Community Acquired Methicillin Resistant Staphylococcus Aureus (CAMRSA) - A New Paradigm

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Since the 1960's, methicillin-resistant *Staphylococcus aureus* (MRSA) has been a recognized nosocomial pathogen. Risk factors include hospitalization (exposure to other high risk patients) or other long-term care facility, surgery, dialysis, and IV drug use. Rates are regionally variable throughout the US but average 40-50% in hospitals.

Methicillin-resistant *S. aureus* has been identified in the community, most typically as a result of exposure to one of the above risk groups. However, several years ago, reports began to appear of MRSA infections in patients without any apparent risk or exposure to risk groups. These were considered "community acquired." Initially, they were not serious and only required use of other antimicrobial agents.

In 1999, MMWR reported several deaths in children due to community-acquired MRSA. The origin, genetics, and epidemiology was not well understood, and subsequently, numerous investigators began looking at this somewhat new phenomenon.

Since then, a few important distinctions have been observed. Genetically, methicillin resistance is carried on a Staphylococcal Cassette Chromosome of the *mec* type (SCCmec). Four variants were identified. Of note, SCCmec type I was an extremely small (and now archaic) gene. Types II and III were subsequently larger genes and are the most common in *hospital-acquired* MRSA (HAMRSA). The strain identified as *community-acquired* has been labeled type IV (CAMRSA). The importance of this is revealed in the fact that the type IV gene is very small and very mobile. So, genetically, CAMRSA can be viewed as distinctly different from HAMRSA. Studies have suggested that the majority of CAMRSA isolates are clonally related.

In addition to being genetically different, CAMRSA carries more virulence factors, most notably Panton-Valentine Leukocidin, which attributes to more severe disease in low-risk patients.

Since the SCCmec type IV is so small, it tends not to carry other resistance determinants that make the organism resistant to non-beta lactam antibiotics. Consequently, CAMRSA is often susceptible to other antimicrobials such as trimethoprim-sulfamethoxasole, minocycline, rifampin, and clindamycin (along with vancomycin, linezolid and the streptogramins) – see figure.

Several risk groups have been identified including: MSM (men who have sex with men), IV drug users, incarcerated persons, and others who play contact sports or other close proximity groups (day care centers, etc.).

Taking this all into consideration, choices of empiric treatment of skin and soft tissue infections, and osteomyelitis in high risk groups should include MRSA coverage. Oral regimens should contain trimethoprim-sulfamethoxazole, plus or minus rifampin, and more serious infections should involve the use of vancomycin. Other infections in which staphylococcus aureus is often a cause, such as pneumonia and bacteremia, might also need coverage for MRSA until culture data are finalized.

In summary, CAMRSA occurs in patients without previously identified risk factors common for HAMRSA. Patients with skin and soft tissue infections without exposure to long-term healthcare risk, but within one of the above risk groups, should have appropriate cultures and sensitivities ordered. Empiric therapy will usually consist of trimethoprim-sulfamethoxazole +- rifampin or vancomycin.

References:

- Cosgrove SE et al. Comparison of Mortality Associated with Methicillin-Resistant and Methicillin-Susceptible *Staphylococcus aureus* Bacteremia: A Meta-analysis *CID* 2003;36:53-59
- Lodise TP et al. Prediction model to identify patients with Staphylococcus aureus bacteremia at risk for methicillin resistance *ICHE* 2003;24:655-61.
- Rybak M J, et al Community-Acquired Methicillin-Resistant Staphylococcus aureus in an Urban Teaching Hospital *CID*; 35: 66 (Abs 123 poster 101146) 2002. Posters and Abstracts of the 40th Annual Meeting of the Infectious Diseases Society of America (IDSA), October 24-27, 2002, Chicago, Illinois
- Public Health Dispatch: Outbreaks of Community-Associated Methicillin-Resistant Staphylococcus aureus Skin Infections --- Los Angeles County, California, 2002--2003 *MMWR* Vol 52, No 05;88 02/07/2003
- Almer LS. et al. Antimicrobial susceptibility and molecular characterization of community-acquired methicillin-resistant Staphylococcus aureus. *DMID* 2002;43(3):225-32
- Tacconelli E. et al Methicillin-resistant Staphylococcus aureus bacteraemia diagnosed at hospital admission: distinguishing between community-acquired versus healthcare-associated strains. *Journal of Antimicrobial Chemotherapy. 2004;53(3):474-9*
- Salgado CD. et al. Community-acquired methicillin-resistant Staphylococcus aureus: a meta-analysis of prevalence and risk factors. *CID* 2003;36(2):131-9
- Siberry GK. et al. Failure of clindamycin treatment of methicillin-resistant Staphylococcus aureus expressing inducible clindamycin resistance in vitro. *CID*. 2003;37(9):1257-60 (you can also talk about the "D-test")
- McKinnon PS, et al. EVALUATION OF POTENTIAL TREATMENT OPTIONS FOR COMMUNITY-ONSET *S. AUREUS* (C-SA) INFECTIONS. (Abs 308) Posters and Abstracts of the 41st Annual Meeting of the Infectious Diseases Society of America (IDSA) in San Diego, CA 2003.
- Vandenesch, F et al. Community-Acquired Methicillin-Resistant *Staphylococcus aureus* Carrying Panton-Valentine Leukocidin Genes: Worldwide Emergence *EID* 2003;9(8):978-984 (http://www.cdc.gov/ncidod/eid/vol9no8/pdfs/Vol9No8.pdf)
- http://www.cdc.gov/ncidod/hip/Aresist/mrsa_comm_faq.htm

Figure 1.

Naimi TS, et al. Epidemiology and Clonality of Community-Acquired Methicillin-Resistant Staphylococcus aureus in Minnesota, 1996-1998. CID 2001;33:990-6

Antibiotic	No. isolates tested	No (%) of isolates that were: Susceptible		Intermediate		Resistant	
Oxacillin	354	0		0		354	(100)
Erythromycin	318	203	(64)	29	(9)	86	(27)
Clindamycin	348	325	(93)	3	(1)	20	(6)
Ciprofloxacin	325	303	(93)	11	(3)	11	(3)
Tetracycline	249	236	(95)	1	(0.4)	12	(5)
TMP-SMZ	342	333	(97)	0		9	(3)
Gentamicin	247	240	(97)	2	(1)	5	(2)
Rifampin	211	209	(99)	2	(1)	0	
Vancomycin	343	343	(100)	0		0	