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REVIEW

Hospitalist Perspective on the Treatment of Skin and Soft Tissue Infections

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Abstract

The prevalence of skin and soft tissue infections (SSTIs) has been increasing in the United States. These infections are associated with an increase in hospital admissions. Hospitalists play an increasingly important role in the management of these infections and need to use hospital resources efficiently and effectively. When available, observation units are useful for treating low-risk patients who do not require hospital admission. Imaging tools may help to exclude abscesses and necrotizing soft tissue infections; however, surgical exploration remains the principal means of diagnosing necrotizing soft tissue infections. The most common pathogens that cause SSTIs are streptococci and *Staphylococcus aureus*. Methicillin-resistant *S aureus* (MRSA) is a prevalent pathogen, and concerns are increasing regarding the unclear distinctions between community-acquired and hospital-acquired MRSA. Other less frequent pathogens that cause SSTIs include *Enterococcus* species, *Escherichia coli*, *Klebsiella* species, *Enterobacter* species, and *Pseudomonas aeruginosa*. Cephalexin and clindamycin are suitable options for infections caused by streptococcal species and methicillin-susceptible *S aureus*. The increasing resistance of *S aureus* and *Streptococcus pyogenes* to erythromycin limits its use in these infections, and better alternatives are available. Parenteral cefazolin, nafcillin, or oxacillin can be used in hospitalized patients with nonpurulent cellulitis caused by streptococci and methicillin-susceptible *S aureus*. When oral MRSA therapy is indicated, clindamycin, doxycycline, trimethoprim-sulfamethoxazole, or linezolid is appropriate. Vancomycin, linezolid, daptomycin, tigecycline, telavancin, and ceftaroline fosamil are intravenous options that should be used in MRSA infections that require patient hospitalization. In the treatment of patients with SSTIs, hospitalists are at the forefront of providing proper patient care that reduces hospital costs, duration of therapy, and therapeutic failures. This review updates guidelines on the management of SSTIs with a focus on infections caused by *S aureus*, particularly MRSA, and outlines the role of the hospitalist in the effective management of SSTIs.

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Skin and soft tissue infections (SSTIs) are common, encompassing a wide range of clinical presentations and definitions, and have increased significantly since the mid-1990s. Ambulatory visits for abscess and cellulitis have tripled from 1993 to 2005, with visits for all SSTIs reaching 14.2 million in 2005.[1,2] Using data from the Healthcare Cost and Utilization Project National Inpatient sample, Edelsberg et al[3] found a 29% increase in hospital admissions for SSTIs during a 5-year period (2000-2004). In a study that assessed the incremental clinical and economic burden of hospitalized patients with a secondary diagnosis of SSTIs compared with matched controls without SSTIs, patients with SSTIs had a mean of 3.8 additional days of hospitalization, $14,794 excess hospital charges, and an increased risk of mortality (odds ratio, 1.32).[4] The most common organisms that cause SSTIs are *Staphylococcus aureus* and *Streptococcus* species.[5,6] Methicillin-resistant *S aureus* (MRSA) is a predominant pathogen that causes SSTIs, is associated with increased length of hospitalization, and is an independent risk factor for increased mortality and hospital charges compared with methicillin-susceptible *S aureus* (MSSA).[7,8] The increasing incidence of SSTIs in both ambulatory and hospital settings, coupled with the increase of MRSA as a causative pathogen, demands optimal management of these infections to improve outcomes.

This review outlines the role of the hospitalist in the effective management of SSTIs, with a focus on infections caused by *S aureus*, particularly MRSA. A PubMed search was performed from 2000 to the present using the search terms *SSTI*, *MRSA*, *surveillance*, *resistance*, *clinical*

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ARTICLE HIGHLIGHTS

- Skin and soft tissue infections (SSTIs) caused by methicillin-resistant *Staphylococcus aureus* are increasing in prevalence in hospitals in the United States. Hospitalists should carefully determine appropriate antimicrobial therapy for SSTIs on the basis of severity of illness, bacterial susceptibilities, risk of adverse effects, and local resistance patterns.
- Ultrasonography can be used as initial diagnostic imaging for suspected abscesses. Computed tomography can help to exclude necrotizing infections to avoid unnecessary surgical incision and debridement; however, surgical exploration may be necessary to confirm or exclude suspected necrotizing soft tissue infections.
- When available, observation units can be used for certain patients with SSTIs to identify patients suitable for hospital admission. Good candidates for observation therapy are those who are likely to respond to empiric therapy, are expected to require a short stay, and have a low probability of infection with resistant organisms.
- Hospitalized patients with complicated SSTIs should receive empiric therapy for methicillin-resistant *S aureus* with intravenous agents, such as vancomycin, linezolid, and daptomycin. Other options include clindamycin, tigecycline, and newer agents, such as ceftaroline fosamil and telavancin.
- Oral antimicrobial agents should be considered as initial therapy in less severe infections. Patients should be switched from intravenous to oral antimicrobial therapy when they are afebrile for 24 hours or longer, improving clinically, and able to take oral medications.

guidelines, *antimicrobials*, and *hospitalists* and supplemented with articles under "Related citations in PubMed." Studies were selected on the basis of clinical relevance, date published, comparative trials, and standards of practice. The term *SSTIs* is used throughout to refer to skin infections; however, terms specified in published studies or approved indications are retained when appropriate.

DIAGNOSIS AND MANAGEMENT

There are a variety of SSTIs, and differentiating infection type is important in selecting appropriate treatment (Table 1).[9-16] Abscesses are collections of pus within the dermis or deeper tissues, commonly treated with incision and drainage alone.[14] Systemic antibiotics may be required for abscesses accompanied by fever or extensive surrounding cellulitis. Cellulitis and erysipelas are diffuse spreading skin infections not associated with underlying suppurative foci. Erysipelas is differentiated from cellulitis by the depth of inflammation; erysipelas affects the upper dermis, including the superficial lymphatics, whereas cellulitis affects the deeper dermis and subcutaneous fat. Antibiotics with coverage for streptococci typically provide effective therapy for erysipelas. Antibiotics with *S aureus* coverage are appropriate when cellulitis is associated with an underlying abscess or penetrating trauma.[14] Surgical site infections should be suspected in patients with postoperative fever, particularly with onset more than 48 hours after surgery. The mainstay of therapy for surgical site infections is changing of wound dressings and surgical debridement. Adjunctive antibiotic therapy should not last long if adequate source control has been achieved. Necrotizing soft tissue infections (NSTIs) are rare (500-1500 cases in the United States each year) but lethal, involving any layer of the soft tissue compartment (eg, dermis, subcutaneous tissue, superficial fascia, deep fascia, or muscle).[14,17] When there is tense edema outside the area of compromised skin, pain disproportionate to appearance, ecchymosis, bullae, significant systemic toxic effects, or presence of crepitus and/or subcutaneous gas, NSTIs should be suspected.[17] Prompt diagnosis is needed to achieve successful outcomes; thus, hospitalists should seek surgical and infectious disease consultation when NSTIs are suspected. The mainstay of therapy for NSTIs is early and complete surgical debridement, combined with antimicrobial therapy, close monitoring, and physiologic support.[17,18]

Hospitalization should be considered for patients with cellulitis who present with fever, pain, advancing erythema, hemodynamic instability, and failure to respond to outpatient therapy.[18] Additional factors include a compromised immune system; comorbidities, such as peripheral vascular disease, diabetes mellitus, or chronic venous insufficiency; and abnormal laboratory values, including elevated creatinine or creatine kinase (CK) level, low serum bicarbonate level, or marked left shift.[14,18] Gram stain, antimicrobial susceptibility testing, and cultures for blood,

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