

Dave Talan's ID Case Discussion and Q&A: Cellulitis with Drainage

History:

A 28-year-old man presents to the ED with an enlarging area of redness, swelling, warmth, and pain on his right arm for 3 days. It started as a painful red bump that he thought was due to a spider bite. He does not recall any trauma. Additionally, he has subjective fevers and chills and denies nausea and vomiting. He says his pain is somewhat controlled with ibuprofen, which is his only medication. He denies significant past medical illness. He denies illicit drug use, exposure to others with skin infections, animal bites or scratches; he has not been in jail or engaged in contact sports.

Examination:

Temperature 38.5 degrees C Pulse 115 Resp. rate 20/m BP 110/70 O₂ sat 98% Pain score 8/10

Well developed and nourished, alert and fully oriented appearing moderately uncomfortable

HEENT – pink conjunctiva, anicteric, moist mucous membranes

Neck – supple without adenopathy

Lung – clear

Heart – no murmur

Abdomen – non-distended and soft, no organomegaly or masses

GU – enlarged and tender right axillary lymph nodes ~ 1 cm in size

Extremities – 4 X 12 inch area of indurated erythema with some superficial abrasion, tender to palpation, small amount of purulent drainage from abrasion, no fluctuance; faint red line suggestive of lymphangitis extending to axilla; distal circulation intact

Neuro – all extremities with grossly normal motor strength and sensation



Laboratory:

CBC – WBC 13.5, 85% neutrophils, 0% bands, 15% lymphs, Hct 46%, platelets 130,000
Bedside ultrasound – no occult abscess

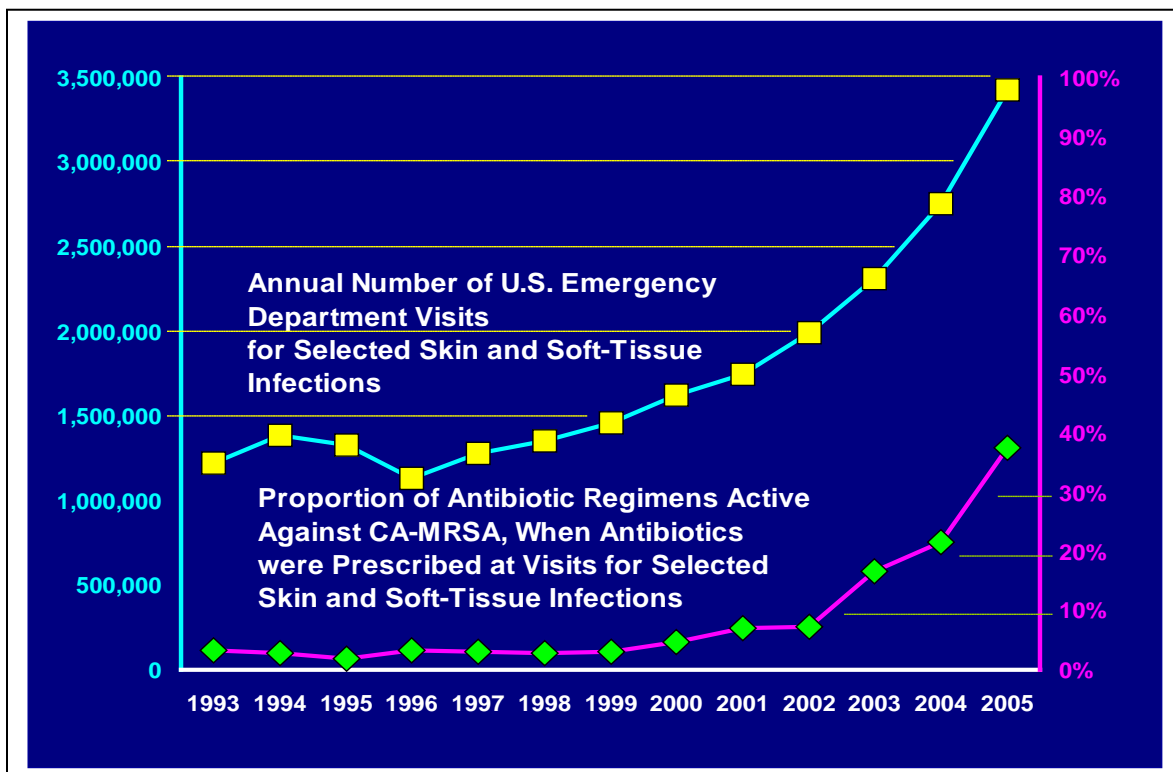
Questions:

1. Can you predict from the patient's epidemiology whether or not this skin infection is due to community-associated methicillin-resistant *Staphylococcus aureus* MRSA (CA-MRSA)?

- Yes
- No

Answer: No

Although certain factors have been associated with CA-MRSA in individuals and outbreaks, such as the presence of an abscess, incarceration, contact sports, parenteral drug use, and even a history of a presumed spider bite, CA-MRSA is such a common infection now that, even in the absence of all risk factors, it is still the most common cause of purulent skin and soft tissue infections and cultured from about 50% (Moran GJ. *N Engl J Med.* 2006; 355:666-74). I now say the risk of MRSA is "being human, and having skin." However, in any one patient, you cannot predict from their risk factors whether or not their infection is due to MRSA. In terms of epidemiology, not only has the cause of these infections changed, there appear to be more people with skin and soft tissue infections being seen in EDs, as shown in the accompanying illustration (Pallin D. *Ann Emerg Med.* 2008;51:291-8). Maybe you have noticed this on your shifts.



(Provided courtesy of Dr. Daniel Pallin)

2. This patient has a large area of cellulitis and a small amount of purulent drainage from a superficial area of apparent abrasion. What is the most likely cause of this case of cellulitis?

- Group A streptococcus (*S. pyogenes*)
- Methicillin-susceptible *Staphylococcus aureus* (MSSA)
- Community-associated methicillin-resistant *Staphylococcus aureus* MRSA (CA-MRSA)
- Healthcare-associated methicillin-resistant *Staphylococcus aureus* MRSA (HA-MRSA)?

Answer: CA-MRSA

The presumed bacterial cause of most cases of cellulitis is a matter of controversy, but for cellulitis with purulent drainage, it appears that CA-MRSA is the most common etiology. In our study of 422 ED patients, 34 had cellulitis with purulent drainage and CA-MRSA was cultured from 47% of these infections (Moran GJ. *N Engl J Med.* 2006; 355:666-74). We also found about 30% grew methicillin-susceptible *S. aureus* (MSSA) and streptococci. However, there is still a persistent belief that streptococci are also the major cause of cellulitis based on the tendency of Group A streptococcus to show up in blood cultures, when blood cultures are done and when they are (rarely) positive. Studies using tissue biopsy and needle aspiration actually suggest that staphylococcal infection is the predominant etiology.

3. What is the most appropriate empirical treatment if this patient is to be treated as an outpatient with oral antibiotics?

- Penicillin
- Trimethoprim/sulfamethoxazole (Bactrim)
- Cephalexin (Keflex)
- Trimethoprim/sulfamethoxazole (Bactrim) and Cephalexin (Keflex)
- Linezolid (Zyvox)
- Clindamycin
- Not sure

Answer: Not sure

The optimal empiric oral antibiotic treatment for cellulitis is controversial, in part related to the debate of the relative role of strep and staph in these infections. Also, no randomized comparative trials have been conducted in the CA-MRSA era. Of note, our group was awarded an NIH contract to conduct randomized clinical trials of off-patent antibiotics for uncomplicated skin and soft tissue infections, which are now ongoing. Expert recommendations include only treating for streptococci with antibiotics like penicillin (such as in the 2005 Infectious Diseases Society of America guidelines, *Clin Infect Dis.* 2005; 41:1373-406) or treating with agents that would cover streptococci and methicillin-susceptible *S. aureus* (MSSA) such as cephalexin (*The Sanford Guide® to Antimicrobial Therapy.* 38th ed. Sperryville, VA: Antimicrobial Therapy, Inc.; 2008). However, neither penicillin nor cephalexin, being beta-lactams, is active against MRSA. Trimethoprim/sulfamethoxazole is considered less active against streptococci. Based on our data of patients with cellulitis and purulent drainage in which we found CA-MRSA, MSSA and streptococci, we would recommend corresponding empirical regimens, which would include trimethoprim/sulfamethoxazole and cephalexin, or clindamycin.

4. Should a specimen be taken for culture and sensitivity testing?

- Yes
- No
- Maybe

Answer: Maybe

The reasons to do C&S testing are 1) if there is uncertainty about the cause of infection and the likelihood that the empirical antibiotics prescribed will be active against the cultured pathogen(s), and 2) to guide infection control decisions, such as MRSA precautions, if the patient was to be admitted to the hospital. Some patients now want to know if they have an MRSA infection. On the other hand, tests have costs, and C&S results generally take 2-3 days, so the results require follow-up, which can be cumbersome for the ED and an additional cost. We surveyed emergency physicians in January 2009 and asked, "In what proportion do you order culture and sensitivity (C&S) testing of the wound drainage?," and here are their responses.

<u>Frequency C&S Ordered</u>	Proportion Responding	
	<u>Outpatients</u>	<u>Admitted</u>
0-10%	17.9%	5.9%
11-25%	13.1%	7.0%
26-50%	18.3%	7.7%
51-75%	11.4%	9.1%
>75% (most common)	39.3%	70.4%

When we asked, "How are the tests usually followed and acted upon?," they responded as follows:

	Proportion Responding
By a subsequent ED physician (most common)	51.0%
By an ED-based NP PA	25.2%
Not specifically followed-up by available	5.9%

5. Is there a test that rapidly and accurately identifies the etiology of a purulent skin and soft tissue infection?

- Yes
- No

Answer: Yes

A rapid PCR test has recently been FDA approved and is commercially available. The test, called Xpert MRSA/SA SSTI, can accurately identify from wound drainage the presence of MRSA, MSSA, or the absence of these within about 1 hour. This same test platform, called the GeneXpert System (Cepheid), has been in use to rapidly identify patients with MRSA nasal colonization. The MRSA/SA SSTI test only provides identification of MRSA and MSSA and not specific antibiotic susceptibility data, and does not provide information on other pathogens, like streptococci. However, as opposed to

standard culture and sensitivity testing, the result is available within the timeframe of ED care and not 2-3 days later.

6. Would the rapid PCR result affect emergency physicians' antibiotic choices?

- Yes
- No

Answer: Yes

We surveyed emergency physicians about the potential use of the rapid PCR test in the ED. When we asked, **"If you could get an accurate result indicating if MRSA or MSSA was present within about 1-hour, in what proportion of patients would you order this test (assuming it's a comparable cost to C&S testing)?,"** they responded as follows:

<u>Frequency Would Order Rapid Test</u>	Proportion Responding	
	<u>Outpatients</u>	<u>Admitted</u>
0-5%	3.1%	1.4%
6-10%	6.2%	2.1%
11-25%	6.9%	2.8%
26-50%	17.9%	6.6%
51-75%	23.8%	9.4%
>75% (most common)	42.1%	77.7%

Almost all physicians indicated the result could change their antibiotic treatment choices. For example, in this case, if MSSA is found by PCR, then a drug like cephalexin would be perfect since it would treat both MSSA and streps. If neither MRSA nor MSSA is found, then penicillin to treat for strep would be indicated. If MRSA is found, then trimethoprim/sulfamethoxazole and cephalexin, or clindamycin would be recommended.

Similarly, if this patient is going to be admitted for treatment with parenteral antibiotics, then the test could guide the use of more expensive parenteral antibiotics. For example, with this patient with a complicated skin and soft tissue infection due to an infected diabetic foot ulcer (below), would you add vancomycin or linezolid to a broad-spectrum antibiotic (without MRSA activity) like ertapenem?



7. Does this patient require hospital admission?

- Yes
- No
- Maybe

Answer: Maybe

The patient as presented does not have clear indications for admission, but there is not enough information to be certain as to whether a necrotizing infection that requires surgery is present or whether the patient has features of severe sepsis. Other than these conditions, no outcome studies tell us if there is a benefit of intravenous compared to oral antibiotics. There is no evidence that fever, which is concerning, is a clear indication for hospital admission, and, of course, we routinely treat other febrile bacterial infections, like CAP and acute pyelonephritis, with outpatient management.

The patient has a fair degree of pain, so a necrotizing infection would need to be considered. Although persistent severe pain could be the only finding of necrotizing fasciitis, some other findings could help reasonably eliminate this diagnosis and severe sepsis from consideration. These include, observing no change in the border of a line drawn around the area of cellulitis, further lab testing that does not reveal evidence of organ failure, metabolic acidosis, coagulopathy, or rhabdomyolysis (i.e., elevated CPK), and absence of subcutaneous air on plain soft-tissue X-rays. One study attempted to create a lab index of abnormalities that are associated with necrotizing fasciitis as opposed to other serious skin and soft tissue infections; it consisted of hyponatremia, leukocytosis, hyperglycemia, renal dysfunction, anemia, and increased CRP (Wong CH. *Crit Care Med*. 2004;32:1535-41).

8. If you decide to admit this patient to the hospital, because of the risk of MRSA, would you admit the patient to a single patient room with contact infection control precautions?

- Yes
- No
- Maybe

Answer: Maybe

Hospitals vary in their approach to infection control of the patient with infection or colonization of MRSA, and Centers for Disease Control and Prevention (CDC) guidelines allow various approaches (Siegel JD. Management of multi-resistant organisms in healthcare settings, 2006, <http://www.cdc.gov/ncidod/dhqp/pdf/ar/mdroGuideline2006.pdf>). Most hospitals contact isolate patients known to harbor MRSA, but in the ED, we only know that many if not most patients with skin and soft tissue infections will be subsequently grow MRSA on culture. Some hospitals isolate these patients presumptively, others only once culture results are available. In EDs using rapid PCR testing, MRSA status can guide infection control admission decisions in real time and before the patient gets to the ward or ICU. Under the rules adopted by the Centers for Medicare and Medicaid Services (CMS) in 2008, payments will be withheld from hospitals for care associated with treating certain preventable infections, such as catheter-associated infections. In response to these new rules, many hospitals have enhanced their surveillance for MRSA, including among high-risk patients being admitted to the hospital through the ED.

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