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Major article

Trends in emergency department management of skin abscesses

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Abscess
Skin and soft tissue infection
Methicillin-resistant *Staphylococcus aureus*
Incision and drainage

Background: Abscess is a distinct skin and soft tissue infection (SSTI) requiring incision and drainage (I&D). Previous national surveys combined all SSTIs to estimate abscess and evaluate management. We hypothesized that antibiotic rates are declining in response to evidence that antibiotics are unnecessary for most SSTIs requiring I&D.

Methods: Emergency department (ED) patients included in the National Hospital Ambulatory Medical Care Survey from 2007-2010 with diagnosis codes for cutaneous abscess or SSTI were filtered using a procedure code for I&D available since 2007. The number of patients with SSTI, the percentage of patients receiving I&D, and the percentage of patients receiving antibiotics were determined. Antibiotics were characterized based on efficacy to methicillin-resistant *Staphylococcus aureus* (MRSA).

Results: ED visits for SSTI increased from 3.55 million (95% confidence interval [CI], 3.24 million-3.86 million) in 2007 to 4.21 million (95% CI, 3.89 million-4.55 million) in 2010. Incidences of I&D rose from 736,000 (95% CI, 602,000-869,000) to 1.48 million (95% CI, 1.30 million-1.65 million) and comprised 32.2% of SSTI visits over the 4 years. In 2007, 85.1% (95% CI, 82.6%-87.7%) of patients received antibiotics after I&D with no change over 4 years. In 2010, 15.5% (95% CI, 12.1%-18.7%) received $\geq$2 antibiotics. Commonly prescribed antibiotics were trimethoprim-sulfamethoxazole (mean, 50.4%) followed by cephalexin (mean, 17.2%) and clindamycin (mean, 16.3%).

Conclusion: ED visits for SSTIs continue to rise. Despite mounting evidence, antibiotic use in SSTIs requiring I&D is high, and many patients receive multiple antibiotics, including drugs with no efficacy on MRSA.

Skin and soft tissue infections (SSTIs) result in >2 million emergency department (ED) visits annually.[1] Abscess represents a distinct SSTI requiring incision and drainage (I&D) for optimal management. Methicillin-resistant *Staphylococcus aureus* (MRSA) is a predominant cause of SSTI requiring ED care in the United States.[2] Abscesses have a particularly strong association with MRSA and have shown to have independent association with both MRSA infection and colonization.[3]

Studies have demonstrated that antibiotics may not be required for the care of abscess after an appropriate I&D but are likely indicated for other nonabscess SSTIs.[4-6] Previous national studies have combined all SSTIs to estimate antibiotic prescribing practice but have not characterized abscess with I&D management.[6,7] This may have overestimated antibiotic use in the care of abscess because patients with cellulitis or folliculitis without a focal collection of subcutaneous infection may have been included in the data. Recent clinical practice guidelines state the role of antibiotics in the management of simple abscesses and boils associated with community-acquired MRSA needs further definition.[8] Prior evaluations of abscess care in the ED have quantified antibiotic use, but not all have classified the drugs based on their efficacy against MRSA.[9,10] It is unclear if this evidence has engendered change in provider behaviors toward the management of antibiotic prescribing for cutaneous abscesses.

We use the most recent 4 years (2007-2010) of the National Hospital Ambulatory Medical Care Survey (NHAMCS) ED data to develop an accurate method of determining abscess requiring I&D among SSTI and analyze the results to investigate trends in antibiotic prescribing for abscess by ED providers.[11] Based on the mounting literature of antibiotics' limited benefit in abscess management, we hypothesize that the prescription of antibiotics for abscess is on the decline.

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METHODS

Study design

We used the ED data of the NHAMCS for years 2007-2010. The study was exempt from review by our institutional review board. The NHAMCS is a national probability sample of outpatient ambulatory care visits compiled by the Division of Health Care Statistics of the National Center for Health Statistics, Centers for Disease Control and Prevention. The survey includes information about the patient's chief reason for the visit, patient demographic information, up to 3 diagnoses based on the ICD-9-CM, and up to 8 medications prescribed. A random sample of patient visits is selected over a randomly assigned 4-week reporting period, and data are recorded on standard forms by hospital staff or field representatives from the U.S. Census Bureau. Each patient visit is weighted to extrapolate national estimates for the data elements.[12]

Study population

We identified ED patients with a cutaneous abscess by the ICD-9-CM diagnoses codes in any of the following diagnosis fields: 680 (carbuncle and furuncle); 681 (cellulitis and abscess of finger and toe); 682 (other cellulitis and abscesses); and 685 (pilonidal cysts with abscess). We think these diagnoses more accurately identified patients with drainable soft tissue infection than previous national studies of SSTI.[7] We excluded patients who were admitted, using discharge as a proxy for uncomplicated SSTI.

Historically, it has been difficult to accurately track certain procedures performed in the ED in this data set. Starting in 2007, the NHAMCS includes a procedure check box for I&D. Patients with SSTI who had a check in INCDRAIN, the procedure designation for I&D, were classified as having an abscess rather than a nonspecific SSTI. We use INCDRAIN as a marker for confirmed abscess.

Up to 8 administered therapeutic agents are recorded for each patient visit representative. The Multum (Cerner Multum) classification of therapeutics was used to identify all antibiotics given in the ED or at discharge based on the following codes: sulfonamides and related compounds, cephalosporins, penicillins, macrolides, aminoglycosides, polymixins, and tetracyclines. Prescribed antibiotics were classified based on efficacy to MRSA.[3,4]

Data analysis

Numbers of visits and patients meeting inclusion criteria were calculated using the population weights used by the NHAMCS to derive national estimates. We calculated percentages of patient visits receiving the outcomes of interest. Confidence intervals were calculated for percentages using SEMs, which were estimated using the methods described by the NHAMCS documentation. The total number of patients with SSTI, percentage of patients receiving I&D (true abscess), number of patients with abscesses who were discharged, percentage of patients receiving $\geq$1 antibiotic in the ED, and percentage of participants with a prescription at discharge were determined. Trends in discharged patients from 2007-2010 for antibiotic prescribing as a percentage of ED abscess visits were computed using weighted linear regression between years to incorporate the sampling scheme used by the NHAMCS.[8] Coding and analyses and were performed with Stata 11 (StataCorp, College Station, TX).

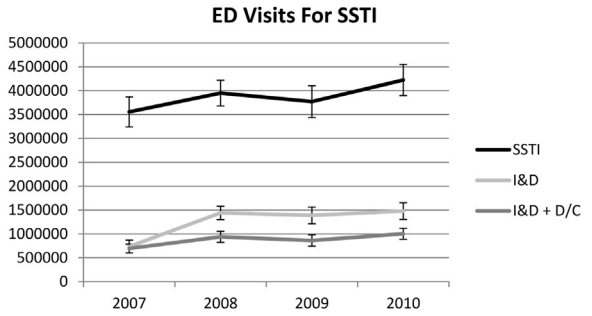

Fig 1. Emergency department (ED) visits for skin and soft tissue infection (SSTI) numbers of ED visits for SSTIs, patients receiving incision and drainage (I&D), and patients who received I&D and then were discharged (I&D + D/C) are displayed with 95% confidence intervals.

RESULTS

ED visits for SSTIs increased from 3.55 million (95% confidence interval [CI], 3.24 million-3.86 million) in 2007 to 4.21 million (95% CI, 3.89 million-4.55 million) in 2010. Patients with SSTI receiving I&D doubled from 736,000 (95% CI, 602,000-869,000) to 1.48 million (95% CI, 1.30 million-1.65 million) in the same period (Fig 1).

Using the patients with the INCDRAIN box checked as a filter for confirmed abscess allowed the exclusion of 2-3 million visits each year that were for SSTI not requiring I&D (Fig 1). SSTI requiring I&D comprised 20.69% $\pm$ 3.8% of visits in 2007 compared with 34.99% $\pm$ 4.1% in 2010. The percentage of discharged patients with SSTI who received I&D also increased (Table 1).

Most (78.4% $\pm$ 3.5% in 2008 to 85.1% $\pm$ 3.0% in 2010) patients were given antibiotics after I&D, and the percentage of discharged patients receiving an antibiotic did not significantly change over the 4 years (Fig 2). An average of 10% (range, 6%-14% over the 4-year period) of patients were given antibiotics in the ED but were not given an antibiotic prescription at discharge. The percentage of discharged patients who were given antibiotic prescriptions for the care of their abscesses was significant and consistent through the study period, ranging from 71.8% $\pm$ 13.8% to 75.5% $\pm$ 15.4%, with no significant difference between years (Table 2). More than 17% of abscesses receiving I&D received dual antibiotic therapy in 2009 (95% CI, 13.94-21.16) (Fig 3). The most commonly prescribed antibiotic was trimethoprim-sulfamethoxazole (mean, 50.4%) followed by cephalexin (mean, 17.2%) and clindamycin (mean, 16.3%) (Table 3). Some subclassification of antibiotic types was not possible because of not having 30 raw cells for the outcome of interest because the National Center for Health Statistics considers estimates based on $<$30 raw observations (or those with $>$30% relative SEM) to be unreliable.

LIMITATIONS

The nature of data collection does not allow for determination of severity of illness at presentation. We attempted to correct in part for this limitation by analyzing the data of discharged patients only. Survey data did not differentiate between patients with abscesses only and those with abscess and cellulitis. We attempted to more accurately exclude cellulitis only by analyzing subjects who underwent I&D. This distinction may be particularly important when reporting rates of antibiotic usage. Previous limitations of NHAMCS data itself are described elsewhere. Some trends may be affected by recording bias because 2007 has a lower number of I&D procedures