only 43% were treated according to IDSA guidelines, 42% were overtreated, and 15% were undertreated. Women were more likely to be undertreated (relative risk, 1.58; 95% confidence interval, 1.21-2.06), whereas patients 50 years and older were at risk for overtreatment (relative risk, 1.44; 95% confidence interval, 1.03-2.02). Women also received shorter courses of antibiotic therapy with an average of 9.6 days of treatment compared with 10.6 days for men.

Conclusions: Physician antibiotic prescribing practices demonstrated poor adherence to IDSA guidelines and were influenced by the patient's age and sex. Standardized antibiotic protocols for treatment of skin and soft tissue infections to IDSA guidelines in the EDOU would minimize physician bias.

1. Introduction

Failure of oral antibiotic treatment for skin and soft tissue infections (SSTIs) has led to the need for intravenous therapy that is often delivered in emergency department observation units (EDOUs) [1-3]. As treatment locations that focus on the brief treatment of medical problems of limited complexity, EDOUs are increasingly the location in which intravenous antibiotic therapy for resistant SSTI is administered [4]. Guidelines from the Infectious Disease Society of America (IDSA) recommend antibiotic coverage for abscesses and intravenous antibiotics for cellulitis, only in the presence of a systemic inflammatory response, if the patient is severely immunocompromised, or failing outpatient treatment [5]. Adherence to IDSA guidelines is important given the increasing resistance to many commonly used antimicrobial agents caused by widespread antibiotic use. Unfortunately, physician discretion in selecting antibiotic regimens leads to a variability in emergency department (ED) treatment approaches to common bacterial infections [6]. Given the risks of bacterial resistance due to inappropriate antibiotic use, physician practices in prescribing antibiotics in the EDOU are unknown and deserve attention [4,7]. The objectives of this cohort study, therefore, were to (1) describe the prevalence of various antibiotic prescribing practices for patients with SSTIs, (2) compare these management practices with national guidelines, and (3) identify factors that might influence physician's prescribing practices.

☆ Meetings: None.
☆☆ Grant: This study was designed and carried out at the University of Massachusetts Medical School and was supported by an intradepartmental grant through the Department of Emergency Medicine. VB is supported by an National Institutes of Health award 1R15AI112985-01A1 and PLH by 5K24AT003683-09.
★ Conflicts of interest: None of the authors listed have any conflict of interest.
★★ Author contributions: JPH, EWB, and PLH conceived the study, designed the trial, and obtained research funding. JPH, GW, and AF supervised the conduct of the trial and data collection. JPH, GW, and AF recruited participating centers and patients and managed the data, including collection and quality control. JPH and VB provided statistical advice on study design and analyzed the data; JPH drafted the manuscript, and all authors contributed substantially to its revision. JPH takes responsibility for the paper as a whole.
* Corresponding author at: 55 Lake Avenue North, Worcester, MA 01655. Tel.: +1 508 450 8688; fax: +1508 421 1490.
E-mail address: john.haran@umassmed.edu (J.P. Haran).

http://dx.doi.org/10.1016/j.ajem.2015.08.035
0735-6757/

2. Methods

2.1. Study design

We conducted a single-center, prospective cohort study. The hospital's institutional review board approved the study (IRB docket no. H00001871).

2.2. Study setting and population

We identified adult ED patients retrospectively and prospectively enrolled and confirmed patient data into this cohort study after discharge from an EDOU at a large urban academic ED between January and December 2013. Patients were eligible for participation if they were discharged home after an EDOU stay and either received antibiotics for an SSTI in the EDOU or upon discharge. *Skin and soft tissue infection* was defined as clinician diagnosis of a bacterially caused abscess or cellulitis upon discharge or a diagnosis of abscess or cellulitis that was treated with antibiotics. We identified potential subjects using EDOU census logs at the end of each month whom we contacted by telephone 4 weeks after the discharge date. Eligible patients were English speaking, 18 years of age or older, treated for an SSTI, and had a working cell or landline telephone. We analyzed separately those patients who were admitted directly to the hospital after failing EDOU treatment. We excluded patients if they were unable to cooperate with the questionnaire or recall events surrounding their care. To minimize recall bias, we also excluded patients whom we were unable to contact within 8 weeks of discharge from EDOU.

2.3. Data collection

Research assistants trained in chart review and patient data extraction by the authors administered a standardized survey to consenting and enrolled patients with an SSTI over the telephone. We obtained data related to the patient's antibiotic compliance, health care visits/hospitalizations, and any other complications since initial EDOU discharge. We obtained medical histories, allergies, and antibiotic treatment regimens that we confirmed through chart review by reviewers blinded to the study objectives. We calculated the Charlson comorbidity index (CCI) to characterize patient's medical comorbidities [8,9]. In addition, we obtained information pertaining to initial ED presentation, EDOU hospital course, and antibiotic treatments used from the medical records in a blinded manner. We reviewed the medical records of patients admitted to the hospital after failing EDOU therapy to obtain medical histories, EDOU visit details, and information about their subsequent hospital stay. We captured and extracted study data using REDCap electronic data capture tools [10].

2.4. Infectious Disease Society of America classification

We determined 2 treatment categories of nonpurulent and purulent SSTIs and then classified the disease as mild, moderate, or severe using the IDSA guidelines comparing observed antibiotic treatment regimens with recommended national guidelines (Table 1) [5]. Each patient received a score of 1 for mild, 2 for moderate, and 3 for severe. Independently, we ranked the observed antibiotic treatment regimen also as mild, moderate, or severe based on IDSA recommendations. We compared the 2 scores with each other to determine if the observed antibiotic regimen matched the anticipated treatment class. We performed this in a blinder manner by 2 independent ED clinicians. Where there was disagreement, a third adjudicator served as a tie breaker in the final determination. We categorized patients into expected treatment when the scores equaled each other, undertreated if the observed score was lower than the anticipated score, and overtreated when the observed score was higher than the anticipated score.

2.5. Outcomes

The primary study outcome was both undertreatment and overtreatment group classification after EDOU therapy for an SSTI. Secondary outcomes were failure of EDOU treatment defined as the patient being admitted to an inpatient ward from the EDOU, hospitalization up to 1 week after EDOU discharge for the same infection, completion of antibiotics as planned, and development of antibiotic-associated diarrhea defined as 3 or more loose stools per day for 2 or more consecutive days up to 30 days after EDOU discharge [11,12]. Patients who were admitted to the hospital from the EDOU after failing therapy were analyzed for sociodemographic characteristics, presenting illness, and antibiotic treatment regimens. We defined failure of EDOU therapy as a continuation of SSTI symptoms in which additional antibiotic treatment was necessary to resolve the infection within 2 weeks of initial visit. This was identified as repeat emergency department visits, primary care or specialist visits, or hospitalizations. We counted only visits that resulted in a change in antibiotic therapy. For example, well visits

Table 1
Practice guidelines for SSTIs adapted from the 2014 IDSA update

Type	Nonpurulent			Purulent		
Class	Severe	Moderate	Mild	Severe	Moderate	Mild
Signs and symptoms	• Malignancy on chemotherapy • Neutropenia • Severe cell-mediated immunodeficiency • Immersion injuries • Animal bites • Penetrating trauma • Evidence of MRSA infection/colonization elsewhere • Injection drug use • SIRS	• Systemic signs of infection	• No SIRS • No AMS • Hemodynamically stable	• Failed initial antibiotic treatment • Impaired host defenses • SIRS with hypotension	• SIRS	• No SIRS
Treatments	Intravenous Rx	Intravenous Rx	Oral Rx	I&D Empiric Rx	I&D Empiric Rx	I&D alone
	• Combination Rx[a]	• Single class[a]	• Penicillin VK or • Cephalosporin or • Dicloxacillin or • Clindamycin	• Vancomycin • Clindamycin • Other[a]	• TMP/SMX or • Doxycycline or • Dicloxacillin or • Cephalexin	

Abbreviations: SIRS, systemic inflammatory response syndrome; Rx, antibiotic; AMS, altered mental status; I&D, incision and drainage; MRSA, methicillin-resistant *Staphylococcus aureus*; TMP/SMX, trimethoprim/sulfamethoxazole; VK, V potassium.

[a] Please refer to Stevens et al [5] for complete list of antibiotic choices.