Fever as a Preliminary Predictor of Higher-Risk Patients with Soft Tissue Infections

Sabbaj A, Jensen B, Browning MA, et al. Soft tissue infections and emergency department disposition: predicting the need for inpatient admission. Acad Emerg Med 2009;16:1290–7.

Study Overview

Objective. To develop a clinical decision rule based on objective data to predict the need for hospital admission (> 24 hours) for emergency department (ED) patients presenting with soft tissue infection.

Design. Retrospective cohort study.

Setting and participants. Consecutive adult patients presenting to a tertiary care hospital ED (annual volume, 40,000 visits) between January 2002 and December 2003 with a final ICD-9 ED diagnosis of nonfacial skin or soft tissue infection (with or without abscess). Patients with facial soft tissue infections were excluded because these patients generally require different clinical management from those with infections in other parts of the body. Patient with multiple ED visits unrelated to the initial presentation had subsequent visits excluded.

Methods. All ED visits meeting inclusion criteria were reviewed by 2 independent abstractors using a standardized data collection form. 29 clinical variables (including laboratory tests, radiographs, demographic variables, mechanisms, medical history, medication use, physical examination findings, laboratory results) were collected. ED disposition was stratified into 3 categories: discharged home (outpatient management), ED observation unit admission, or inpatient (ward or intensive care unit) admission.

Main outcome measures. The primary outcome was hospital admission lasting > 24 hours. This included patients discharged from the ED who had a repeat ED visit < 7 days for the soft tissue infection that resulted in an admission > 24 hours. Classification and regression tree (CART) analyses were completed to determine predictors of ED disposition with high sensitivity and specificity. CART is a method that reduces bias in derivation and accuracy assessment of a decision tree by randomly sampling 90% of the records for the decision rule and the remaining 10% to validate the rule [1,2]. Multivariable logistic regression was also used to test clinical predictors of > 24 hour hospital admission.

Results. A total of 674 patients were included in analyses. In total, 81 (12%) of the patients initially presented with nonfacial soft tissue infection that required hospital admission > 24 hours. Two CART decision trees were generated, one favoring high sensitivity, the other high specificity. Both decision trees included the presence of fever during initial ED evaluation to predict > 24 hour hospital admission. Fevers were defined at temperatures > 37.2°C, which produced models with modest sensitivity (68% [95% confidence interval {CI}, 57–78]) and specificity (71% [95% CI, 67–75]) or at temperatures > 37.8°C, which produced models with low sensitivity (31% [95% CI, 21–42]) but higher specificity (95% [95% CI, 93–96]). In multivariable adjusted logistic regression, every degree > 37°C was associated with a threefold risk of prolonged hospital stay (odds ratio, 2.91 [95% CI, 1.65–5.12]).

Conclusion. No high-sensitivity clinical decision rule could be developed identifying patients with soft tissue infections needing hospital admission (instead of outpatient or ED observation [24-hour admission]). Presence of fever (temperatures > 37.2°C), however, appears to be a predictor of patients that may require hospital admission.

Commentary

Management of soft tissue infections or cellulitis in the ED or outpatient setting is increasingly common. With the emergence of methicillin-resistant *S. aureus* as the most prevalent causative agent of ED skin infections [3], clearer guidelines in the recognition and management of patients with soft tissue infections are needed. The majority of these patients can be treated as outpatients, with hospitalization reserved for those that are hemodynamically unstable or with severe infection, intractable symptoms (eg, nausea and vomiting), failed outpatient treatment, or immunocompromised status [4]. In both the ED and outpatient setting, a wide spectrum of disease severity is seen that ranges from mild infections to complicated ones involving abscesses and necrotizing bacteria. The ability to predict which patients are at risk for developing complications would aid in appropriate therapies and patient disposition. Guidelines by the Infectious Diseases Society of America (IDSA) recommend that patients with "hypotension and/or elevated creatinine, low serum bicarbonate, elevated creatinine phosphokinase, marked left shift, or an elevated C-reactive protein" should be hospitalized [5]. This study by

Sabbaj et al set out to identify clinical risk factors associated with hospital admission > 24 hours for patients with soft tissue infections. While unable to develop a decision rule with high sensitivity and specificity, investigators found the presence of fever was a strong predictor.

The results of this study suggest that presence of fever can be used as a preliminary indicator to further evaluate patients for the need to be admitted. Management of patients with soft tissue infections is complex because while the majority of cases will be simple to treat and can be done on an outpatient basis, identifying those that may become complicated or require admission are not as obvious. It may not be difficult to recognize that a patient in florid sepsis with hemodynamic instability requires hospital admission. The difficulty lies in recognizing those who are not yet septic and unstable but may become so. Higher initial ED temperatures (> 37.8°C or for incrementally increasing degrees above > 37°C) appeared to have higher specificity to rule in the potential need or increased risk for hospital admission. The simple presence of fever can be used as a preliminary sign to raise clinician suspicion a patient should be further evaluated. Fever should prompt laboratory testing as recommended by IDSA to differentiate if a hospital admission is needed.

Limitations of this study include the single institution setting and retrospective structured medical record review. Unobserved clinical decision making by the physicians, environmental factors (eg, hospital capacity, ED crowding), availability of primary care follow-up, and social factors (eg, caregiver status) that may have impacted the outcome of hospital admission could not be accounted for with medical record review. Prospective validation of study findings, along with the presence of clinical findings supporting hospital admission as recommended by the IDSA, are needed. Additionally, it should be noted that because of its only modest sensitivity in this study, the *absence* of fever cannot be used to rule out the need for admission.

Applications for Clinical Practice

Because soft tissue infections can range from simple to complicated, guidelines currently exist recommending hospital admission for patients with specific signs and symptoms of systemic toxicity. The presence of fever in patients with acute soft tissue infection should prompt clinicians to subsequently evaluate IDSA guideline criteria for hemodynamic stability and laboratory tests to determine the need for hospital admission.

—Review by Ula Hwang, MD, MPH

References

1. Stiell IG, Wells GA. Methodologic standards for the development of clinical decision rules in emergency medicine. Ann Emerg Med 1999;33:437–47.
2. Breiman L. Classification and regression trees. Belmont (CA): Wadsworth International Group; 1984.
3. Moran GJ, Krishnadasan A, Gorwitz RJ, et al. Methicillin-resistant S. aureus infections among patients in the emergency department. N Engl J Med 2006;355:666–74.
4. Abrahamian FM, Talan DA, Moran GJ. Management of skin and soft-tissue infections in the emergency department. Infect Dis Clin North Am 2008;22:89–116, vi.
5. Steven DL, Bisno AL, Chambers HF, et al. Practice guidelines for the diagnosis and management of skin and soft-tissue infections. Clin Infect Dis 2005;41:1373–406.