April 20th, 2021

Agenda

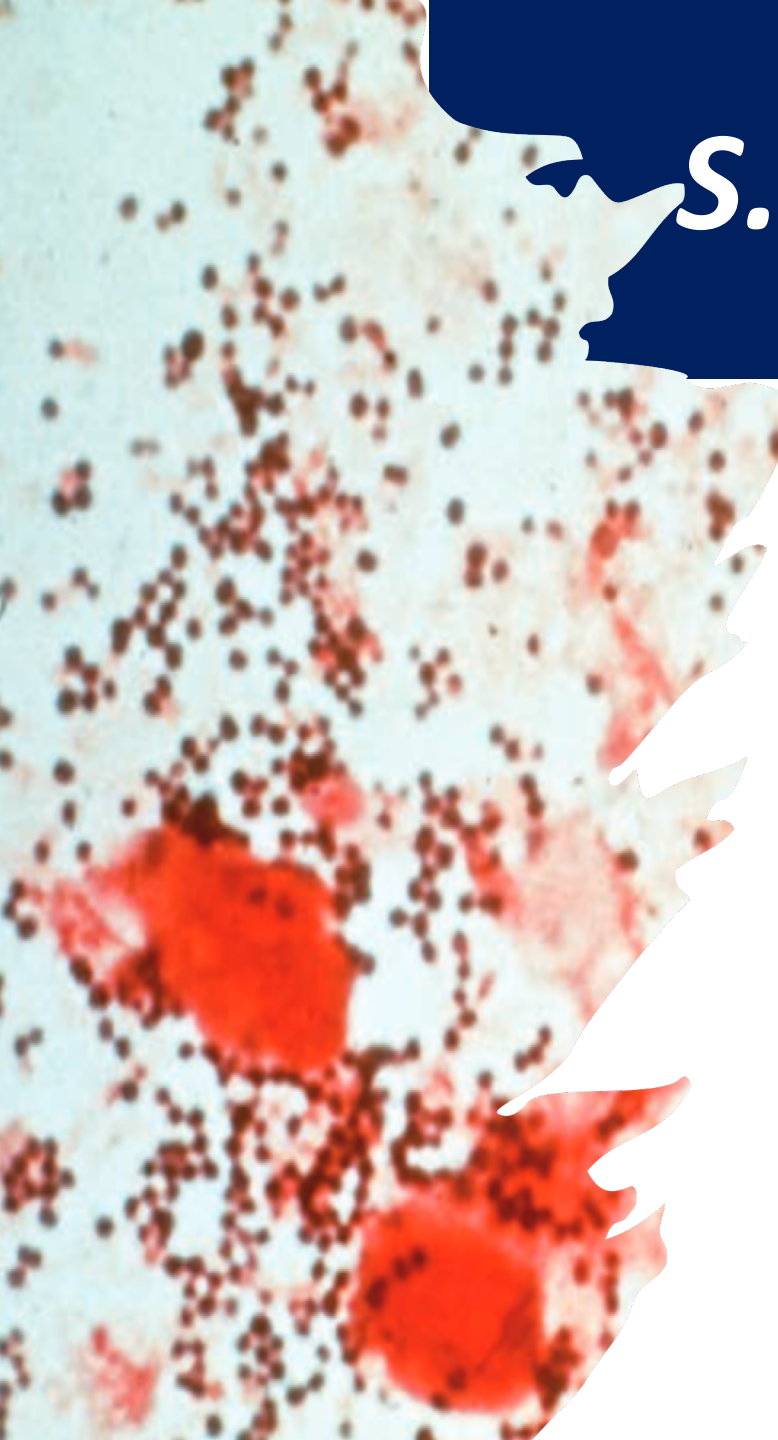
- *It's complicated: Staph aureus Bloodstream infections*

Team effort: Chloe, Jeannie and Rupali

- Case Discussions
- Open Discussion

Objectives

- Explain why *S.aureus* bloodstream infections (SAB) are different than other bloodstream infections
- Demonstrate the classification of uncomplicated (low-risk) vs complicated SAB and why it matters
- Discuss the best practices for treatment and diagnosis of *S.aureus* BSI



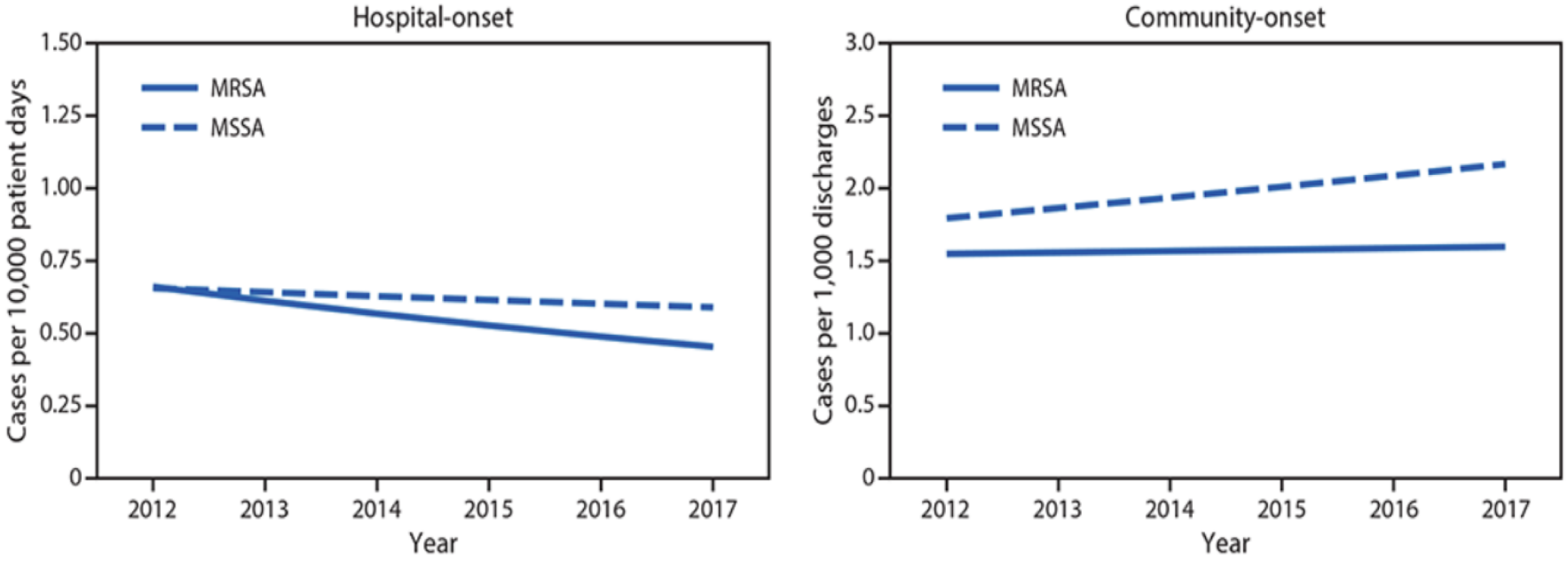
S.aureus - the basics

- Successful opportunistic pathogen
- Frequent colonizer of skin and mucosa on humans and animals
- Spectrum of disease:

  Benign skin infections (folliculitis and furunculosis) to life threatening diseases (endocarditis to sepsis to pneumonia)
- **Extraordinary capacity to adapt and survive in many environments**

Trends in the US

FIGURE 2. Adjusted* hospital-onset and community-onset rates of *Staphylococcus aureus* bloodstream infections — Premier and Cerner Hospitals, United States, 2012–2017



Abbreviations: MRSA = methicillin-resistant *Staphylococcus aureus*; MSSA = methicillin-susceptible *Staphylococcus aureus*.

hospital-onset =the culture was obtained on or after the 4th day of an inpatient hospitalization; **health care–associated community-onset =** the culture was obtained from an outpatient or during the first 3 days of hospitalization in a patient with one of several significant prior health care exposures; community-associated, otherwise. **Community-onset infections** comprise health care–associated community-onset and community-associated infections.

Why are we so concerned about SAB?

- ✓1/3 of patients develop metastatic complication
  - Indicated by positive follow-up blood cultures after 48-96 hours and persistent fever

- ✓High Risk for Relapse despite adequate therapy
  - ✓20% risk of relapse without indwelling foreign body
  - ✓80% risk for relapse with indwelling foreign body
    - ✓ Median onset 69 days

- Mortality:
  - 30-day all cause mortality: 20%
    - More recent estimates around 16%
  - MRSA is an independent risk factor for mortality

Fowler VG Jr, et al J Infect Dis. 1999
Mandell Douglas and Bennett's Principles and Practice of Infectious Diseases. Chapter 194: Staphylococcus aureus
UpToDate: Clinical Approach to Staphylococcus aureus bacteremia

Evaluation of patients with SAB

- ✓ A single positive blood culture should prompt initiation of antibiotic therapy
  - ✓Never a contaminant
- ✓Perform a thorough history and physical
  - ✓Metastatic foci of infection
    - ✓ New murmur
    - ✓ Embolic: skin, digits, conjunctivae
- ✓Search for endocarditis with transesophageal echocardiography

Echocardiography

Why do we need it?

Recommended to evaluate for endocarditis

- Clinical exam misses endocarditis

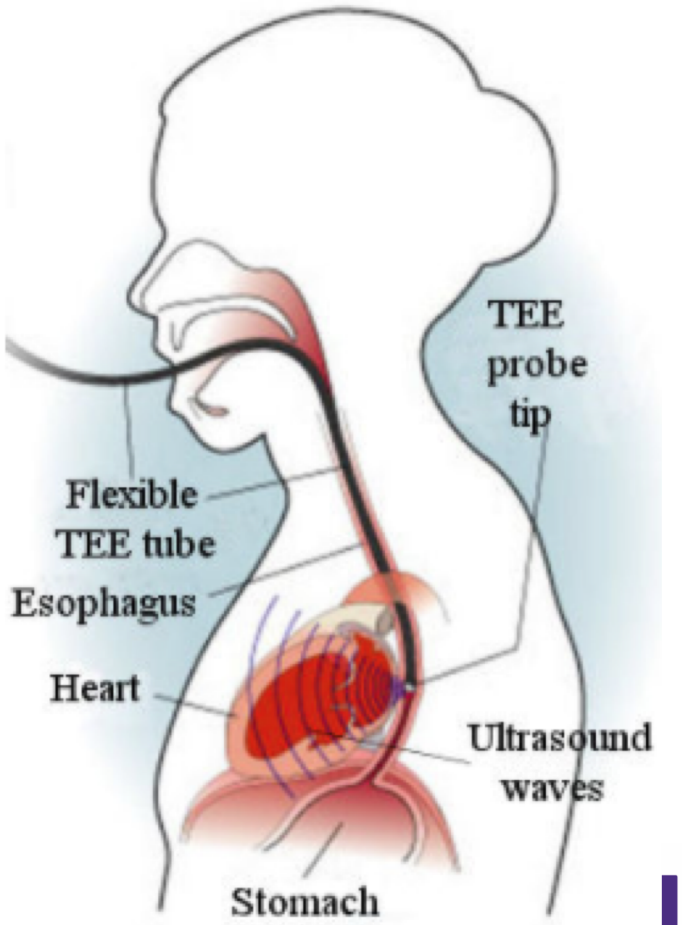
TTE preferred for low-risk:

-nosocomial acquisition

sterile follow-up cultures,

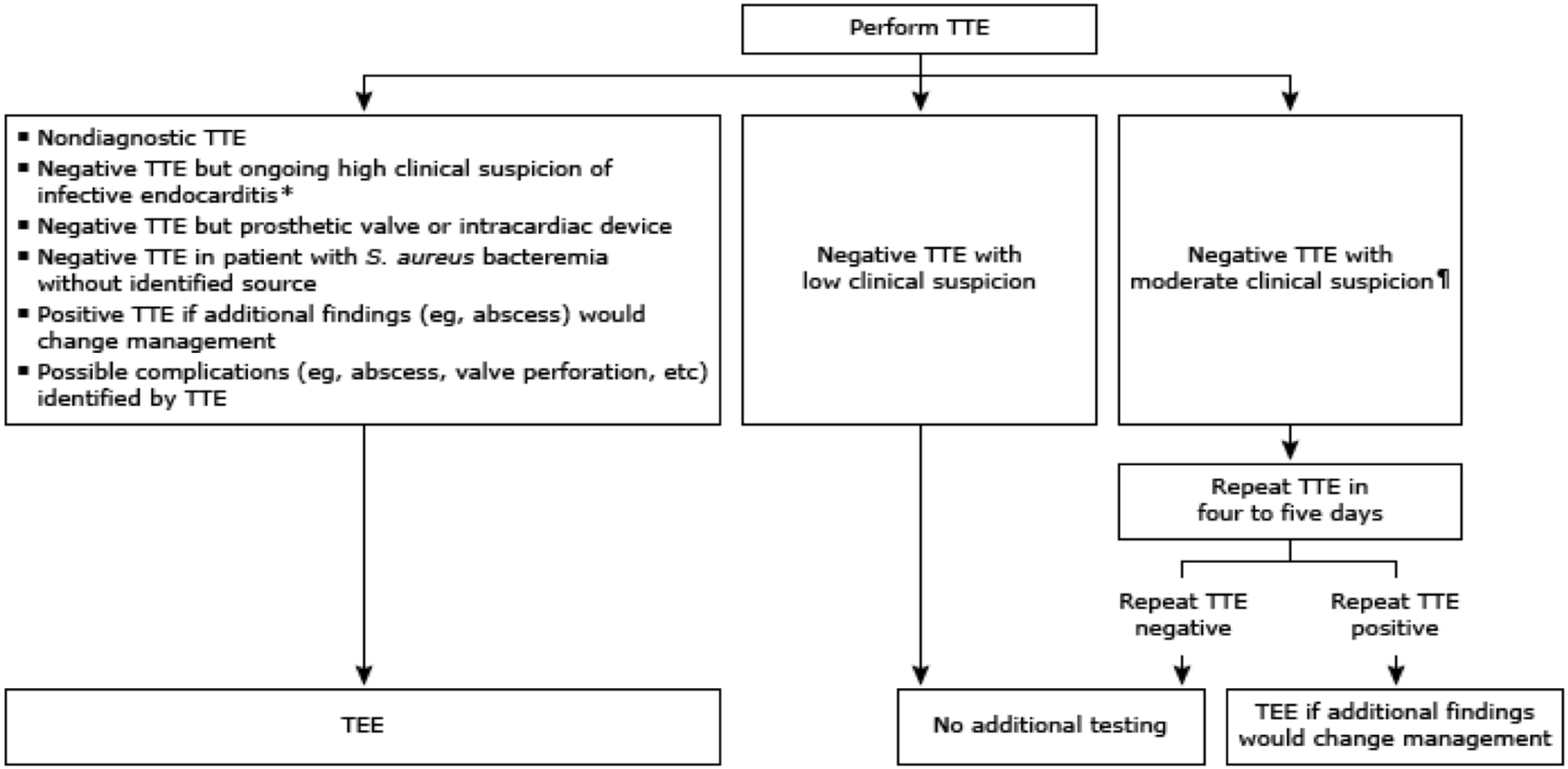
-absence of permanent intracardiac device

- absence hemodialysis dependence



Vance Flower IDWEEK 2020 presentation

Echocardiographic evaluation of a patient with suspected infective endocarditis



General approach for diagnosis of infective endocarditis by echocardiography. Individual patient circumstances may justify different approaches. Please note that for well visualized uncomplicated tricuspid or pulmonic endocarditis, a transesophageal echocardiogram may not be necessary.

TTE: transthoracic echocardiogram; TEE: transesophageal echocardiogram; AV: atrioventricular.

* High clinical suspicion includes previous infective endocarditis, worsening valvular regurgitation, recurrent unexplained bacteremia, embolic events, or AV heart block.

¶ Moderate clinical suspicion includes Duke criteria "possible endocarditis" or scenarios where an alternative infectious source may not usually cause bacteremia.

At your site, do you have access to TTE or TEE?

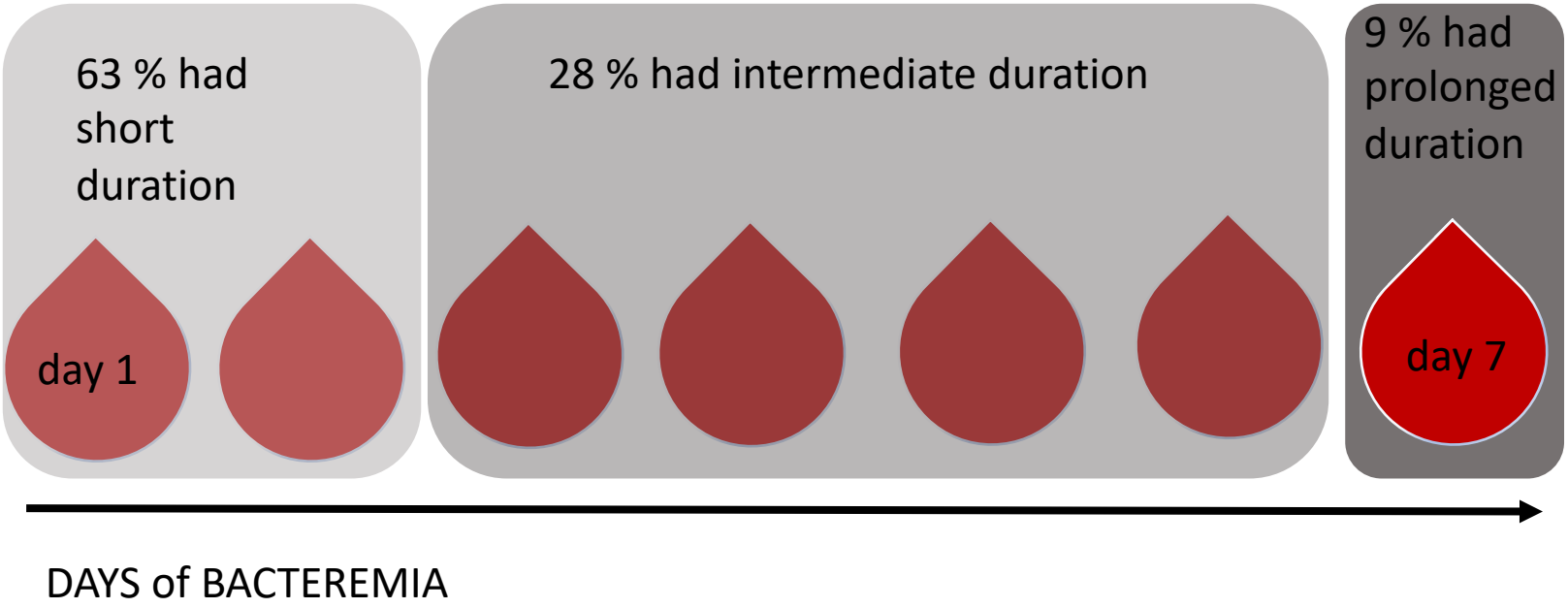
1. Yes, we have access on-site to both
2. TTE on-site; TEE off-site/transfer out
3. Neither are available on site
4. I don't know
5. Other

Evaluation of patients with SAB

- ✓A single positive blood culture should prompt initiation of antibiotic therapy
  - ✓Never a contaminant
- ✓Perform a thorough history and physical
  - ✓Metastatic foci of infection
    - ✓New murmur
    - ✓Embolic: skin, digits, conjunctivae
- ✓Search for endocarditis with transesophageal echocardiography

- ✓Sampling of blood for follow-up cultures q24-48h until clear

How long are patients bacteremic?



Time to source control was delayed

Minejima E, et al. Clinical Infectious Diseases 2020;70(4):566–73

duration of BSI and mortality

- Abx choice did not affect length of BSI **but delay in source control DID**
- Metastatic complications, LOS, 30-day mortality were worse as bacteremia duration increased

Table 4. Relative Risk of 30-Day Mortality by Duration of Bacteremia

No. of Days of Bacteremia	Total N	Mortality, %	Relative Risk (95% CI)	*P* Value
1	446	4.5	Reference	Reference
2	108	8.3	1.86 (0.87–3.97)	.11
3	98	9.2	2.05 (0.96–4.36)	.06
4	74	12.2	2.71 (1.28–5.73)	.01
5	46	8.7	1.94 (0.69–5.43)	.21
6	33	18.2	4.05 (1.75–9.40)	.001
7	28	21.4	4.78 (2.09–10.94)	<.001
8–10	30	20.0	4.46 (1.94–10.27)	<.001
11+	21	23.8	5.31 (2.21–12.76)	<.001
Per day	…	…	1.16 (1.10–1.22)	<.001

N = 884. The numbers of days of infection at 8–10 and 11+ were collapsed to account for the observed sample sizes.

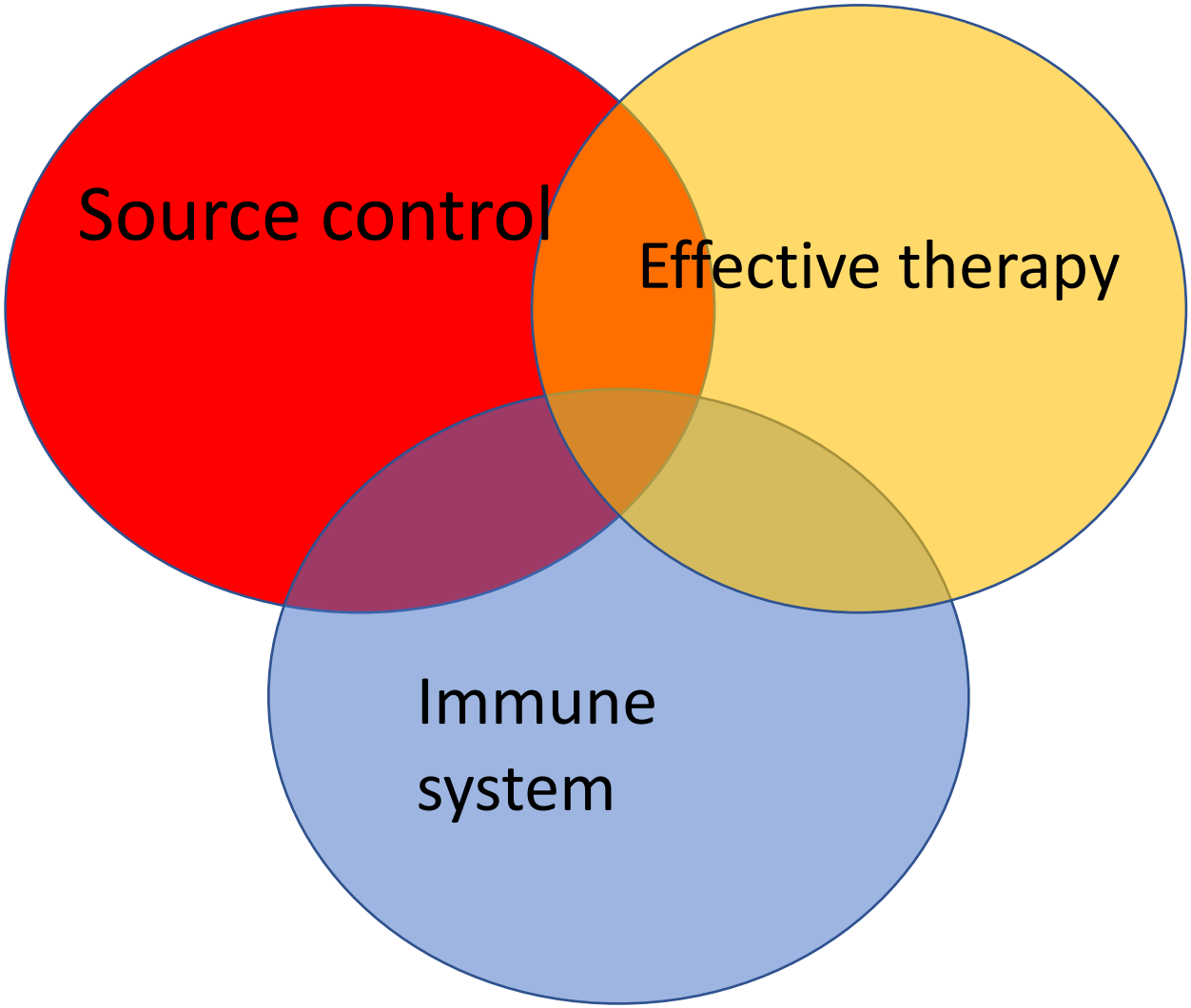
Abbreviation: CI, confidence interval.

Minejima E, et al. Clinical Infectious Diseases 2020;70(4):566–73

Refractory SAB

- Definition of persistent or refractory SAB is not well-defined
  - 2011 MRSA guidelines state patients are bacteremic for 7 days
- Is it Medical vs surgical failure?
  - Source control is paramount
- Consideration for combination MRSA therapy???
  - Data is not definitive

Treatment of Infectious Diseases



S.aureus BSI

- Positive follow-up blood culture with *S.aureus*
- Persistent fever
- ECHO consistent with endocarditis
- Signs of metastatic infection

Complicated

- Intravascular device removed within 5 days
- Negative blood cultures within 24-72 hours
- Defervescence within 72 hours of initial positive culture
- No metastatic diseases, or evidence of endocarditis
- No evidence of prosthetic material

Uncomplicated/low risk

ID consult = better outcomes

- Reduced 90-day mortality 9 vs 29% (OR 0.25 95% 0.13 to 0.51)
- Even with pts with appropriate duration of therapy, significantly fewer relapses in pts with ID consults (6 vs 18%)
- Underscore the importance of serial evaluations for metastatic infection and/or source control

Forsblom E, et al Clin Infect Dis. 2013;56(4):527. Jenkins T Clin Infect Dis 2008; 46; Folwer VG Clin Infect Dis. 1998;27(3):478; Turner RB, Antimicrob Agents Chemother 60:5682–5687.

At your site, do you have access to ID consultation?

1. Yes, they are on-site and readily available within 24 hours
2. Yes, available on-call but not on-site/phone only
3. No services available
4. Other

Treatment

	Uncomplicated*	Complicated
MRSA Vancomycin Daptomycin	14 days after 1st negative culture	4-6 weeks
MSSA Cefazolin Nafcillin	14 days after 1st negative culture	4-6 weeks

*IV to PO step-down for uncomplicated SAB: Future TASP

Best practices with *S.aureus* BSI

- Rarely a contaminant
- Obtain Follow-up blood cultures
- Determine the source of the infection
- ECHO to R/O endocarditis
- ID consult, if available

Papers worth reading

- Holland TL, et al Clinical Management of Staphyloccocus aureus Bacteremia. A Review. JAMA. 2014;312(13):1330-1341.

- Minejima E et al Defining the Breakpoint Duration of Staphyloccus aureus Bacteremia Predictive of Poor Outcomes. Clin Infect Dis 2020 Feb 3;70(4):566-573

Questions

Evaluation of patients with SAB

- ✓Perform a thorough history and physical
- ✓a single positive blood culture should prompt initiation of antibiotic therapy
- ✓sampling of blood for follow-up cultures q24-48h until clear
- ✓ determination of the source and extent of infection
- ✓Remove indwelling devices/hardware
- ✓search for endocarditis with transesophageal echocardiography