

# Community Acquired Methicillin-Resistant Staphylococcus Aureus (CA-MRSA)

An Overview of an Emerging Infection

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# Terminology:

## Methicillin-Resistant Staphylococcus aureus (MRSA)

- First recognized in the 1970's causing epidemics in healthcare settings leading to endemnicity (11). These MRSA strains are referred to as Healthcare Associated MRSA (HCA-MRSA)
- Generally resistant to most antibiotics: all beta-lactams, usually macrolides, clindamycin, quinolones, and tetracyclines (11)
- Risk factors for HCA-MRSA (8, 17):
  - prolonged hospitalization
  - care in an intensive care unit
  - prolonged antimicrobial therapy
  - surgical procedures
  - close proximity to an infected/colonized patient
- Usually considered an infection of chronically ill, hospitalized patients

# Terminology:

## Community-Acquired Methicillin-Resistant Staphylococcus aureus (CA-MRSA)

- A new strain of MRSA presenting from the community in persons without traditional risk factors for MRSA
- Differing from HCA-MRSA in terms of
  - Epidemiology
  - Antibiotic sensitivity patterns
  - Virulence
  - Presentation
  - Treatment
- Thought to have evolved separately in the community based on genetic differences (16)

# CA-MRSA: An Emerging Infection

- Colonization rates are generally low (12)
- Infection rates are increasing
  - A recent meta-analysis found CA-MRSA to account for 30%-37% of all hospitalized MRSA patients (17)
  - In Los Angeles, a study demonstrated that CA-MRSA was the most common cause of community-acquired skin/soft tissue infections presenting to emergency rooms (14)
  - A Houston study demonstrated that CA-MRSA accounted for 56% in 2000-2001, 57% in 2002 and 78% in 2003 of community-associated Staph aureus infections in hospitalized pediatric patients (15)
  - A Rhode Island study has demonstrated that up to 40% of children with MRSA have community acquired strains (8)

# Epidemiology of CA-MRSA

- CA-MRSA appears to spread by close contact
- Outbreaks of CA-MRSA infection have been described in the United States and internationally
- Risk factors include (12):
  - Younger age groups
  - Minorities
  - Low economic status
- Factors conducive to spread of the bacteria include (7, 19):
  - Close skin to skin contact
  - Cuts or abrasions
  - Shared contaminated items or surfaces
  - Poor hygiene
  - Crowded living conditions

# Outbreak Reports

- Athletic teams (3)
- Maternity wards (4)
- Correctional facilities (14)
- Day care facilities (7)
- Military recruits (7)
- Injection drug users (14)
- Native Americans (6)
- Pacific Islanders (6)
- Men who have sex with men (6)

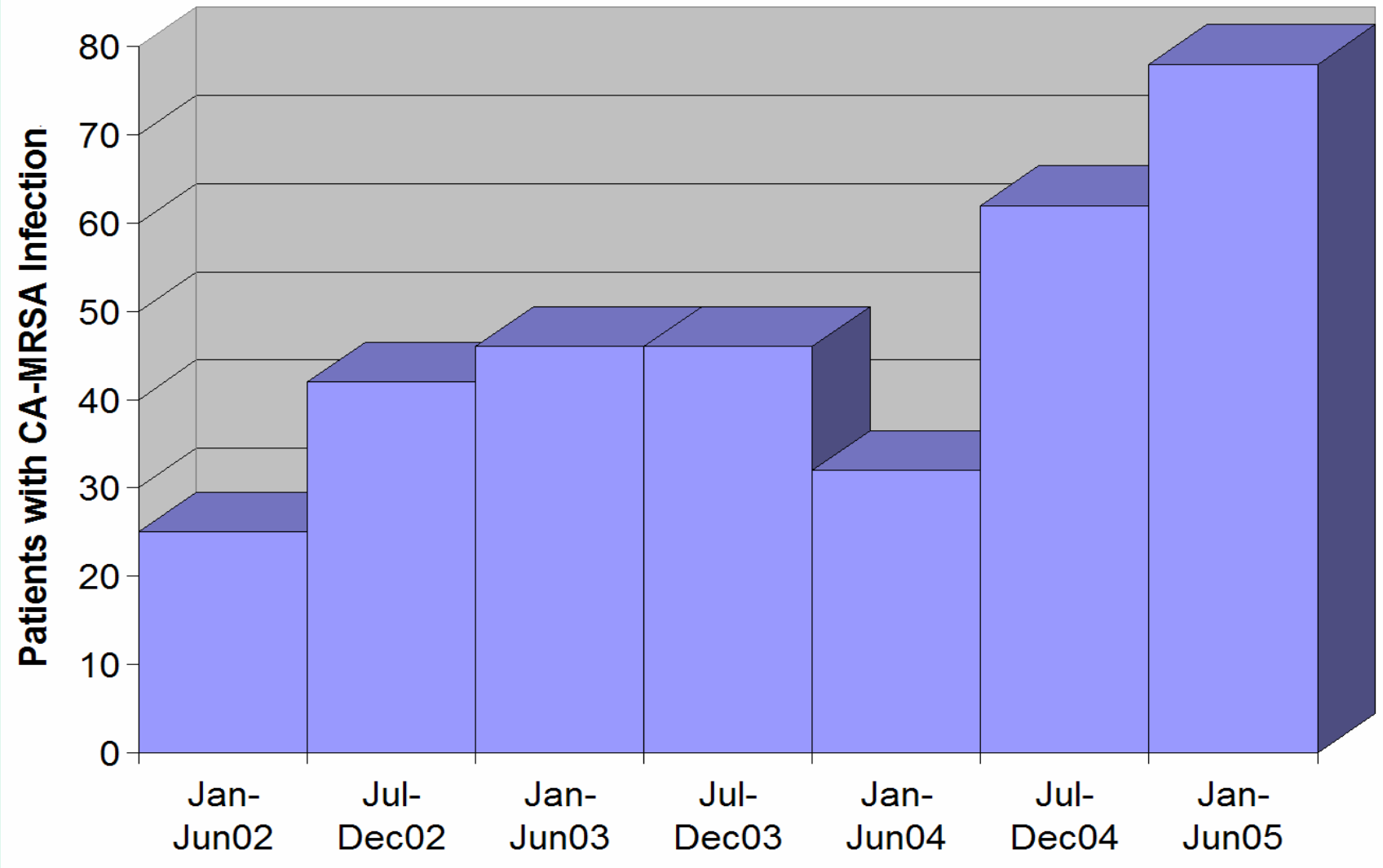
# Genetic differences reflect the different evolution and virulence of CA-MRSA and HCA-MRSA

- CA-MRSA
  - Possess a Staphylococcal Chromosomal Cassette (SCC) which contains the type IV mec element. This small, highly mobile genetic element confers resistance ONLY to beta-lactams.
  - Carry the Panton-Valentine leukocidin (PVL) gene, which codes for a leukocyte toxin that may account for increased virulence of skin and soft tissue infections and necrotizing pneumonias.
- HCA-MRSA
  - Possess a SCC which contains types II or III mec elements. These bulky genetic elements confer resistance to multiple antibiotics.
  - Lack the PVL gene and lack some unique virulence factors found in some community acquired strains.

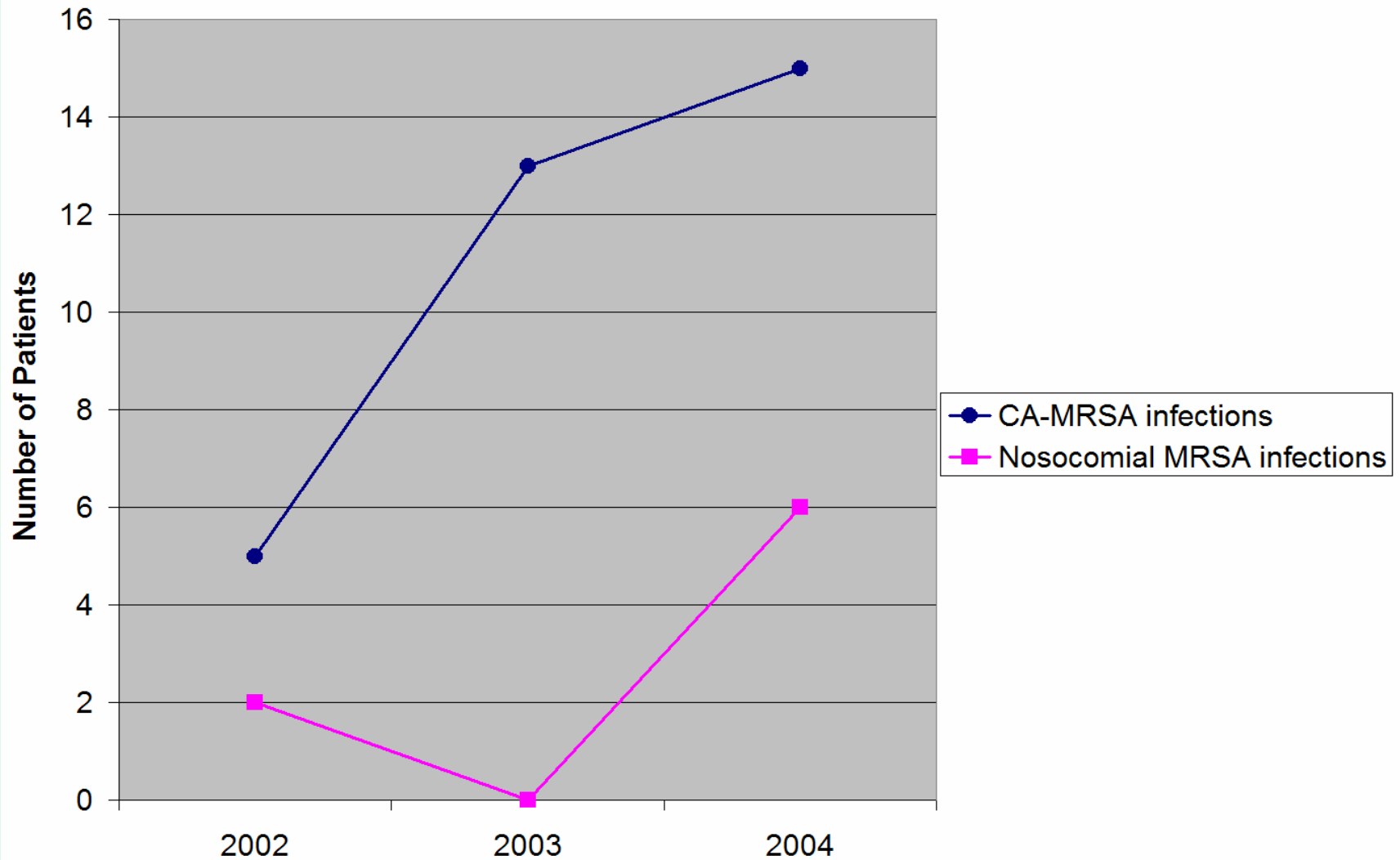
# Rhode Island Data

- Local data is important when considering the impact of an emerging infection which is spread by close contact. Though outbreaks of CA-MRSA have been documented across the United States and internationally, the impact of this resistant organism has not been well defined in Rhode Island.
- The following data defines CA-MRSA cases as patients who presented from their homes to Rhode Island Hospital and Hasbro Children's Hospital with infections which grew MRSA in the first 48 hours of admission. These patients had no contact with health care facilities in the month prior to presentation.

# Patients with CA-MRSA infections presenting to Rhode Island Hospital or Hasbro Children's Hospital



# Patients with CA-MRSA infections presenting to Hasbro Children's Hospital



# Signs and Symptoms of CA-MRSA Infection

- CA-MRSA most often causes severe skin and soft tissue infections.
- Skin and soft tissue infections often present as cellulitis, boils, or furuncles often in the thighs and buttocks. Sites may be erythematous, painful, and draining.
- Patients may think they have been bitten by a spider.
- Children may present with a severe necrotizing pneumonia.
- More serious infections like blood stream infections, septic arthritis, osteomyelitis, septic arthritis, and endocarditis are possible

# Boil



# Furuncle



[http://www.merck.com/mrkshared/mmanual/plates/112pla2\\_1.jsp](http://www.merck.com/mrkshared/mmanual/plates/112pla2_1.jsp)

# Carbuncle



• <http://dermatlas.med.jhmi.edu/derm/IndexDisplay.cfm?ImageID=848087848>

# Cellulitis



• <http://dermatlas.med.jhmi.edu/derm/IndexDisplay.cfm?ImageID=-1932607075>

# When is Culture Appropriate?

- Purulent material from boils and furuncles or other skin & soft tissue infections, especially those not responding to the therapeutic intervention
- Multiple cases from patients with close contact
- Patients with a history of CA-MRSA infections

References: (2, 12, 19)

# Treatment Recommendations

- For mild skin and soft tissue infections, incision and drainage is often curative; obtain cultures if possible. Antimicrobial therapy is warranted for more serious, deep seated infections or rapidly spreading infections.
- In patients without allergies, risk factors for CA-MRSA, or history of contact with known cases of CA-MRSA, traditional beta-lactam agents are appropriate.
- For suspected or culture-positive CA-MRSA cases, vancomycin, TMP-SMX, and quinolones have been used successfully. Daptomycin and linezolid are alternative agents.
- Seriously ill patients with either community-acquired necrotizing pneumonia or skin & soft-tissue infections should be empirically covered for CA-MRSA pending culture and sensitivities.

## A Special Consideration: Inducible Clindamycin Resistance

- Clindamycin is often chosen for skin/soft tissue infections to cover both staph and strep
- CA-MRSA which are resistant to erythromycin but sensitive to clindamycin often display inducible clindamycin resistance
- A D-test can be performed to test for inducible clindamycin resistance if your laboratory offers it
- If a D-test is unavailable, avoid clindamycin for the treatment of erythromycin resistant CA-MRSA in patients with serious skin/soft tissue infections

References: (2, 12, 19)

# Tips for Outbreak Prevention For Patients with Boils or Furuncles

- Wash hands and body frequently with soap and warm water
- Keep draining lesions covered with clean dressings
- Do not share towels, razors or other personal items
- Launder soiled towels, sheets, and clothes in hot water
- Dry clothes on high heat

References: (2, 7, 19)

# Concerns for the Future

- The lines between hospital and community are blurring with regard to MRSA. CA-MRSA has caused hospital outbreaks and HCA-MRSA has moved into the community.
- Horizontal transmission of the mobile SCC mec type IV genetic element via plasmids or bacteriophages could create a bacteria that has the antibiotic resistance genes of HCA-MRSA and the virulence of CA-MRSA.

# Acknowledgments:

- Leonard A. Mermel, D.O., Sc.M., A.M, FACP
- Julie A. Jefferson, R.N., M.P.H., C.I.C.
- Kerry A. Blanchard, MT(ASCP)
- Barbara Cifelli, R.N.
- Patricia Ciolfi
- Maria McKay, R.N., M.A., C.I.C.
- Sylvia A. Monti, MT(ASCP), C.I.C.
- Stephen L. Parenteau, MT(ASCP), M.S., C.I.C.

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