Foe Revisited: Focus update of *Staphylococcus aureus* for clinicians

Dr. Anthony R. Tam

Associate Editor, IMPACT Guideline (6th edition);

Associate Consultant, Division of Infectious Diseases,

Department of Medicine, Queen Mary Hospital

ID Forum (June 19, 2025)

Culprits of bloodstream infections in HA (2023)

Organism	Non-ICU/ HDU Rank (%)	ICU/ HDU Rank (%)
Escherichia coli	1 (34%)	2 (17%)
Klebsiella spp.	2 (12%)	3 (11%)
Staphylococcus aureus	3 (11%)	4 (10%)
Staphylococcus, coagulase negative	4 (9%)	1 (23%)
Proteus mirabilis	5 (4%)	8 (2%)
Enterococcus spp.	6 (4%)	5 (5%)
Pseudomonas aeruginosa	7 (2%)	6 (3%)

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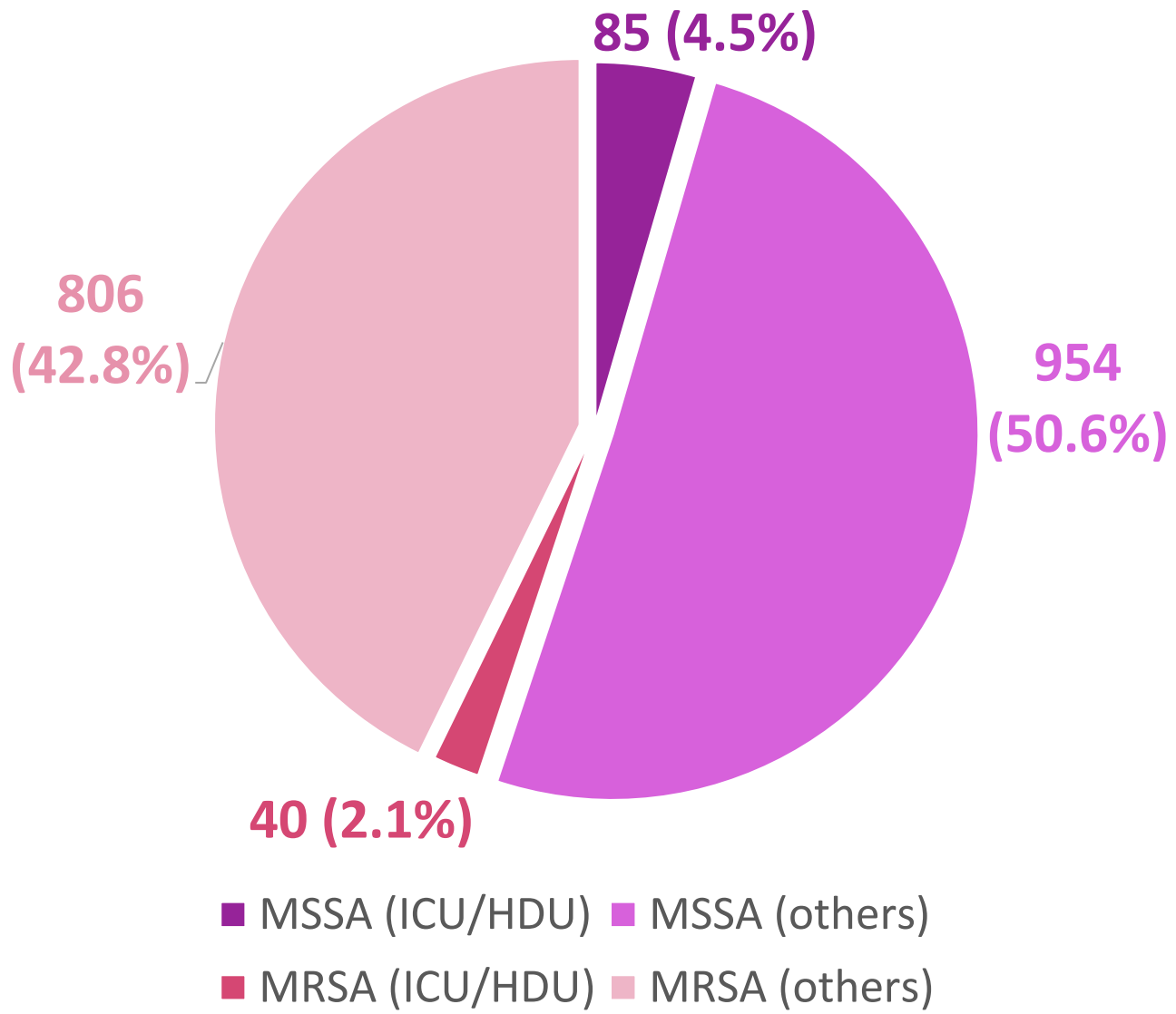
S. aureus bacteraemia in HA (2023)



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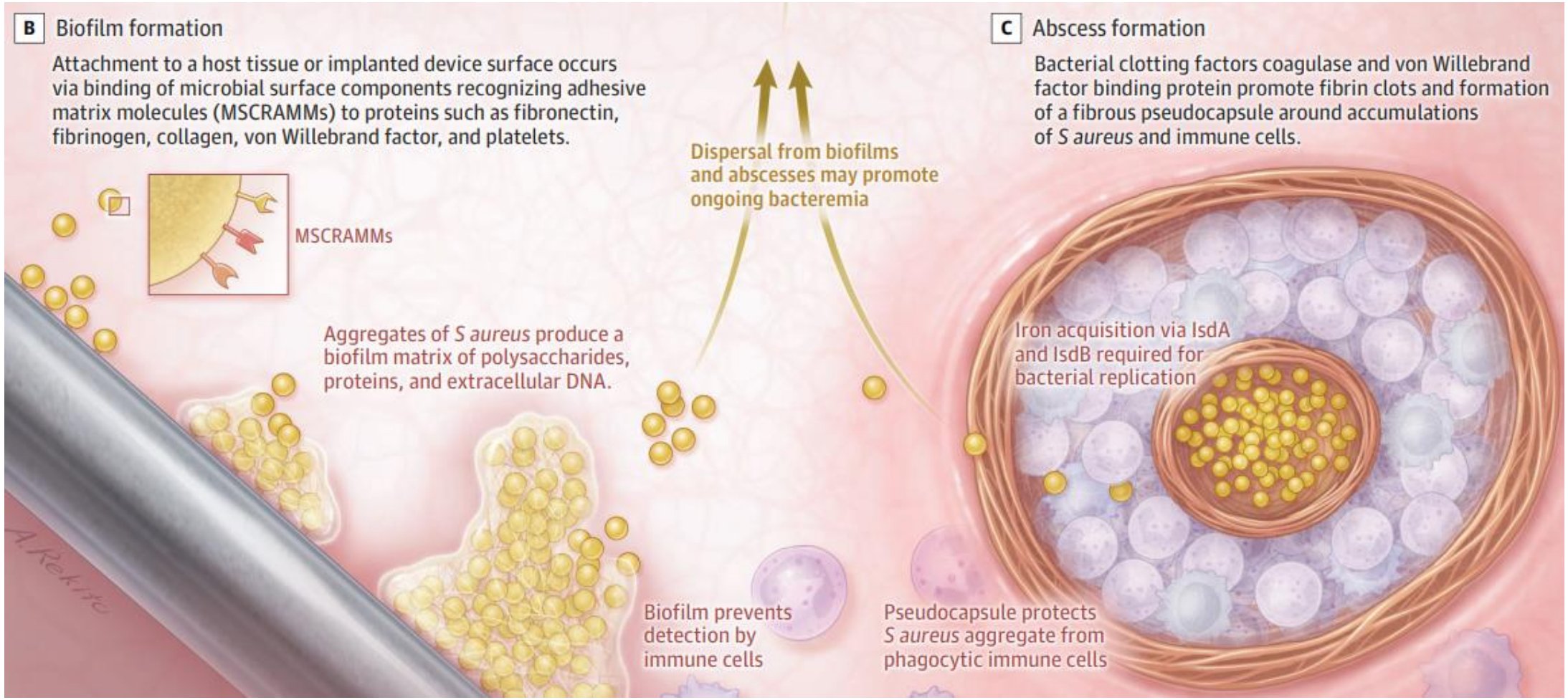
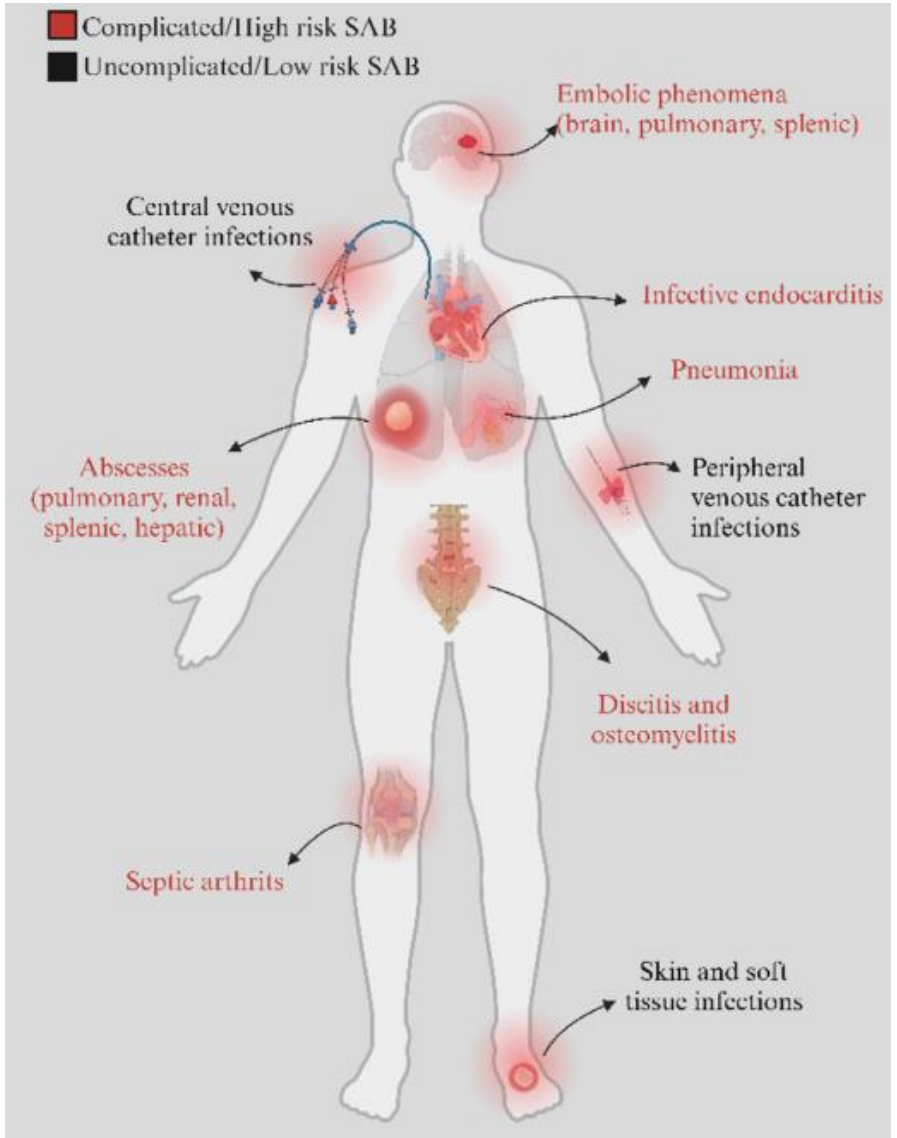
Biofilm and abscess formation



Tong SYC et al. JAMA 2025

Metastatic infection



Shah RJ et al. Clin Med 2024

Diagnostic evaluation

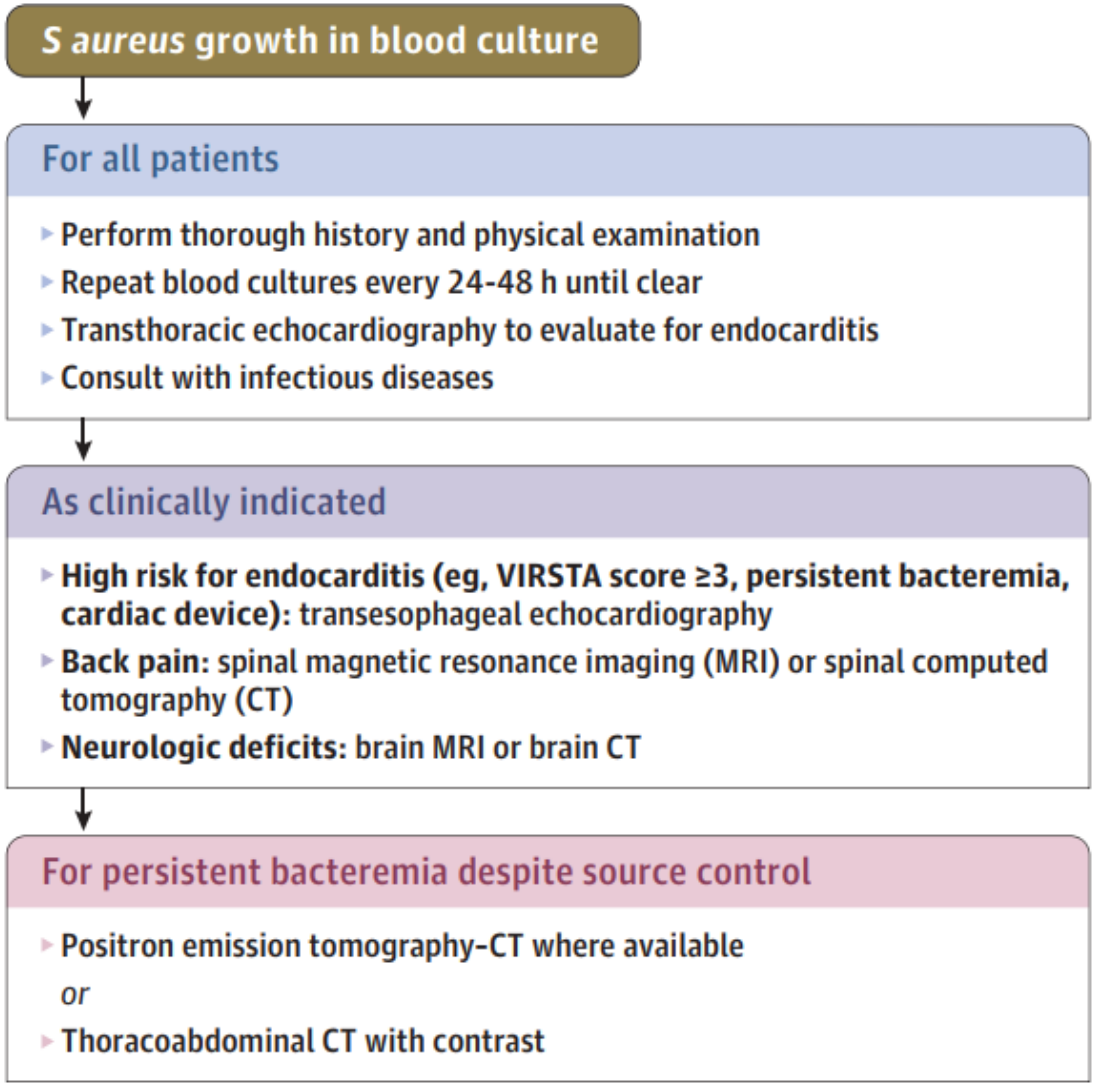
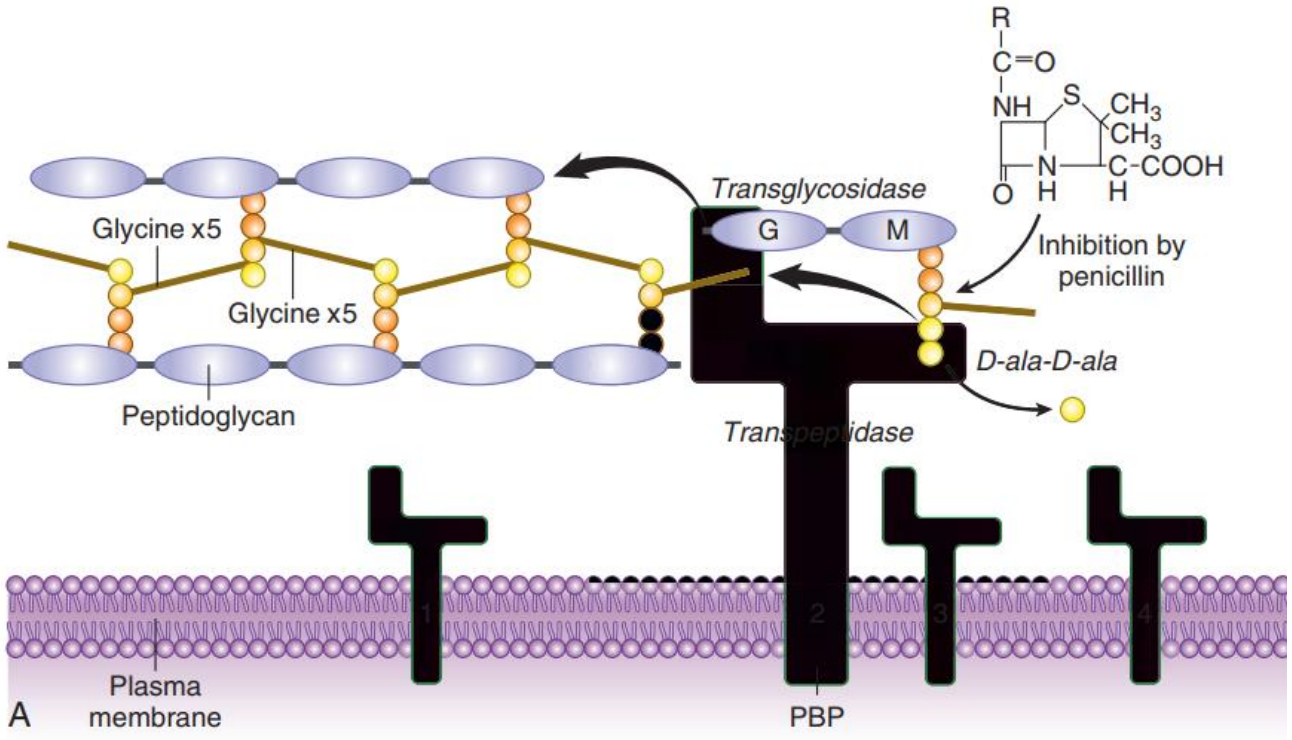


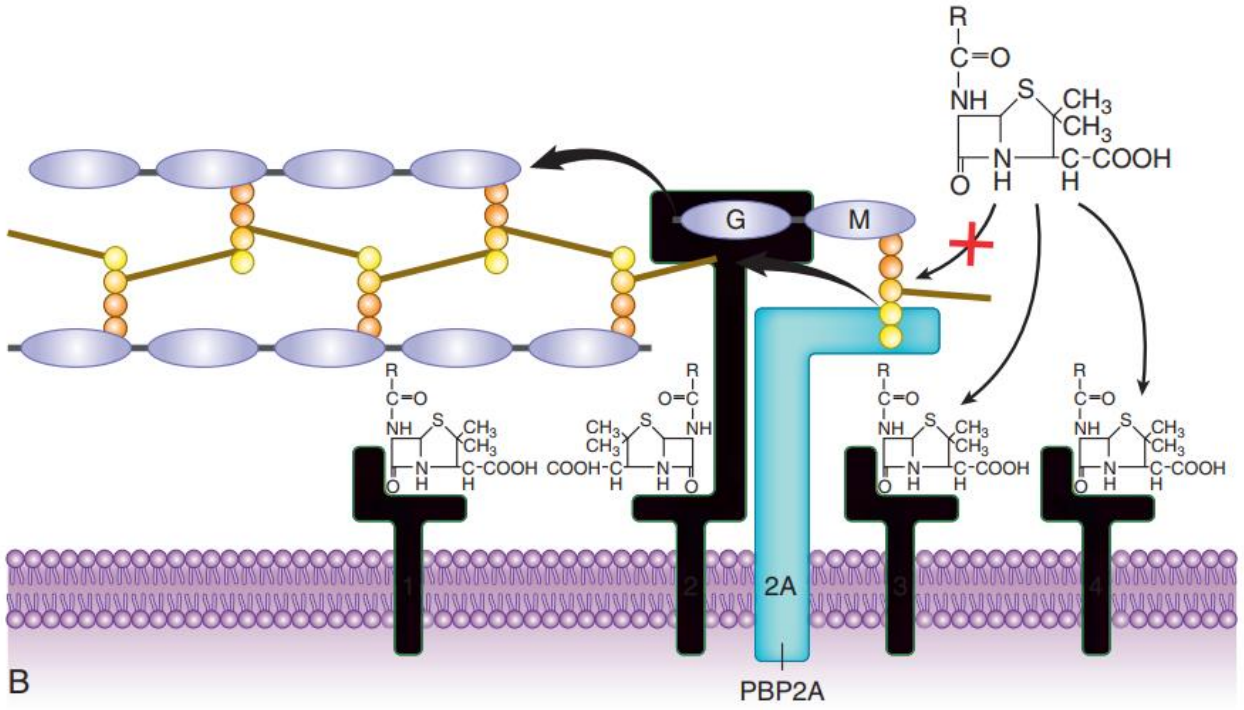
Table 1. VIRSTA Score to Determine Priority of Transesophageal Echocardiography in Patients With *Staphylococcus aureus* Bacteremia

Clinical condition	Weight
Cerebral or peripheral emboli	5
Meningitis	5
Permanent intracardiac device or previous infective endocarditis	4
Intravenous drug use	4
Preexisting native valve disease	3
Persistent bacteremia (defined as positive follow-up blood culture result obtained 48 h after initial positive blood culture)	3
Vertebral osteomyelitis	2
Community or nonnosocomial health care-associated acquisition	2
Severe sepsis or shock	1
C-reactive protein >190 mg/L	1

Tong SYC et al. JAMA 2025
Tubiana S et al. J Infect 2016

PBP2A, encoded by *mecA*, as mediator of methicillin resistance in *S. aureus*



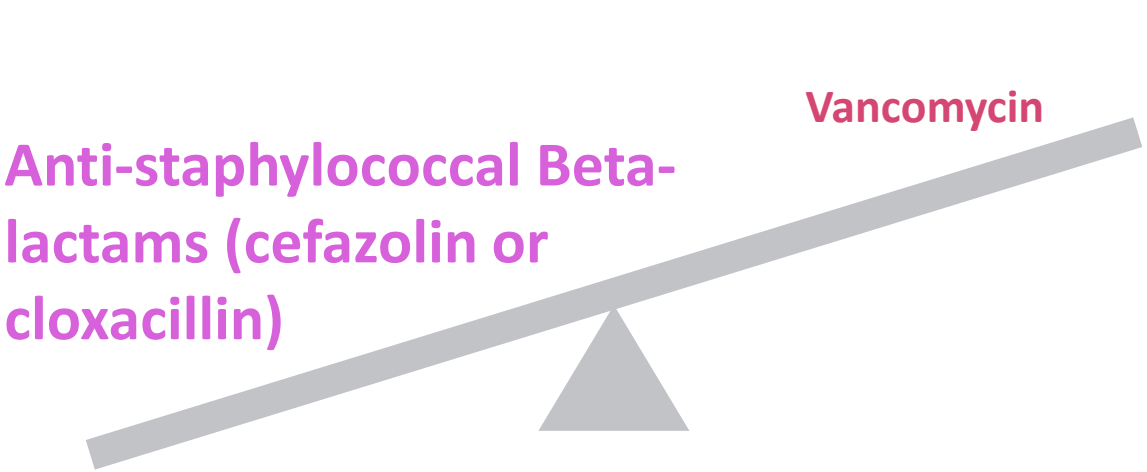


Methicillin-susceptible *S. aureus* (MSSA)

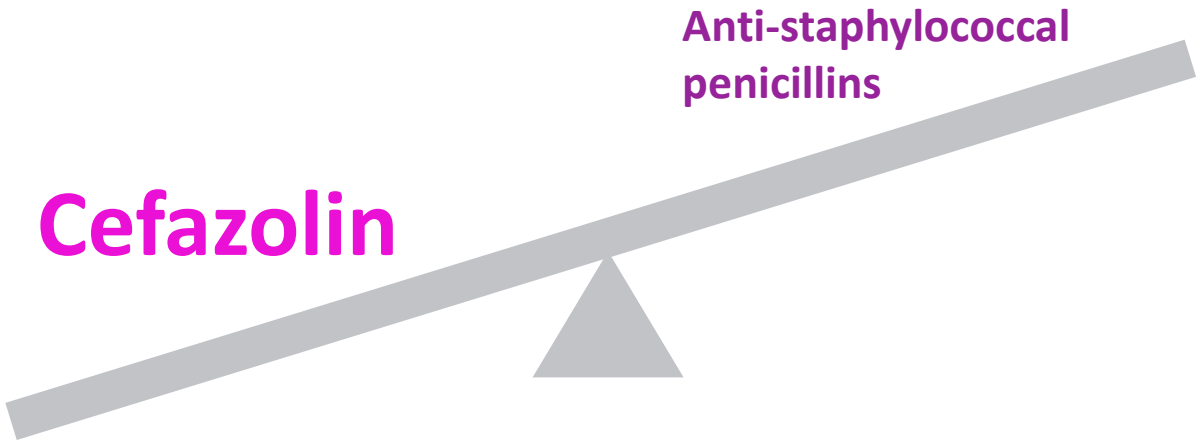
Methicillin-resistant *S. aureus* (MRSA)

Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases. 9th edition (2019)

Therapeutic options in methicillin-susceptible *S. aureus* (MSSA) infections



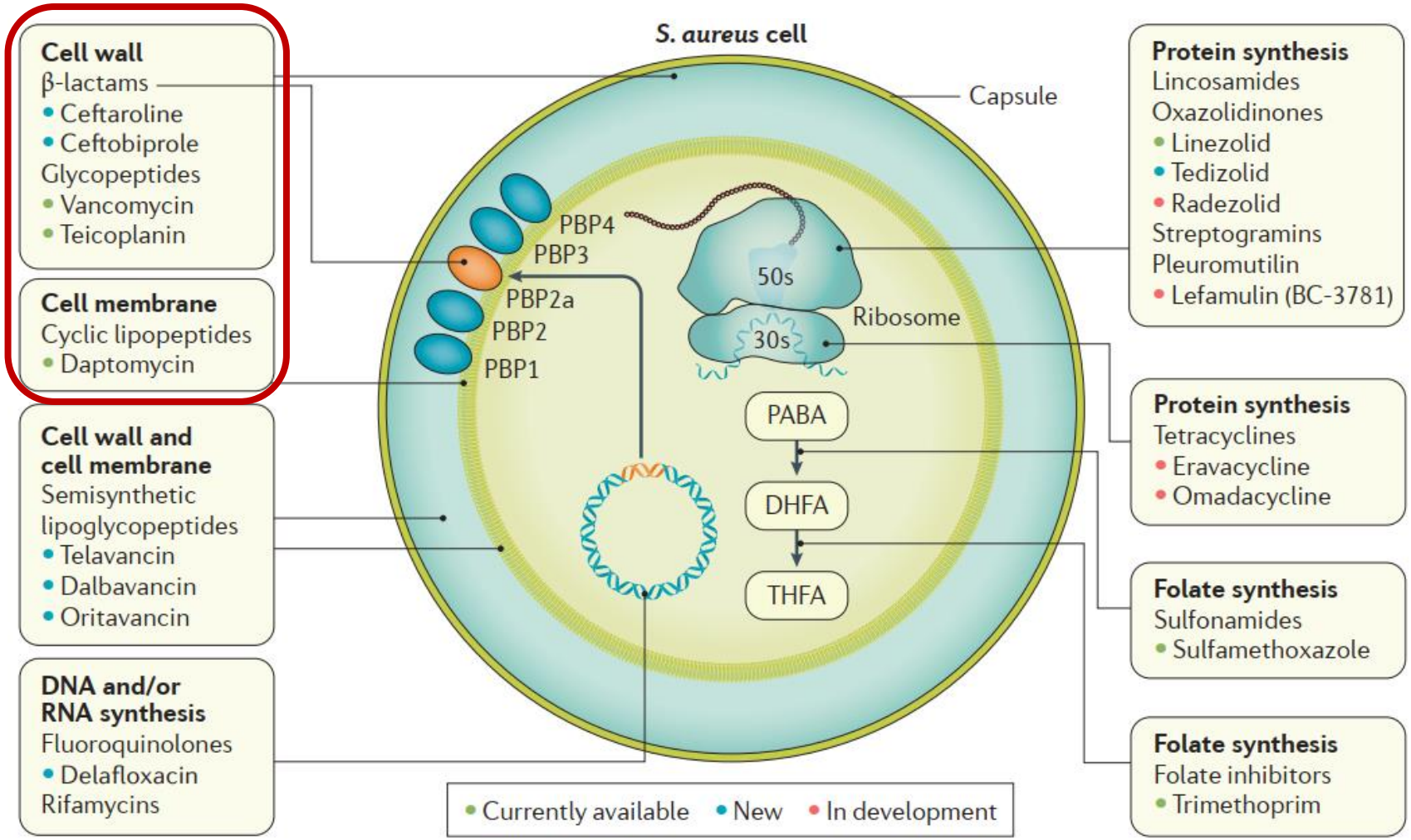
- Reduced mortality as definitive therapy
- Reduced recurrent infections



- Reduced mortality
- Reduced nephrotoxicity
- Comparable efficacy
- Sufficient for CNS infections

Stryjewski ME et al. Clin Infect Dis 2007
Li J et al. Antimicrob Agents Chemother 2014
McDanel JS et al. Clin Infect Dis 2015
Lee BJ et al. Int J Antimicrob Agents 2019
Weis S et al. Clin Microbiol Infect 2019
Antosz K et al. Pharmacother 2022
SNAP Trial, ESCMID 2025

Therapeutic options in methicillin-resistant *S. aureus* (MRSA) infections



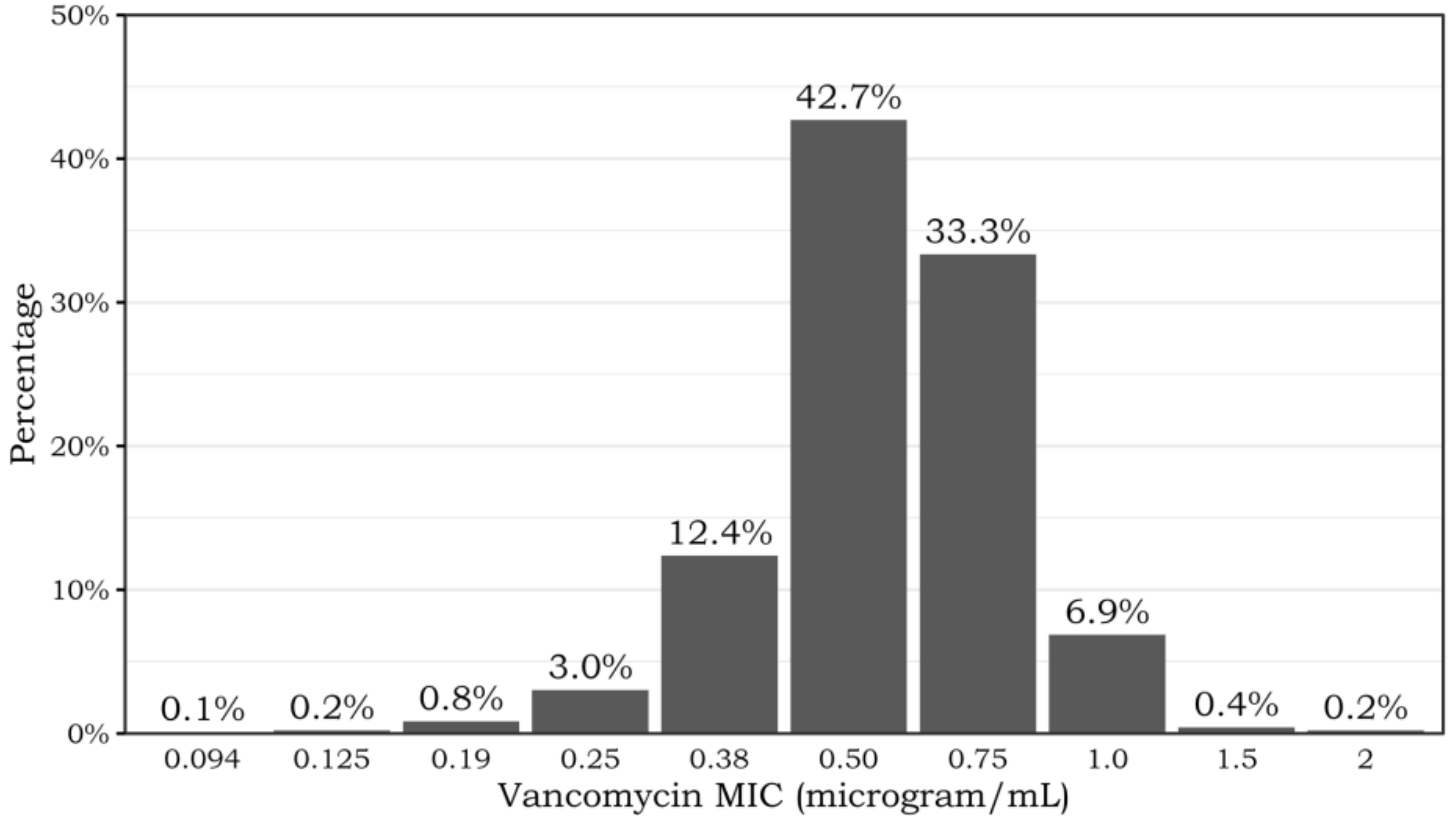
Lee AS et al. Nat Rev Dis Primers 2018

Challenges in selected anti-MRSA agents (1)

Vancomycin

- Narrow therapeutic index
- Increased risk of nephrotoxicity if serum trough level rises above 15 microgram/ml
- AUC/MIC increasingly recommended as therapeutic target overseas, but not routinely available locally
- Dosing should be customized based on patient factors, site and severity of infection, and vancomycin MIC

Figure 1.1: Distribution of MIC for Vancomycin Against 963 MRSA Isolated from Blood Cultures in KCC, KEC and HKWC, 2020–2023



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Challenges in selected anti-MRSA agents (2)

Daptomycin

- Microbiologic failure reported in patients receiving daptomycin monotherapy
- 4 mg/kg per day for complicated SSTI
- Higher doses (8-12 mg/kg per day) have been used in serious infections e.g. bacteraemia, endocarditis and osteomyelitis
- Balancing risk of elevated serum creatinine kinase and rhabdomyolysis, give 8-10 mg/kg per day if daptomycin is chosen for *S. aureus* bacteraemia
- Consider stopping HMG-CoA reductase inhibitors temporarily during daptomycin therapy

Ceftaroline

- High binding affinity with Penicillin-Binding Protein 2a
- Efficacies in bacteraemia, endocarditis and pneumonia due to MRSA largely based on retrospective studies
- Dosing at every 8 hours for severe infections

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When should consultation with ID Physicians or Microbiologists be sought in *S. aureus* bacteraemia?

- Persistent blood culture positivity after 2 days of appropriate antibiotics
- Presence of indwelling devices
- Pre-existing heart valve abnormalities
- Community-acquired infections
- Concomitant Gram negative bacteria and MSSA infections
- Uncertainties in antimicrobial dosing for MRSA infections

Goto M et al. JAMA Netw Open 2020
Lee JC et al. Am J Med 2023

Take-home messages

- *Staphylococcus aureus* infection especially bacteraemia is a significant burden in local hospitals
- Anti-staphylococcal beta-lactams are preferred over vancomycin for MSSA infections.
- Cefazolin has consistently demonstrated superiority over anti-staphylococcal penicillins in MSSA infections, with lower toxicities yet comparable efficacies
- Controversies of antibiotic dosing against MRSA remain unresolved
- Please consult our team if in doubt!