ANNENBERG CENTER
FOR HEALTH SCIENCES
AT EISENHOWER

De-escalation for Therapy of Patients at Low Risk for CA-MRSA

A Quality Improvement Initiative at Eisenhower Medical Center

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De-escalation of Therapy for Patients with Cellulitis at Low Risk for CA-MRSA

Overall Goals and Objectives

In response to our LOI, the review panel noted that we had outlined two very different areas of focus: de-escalation and hand hygiene, and noted that de-escalation was of greater interest. The Team interpreted the comments as a need for greater focus, and it is reflected in the proposal. In developing this proposal, the team made two decisions:

- Eliminate the hand hygiene portion as part of this grant proposal and pursue improvement in hand hygiene as a separate patient safety initiative
- Focus on de-escalation in a population with the greatest opportunity for improvement

The effort of the Eisenhower Medical Center (EMC) Antibiotic Stewardship program has been very successful in addressing pneumonia. Patients admitted with pneumonia routinely receive the standard of care as defined by our internal clinical policies and while there are occasional failures to de-escalate, the problem has largely been addressed. Urinary tract infections were also considered, but current guideline recommendations for therapy limit the feasibility of pursuing this. However, patients with skin and soft-tissue infections without an apparent lesion (cellulitis) are fairly common in our hospital population and represent an area where opportunities to de-escalate therapy are often missed.

The objectives of this improvement project are as follows:

- Reduce the overall use of vancomycin therapy in patients at low risk for community-acquired methicillin-resistant Staphylococcus aureus (CA-MRSA)
- Reduce length of hospital stay
- Reduce time to clinical improvement (time to resolution of fever, reduction of erythema)

Technical Approach

The project described in this proposal is a team-based learning and improvement project aimed at improving the management of patients admitted to our hospital with complicated skin and soft-tissue infections who are perceived upon admission to be at risk for CA-MRSA. The project will involve an infectious disease physician champion, the infection prevention and control staff within the Quality Management department, pharmacy, and nursing.

Current Assessment of Need

EMC instituted an antibiotic stewardship program in 2008. The program includes clinical guidelines, therapeutic substitutions, and formulary changes. The program has shown considerable improvements in utilization and cost and has been successful in managing patients

with pneumonia particularly in de-escalating therapy after culture and sensitivities have been reported. The area with the greatest opportunity for improvement with regard to de-escalating therapy is in patients with skin and soft tissue infections but without a visible lesion.

These patients are often admitted through the emergency department (ED) and placed on empiric therapy with vancomycin to cover for the possibility of CA-MRSA. Often the choice of therapy is never evaluated and the patient remains on this therapy throughout the hospitalization and into the outpatient setting. The use of vancomycin in this setting is problematic for a number of reasons. First, while vancomycin is one of the older antimicrobials in our armamentarium, it remains one of the few that is still active against many multi-resistant organisms and as such, good antibiotic stewardship would reserve it whenever possible. Indeed, the emergence of vancomycin intermediate-resistant strains of Staphylococcus aureus points to current abuse of this agent in the United States. Second, vancomycin is associated with significant toxicities including nephrotoxicity and ototoxicity. Third, vancomycin is bacteriostatic and therefore requires extended therapy. Patients who are not at high risk for CA-MRSA would likely achieve faster clinical improvement and perhaps a better clinical outcome if they were switched to a more active agent when appropriate.

Skin and soft tissue infections where there is no clear penetrating lesion are problematic to manage. Blood cultures are positive is less than 5% of cases,[1] cultures of needle aspirations can range from less than 5% to as high as 40%,[2,3,4] and cultures of punch biopsies yield organisms in between 20% and 30% with low concentrations of bacteria.[5,6] Because of the low yield, these cultures are not recommended by current guidelines unless the infection is particularly severe.[7] This makes the classic culture and sensitivities strategy difficult to implement. Traditionally, empiric treatment of these patients has emphasized coverage for streptococci. Other pathogens may be considered based on history. The emergence of CA-MRSA has recently become an important consideration. However, a careful history taken by an infectious disease expert can often determine that the risk of CA-MRSA is in fact very low, and can further

[1] Perl B, Goittehrer NP, Raveh D, et al. Cost-effectiveness of blood cultures in adult patients with cellulitis. Clin Infect Dis 1999;29:1483-8

[2] Sachs MK. The optimum use of needle aspiration in the bacteriologic diagnosis of cellulitis in adults. Arch Intern Med 1990;150:1907-12.

[3] Leppard BJ, Seal DV, Coleman G et al. The value of bacteriology and serology in the diagnosis of cellulitis and erysipelas. Br J Dermatolol 1996;132: 842.

[4] Lebre C, Girard-Pipau F, Roujeau JC et al. Value of fine needle aspiration in infectious cellulitis. Arch Dermatolol 1996; 132:842-3.

[5] Hook EW III, Hooten TM, Horton CA et al. Microbiologic evaluation of cutaneous cellulitis in adults. Arch Intern Med 1986;146: 295-7

[6] Hepburn MJ Dooley DF Skidmore PI et al. Comparison of short-course (5-days) and standard (1—days) treatment of uncomplicated cellulitis. Arch Intern Med 2004; 164:9-74.

[7] Stevens DL, Bisno AL, Chambers HF et al. Practice guidelines for the diagnosis and management of skin and soft-tissue infections. Clinical Infections Diseases 2005; 1373-1406.

determine the most likely pathogens. The ED is often a chaotic environment for taking a thorough history and even if a careful history were feasible, misdiagnosis is possible. Diagnostic discordance between infectious disease specialists and non-specialists has been reported in as much as one third of all cases.[8,9] Uncertainty and concern about CA-MRSA tends toward caution, and if the original choice of choice of empiric therapy is never challenged, it can result in the abuse of vancomycin including the possibility of encouraging the development of resistant organisms, the potential of a suboptimal clinical outcomes, and exposure of the patient to unnecessary toxicities.

From January of 2011 through September of 2012 a total of 996 patients have been admitted to EMC with a diagnosis of cellulitis, excluding those with diabetic foot and decubitus ulcers. Of these patients, 69% were treated with vancomycin. While it is difficult to determine how many of these patients may have actually had CA-MRSA, a recent estimate of the burden in a US academic medical center estimated the prevalence to be 41.7 per 1000 hospital discharges in 2008 [10] This would seem to indicate that there is significant room for improvement.

[8] Pulcini C, Pradier C, Samat-Long C et al. Factors associated with adherence to infectious disease advise in two intensive care units. J Antimicrob Chermother 2006;57:546-550.

[9] Pulcini C, Cua E, Lieutier F et al. Antibiotic misuse: a prospective clinical audit in a French university hospital. Eur J Clin Microbiol Infect Dis 2007;26:277-280.

[10] David MZ, Medvedev S, Hohmann SF et al. Increasing burden of methicillin-resistant Staphylococcus aureus hospitalizations at US academic medical centers, 2003-2008. Infect Control Hosp Epidemiol 2012;33:782-9

Intervention Design and Methods

Initiative Overview	
Learning and Planning Stage ▪ Form team ▪ Review baseline data ▪ Review pertinent literature ▪ Finalize protocol ▪ Seek IRB and committee approvals	**2 Months**
Intervention Phase ▪ Implement protocol ▪ Monitor process and refine as needed	**3 Months**

Evaluation Phase
▪ Review charts of patient seen during intervention phase (estimate 100-150 patients)
▪ Review charts of all eligible patients seen during the same time period during the previous calendar year
▪ Analyze data from charts
  ▪ Appropriateness of therapy based on CA-MRSA risk
  ▪ Length of stay
  ▪ Time to clinical improvement
  ▪ Vancomycin use
▪ Draw conclusions and consider implications for practice
	2 Months

Dissemination Phase ▪ Prepare manuscript for submission to peer reviewed journal ▪ Prepare abstracts, posters, and proposals for oral presentation at appropriate professional meetings	**2 Months +**

EMC will form an interdisciplinary team as part of its overall Antibiotic Stewardship Program. Membership will include representation from the following stakeholder groups:

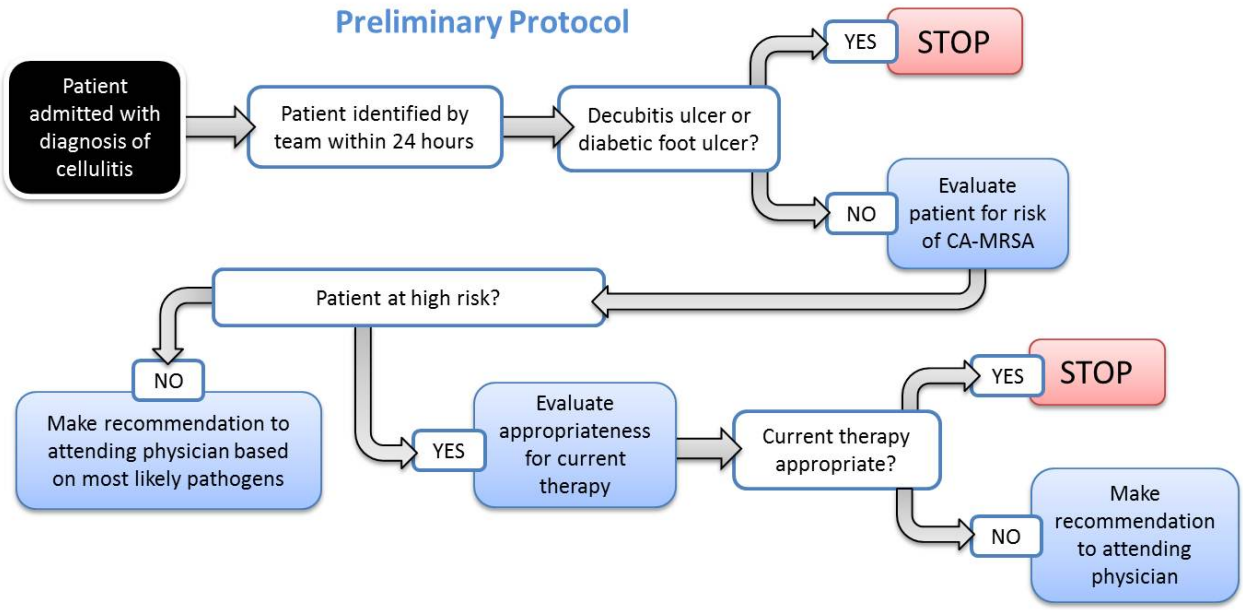
- Infectious Disease
- Hospital Medicine
- Private practice physicians
- Infection Prevention and Control/Quality Management
- Pharmacy
- Nursing

Additional team members may be added as needed as the project develops. Team members will be eligible to receive CME/CE credits for their participation in formal parts of the process such as team meetings.

In the first stage, the team will review current literature and develop an evidence-based protocol for managing patients with cellulitis including the following:

- A mechanism to identify these patients to the team early in their admission
- ID consult to obtain a careful history
- Obtain cultures in those clinical cases where cultures may be appropriate
- Make recommendations to the attending physician for de-escalation of therapy based on likely pathogens, along with instructions for monitoring for clinical response (academic detailing)

Before implementing the protocol, the team will seek approval from the EMC Institutional Review Board and all relevant nursing and physician leadership committees.



Evaluation Design

Intervention Group: The team will attempt to intervene with all eligible patients. EMC sees approximately 46 eligible patients per month. Because of the seasonal nature of our community, the numbers seen per month is likely higher during the "high season" months during which we propose to implement our project. During a span of 3 months we are likely to encounter between 100 and 150 eligible patients. After 3 months, the team will generate a list of patients admitted with cellulitis during the intervention period. Charts will be reviewed and information will be abstracted to determine the following:

- Rate of compliance with team advice
- Length of stay
- Time to clinical improvement (composed of time to resolution of fever, and reduction in erythema)
- Overall use of vancomycin

Comparison Group: The team will then generate a list of all patients admitted to the hospital with a diagnosis of cellulitis excluding those with decubitus ulcer or diabetic foot ulcer during the same time period during the previous calendar year. Data will be abstracted from their charts related to the following variables:

- Length of stay
- Time to clinical improvement (composed of time to resolution of fever, and reduction in erythema)
- Vancomycin use

The team may also look at other variables such as history notes that may indicate the patient's level of risk for CA-MRSA, whether there was any evaluation of the opportunity to de-escalate therapy, or if there was any attempt to obtain cultures. We expect that the number of patients who meet the criteria for chart review in the comparison group will be similar to the number of patients who will be accumulated during the intervention period.

Data Analysis and Dissemination: A statistician will be engaged to perform an analysis among key variables related to both groups to determine the effectiveness of the intervention in improving the care provided to this group of patients. The team will work with a medical writer to develop a manuscript for publication in an appropriate peer-reviewed journal. Team members will also look for opportunities to submit abstract, posters, or proposals for oral presentations in order to present our findings at appropriate professional meetings.

Detailed Workplan and Deliverables Schedule

Award Notification	12/12/12
Literature review and protocol development	12/12/12—02/15/13
Rollout Planning	02/18/13—03/01/13
Intervention Period	03/02/13—05/31/13
Chart review	06/03/13—07/12/13
Data analysis	07/05/13—08/09/13
Manuscript preparation and review	08/12/13—10/20/13
Manuscript submission	10/20/13
Final Summary and grant reconciliation	11/29/13