



METHICILLIN RESISTANT STAPHYLOCOCCAL AUREUS (MRSA)

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Staph aureus

- bacteria commonly carried on the skin or in the nose of healthy people
- approximately 25% to 30% of the population is colonized (when bacteria are present, but not causing an infection) in the nose with staph bacteria
- one of the most common causes of minor skin infections in the US

MRSA

WHAT IS IT?

- antimicrobial-resistant type of *Staphylococcus aureus*
- resistant to currently available beta-lactam antibiotics including penicillins (e.g., penicillin, amoxicillin), “anti-staphylococcal” penicillins (e.g., methicillin, oxacillin), and cephalosporins (e.g., cephalexin)

MRSA

WHAT IS IT?

- When resistance was first described in 1961, methicillin was used to test and treat infections caused by *S. aureus*.
- Oxacillin maintains its activity during storage better than methicillin and is more likely to detect heteroresistant strains

MRSA

WHAT IS IT?

- Methicillin is no longer commercially available in the United States
- Thus, oxacillin, which is in the same class of drugs as methicillin, was chosen as the agent of choice for testing staphylococci in the early 1990s

MRSA

WHAT IS IT?

- The acronym MRSA (instead of ORSA) is still used by many to describe these isolates because of its historic role.

MRSA

TYPES

- Community acquired MRSA (CA-MRSA)
- Healthcare/Hospital acquired MRSA (HA-MRSA)

MRSA

- While 25% to 30% of the population is colonized with Staph aureus, approximately 1% is colonized with MRSA.



CA-MRSA

WHAT IS IT?

- MRSA infections that are acquired by persons who have not been recently (within the past year) hospitalized or had a medical procedure (such as dialysis, surgery, catheters)
- manifested as skin infections, such as pimples and boils
- occur in otherwise healthy people

CA-MRSA

PREVELANCE

- occurs worldwide
- special concern in the United States where it accounts for up to 60 to 75 percent of all reported *S. aureus* infection

CA-MRSA

RISK FACTORS

- close skin-to-skin contact
- openings in the skin such as cuts or abrasions
- contaminated items and surfaces
- crowded living conditions
- poor hygiene

CA-MRSA

RISK FACTORS

- This includes delivery...infants of mothers with h/o MRSA are considered contaminated despite “no s/sx of infection”.
- Example of why: 6 dy female infant brought to clinic for small pimple in R pubic area. Treated w/ topical abx and asked to RTO in 2 dys for C&S results.
- 2 dys later, R pubic area is red, warm, swollen, hard. Track palpable through R groin. Child sent to Peds Surgery for I&D. C&S + MRSA.
- Child placed on bactrim postop. Recovered quickly & area healed w/o scarring.

CA-MRSA

CLINICAL FEATURES

- skin or soft tissue infection such as a boil or abscess
- patients frequently recall a “spider bite”
- involved site is red, swollen, and painful and may have pus or other drainage
- can cause more serious infections, such as blood stream infections or pneumonia, leading to symptoms of shortness of breath, fever, and chills.

CA-MRSA



CA-MRSA

DIAGNOSIS

- made in the outpatient setting or by a culture positive for MRSA within 48 hours after admission to the hospital
- no medical history of MRSA infection or colonization.
- no medical history in the past year of: Hospitalization, Nursing Home/Facility, Hospice, Dialysis or Surgery
- no permanent indwelling catheters or medical devices that pass through the skin into the body

CA-MRSA

DIAGNOSIS

- Skin: wound culture or skin bx from the infection site
- Pneumonia: sputum culture
- Bloodstream Infection: blood cultures using aseptic techniques
- Urinary Infection: urine cultures using aseptic techniques
- (organism must be tested to determine effective abx)

CA-MRSA



CA-MRSA

TREATMENT

- Staph skin infections, such as boils or abscesses, may be treated by incision and drainage, depending on severity
- Antibiotic treatment, if indicated, should be guided by the susceptibility profile of the organism

CA-MRSA TREATMENT

Agent (PO)	Adult Dosage
*Clindamycin	300-600mg q 6-8hrs
Doxycycline	100mg q 12hrs
Linezolid (Zyvox)	400-600mg q 12hrs
Minocycline	100mg q 12hrs
*TMP/SMX (Bactrim)	1-2 DS tabs q 12hrs

CA-MRSA TREATMENT

Agent (IV)	Adult Dosage
Daptomycin	4mg/kg q 24hrs
Linezolid (Zyvox)	600mg q 12hrs
Tigecycline (Tygacil)	100mg x1; then 50mg q 12 hrs
*Vancomycin	1gm q 12 hrs
*Need to know renal	function; adj if low

CA-MRSA

EPIDEMIOLOGY

- at least three different *S. aureus* strains in the United States
- unique microbiologic and genetic properties suggest some biologic properties (e.g., virulence factors) may allow the community strains to spread more easily or cause more skin disease

CA-MRSA

PREVENTION

- Practice good hygiene:
- Keep your hands clean by washing thoroughly with soap and water or using an alcohol-based hand sanitizer.
- Keep cuts and scrapes clean and covered with a bandage until healed.
- Avoid contact with other people's wounds or bandages.
- Avoid sharing personal items such as towels or razors

HA-MRSA

WHAT IS IT?

- Staph infections, including MRSA, occurring among persons in hospitals and healthcare facilities (such as nursing homes and dialysis centers) who have weakened immune systems
- causes serious and potentially life threatening infections, such as bloodstream infections, surgical site infections, or pneumonia

HA-MRSA

RISK FACTORS

- patients who already have an MRSA infection or who carry the bacteria on their bodies but do not have symptoms (colonized) are the most common sources of transmission

HA-MRSA by the numbers

- In 1974, MRSA infections accounted for two percent of the total number of staph infections; in 1995 it was 22 percent; and in 2004 it was 63 percent



HA-MRSA by the numbers

- estimated number of people developing a serious MRSA infection (i.e., invasive) in 2005 was about 94,360...
- ...approximately 18,650 persons died during a hospital stay related to these serious MRSA infections
- overall rates of disease were consistently highest among older persons (age >65), blacks, and males

HA-MRSA

by the numbers

- Serious MRSA disease predominantly related to exposures to healthcare delivery:
- About 85% of all invasive MRSA infections associated with healthcare
 - of those, about two-thirds occurred outside of the hospital
 - about one third occurred during hospitalization.
- About 14% of all the infections occurred in persons without obvious exposures to healthcare

HA-MRSA

SPREAD

- An MRSA outbreak can occur when one strain is transmitted to other patients or close contacts of the infected persons in the community.
- occurs when a patient or health-care worker is colonized with an MRSA strain (i.e., carries the organism but shows no clinical signs or symptoms of infection) and, through contact, spreads the strain to another person.

HA-MRSA DIAGNOSIS

- Same as for CA-MRSA
 - swab of nose or wound
 - culture of blood, urine, sputum
 - secretions based on presumed site of infection

HA-MRSA

- 72 year old female with end-stage COPD c/o increased dyspnea over past few days. She states that she feels like there is increased congestion in her chest and she has been trying to cough it up.
- This morning she had severe RUQ pain, squeezing in nature, that has now resolved spontaneously.
- Upon arrival of EMS she had O2 sat in the 70's.

HA-MRSA

- Current Problems:
- CARDIOMYOPATHY, DILATED (ICD-425.4)
- CONGESTIVE HEART FAILURE (ICD-428.0): will remove after this adm noting nl eval in 2004; related to CM; not current problem
- HYPOTHYROIDISM NOS (ICD-244.9)
- INCONTINENCE, FEMALE STRESS (ICD-625.6)
- BREAST CANCER, LEFT (ICD-174.9)
- COPD NEC (ICD-496)
- MULTIPLE SCLEROSIS (ICD-340)
- FOOT DROP, LEFT (ICD-736.79)
- DEPRESSION, CHRONIC (ICD-311)

HA-MRSA

- Upright PA and Lateral cxr: the lungs are hyperexpanded
- clear hyperlucent regions in both lungs compatible with extensive emphysema
- no new focal pneumonia suggested
- no pneumothorax or pleural effusion
- cardiac and mediastinal contours stable
- no overt edema and no pleural effusion.
- IMPRESSION- Extensive scarring and emphysema changes seem stable from before.

HA-MRSA

- Specimen: NASOPHARYNGEAL
- Infection Control
- Results (Final): No Methicillin resistant Staphylococcus Aureus isolated

HA-MRSA

- Specimen: SPUTUM Collected:
- GRAM ST (Final) Sputum satisfactory for culture
- ISO I (Final) METHICILLIN RESISTANT Staphylococcus aureus Moderate Growth

HA-MRSA

- MIC Interp
- Ciprofloxacin (CP) ≥ 8 R
- Clindamycin (CD) ≤ 0.25 S
- Erythromycin (E) ≤ 0.25 S
- Gentamycin (GM) ≤ 0.5 S
- Linezolid (LIN) =2 S
- Oxacillin (OX) ≥ 4 R
- Penicillin (P) ≥ 0.5 R
- Rifampin (RIF) ≤ 0.5 S
- SXT (T/S) ≥ 320 R
- Tetracycline (TE) ≤ 1 S
- Vancomycin (V) ≤ 0.5 S
- Levofloxacin (LEV) ≥ 8 R

HA-MRSA

- Pt started on doxycycline, prednisone for COPD exac on admission
- Abx coverage changed to cipro with prelim gram stain: Gm + cocci in clusters & pairs
- Abx changed back to doxy when final C&S noted cipro resistance
- Pt d/c on 10dys total of twice daily doxy

HA-MRSA TREATMENT

- approximately 10% of *S. aureus* isolates in the United States are susceptible to penicillin.
- many *S. aureus* strains, while resistant to penicillin, remain susceptible to penicillinase-stable penicillins, such as oxacillin and methicillin.

HA-MRSA TREATMENT

- Strains that are oxacillin and methicillin resistant, historically termed methicillin-resistant *S. aureus* (MRSA), are resistant to all β -lactam agents, including cephalosporins and carbapenems

HA-MRSA TREATMENT

- Hospital-associated MRSA isolates often are multiply resistant to other commonly used antimicrobial agents, including erythromycin, clindamycin, and tetracycline
- Since 1996, MRSA strains with decreased susceptibility to vancomycin, and strains fully resistant to vancomycin (MIC \geq 32 μ g/ml) have been reported

HA-MRSA TREATMENT

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*Clindamycin	300-600mg q 6-8hrs
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HA-MRSA PREVENTION

- **UNIVERSAL PRECAUTIONS**
- Proper hand hygiene
- Wear gloves and gowns as indicated for type of contact
- Wear appropriate mouth, nose and eye protection
- Use patient specific medical equipment, devices
- Handle all laundry so as to avoid cross contamination with other patients

HA-MRSA

- Screening patients for MRSA should be performed to decrease transmission and reduce the number of patients infected with MRSA
- Now a must for **POA documentation**
- Once MRSA....always MRSA
- Know your patient's history...

MRSA ICD-9 CODES

MRSA	041.12
MRSA pneumonia	482.42
MRSA septicemia	038.12
h/o MRSA	V12.04
Carrier MRSA	V02.54
MSSA	041.12

MRSA

- Know your patient's history...
once MRSA....always MRSA
- Not all MRSA's are the same.
They may start the same,
look the same,
but end up very differently

MRSA

