Staphylococcus aureus Bacteremia Bundle Implementation

Jordan Wong, PharmD, BCPS

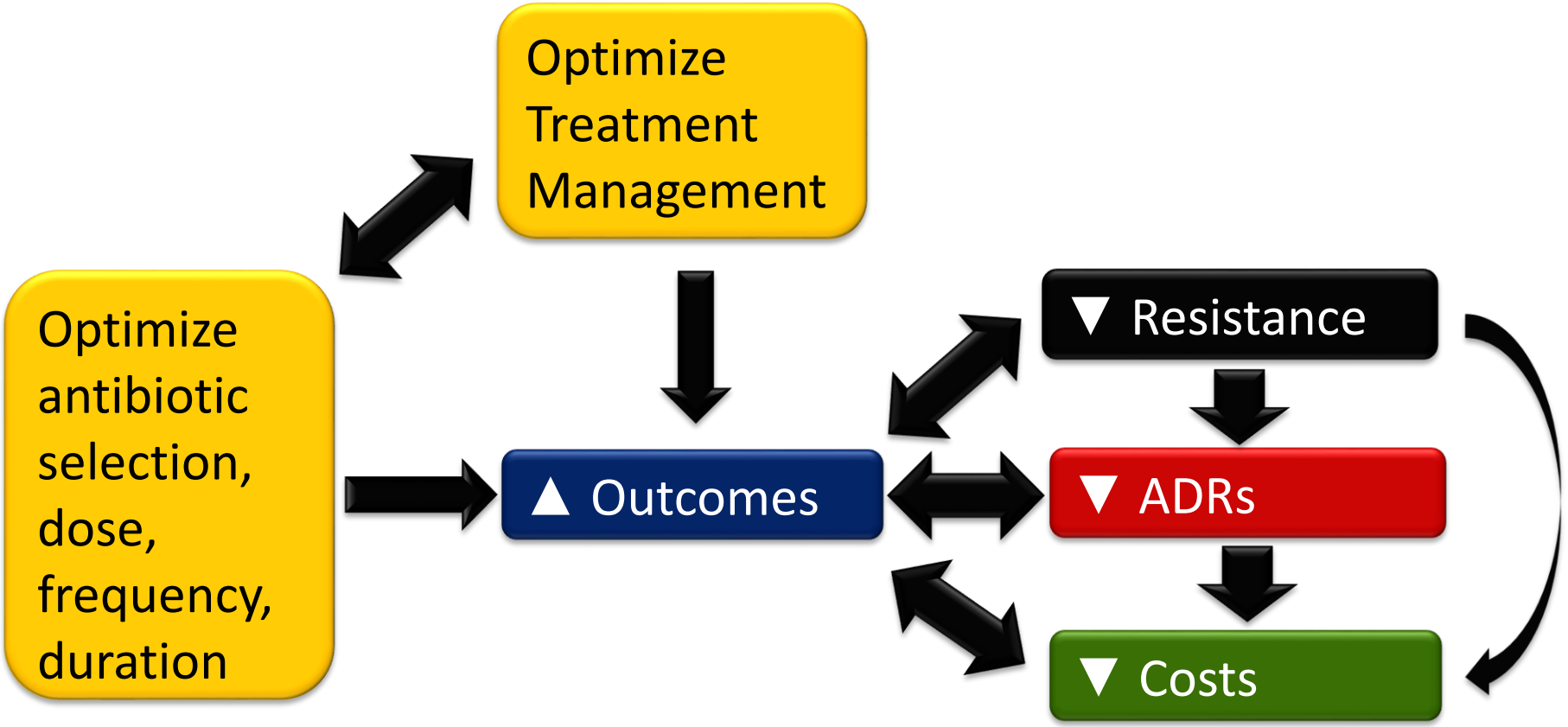
Grady Health System

Atlanta, Georgia

November 29, 2017

Grady

Antimicrobial Stewardship



ADRs = adverse drug reactions

Grady

Dellit, *et al*. Clin Infect Dis. 2007; 44:159-77.

Bundle Implementation Timeline

- Identifying the problem
- Collect data
- Present data
- Bundle approval
- Go-live!
- Intervention analysis

Identifying the Problem

Overall

- Institutional goals
- Literature?
- Your biggest pet peeve
- Stewardship initiative

Grady Experience

Staphylococcus aureus bacteremia (SAB)

- Repeat blood cultures
- Source control
- ID consultation

Collecting SAB Data

Overall

- Guidelines
  - Liu C, et al. Clin Infect Dis. 2011; 52:285-92
- Supporting literature
  - See data

Grady Experience

- Assigned priority antimicrobial stewardship project
- Assigned pharmacy student project

Management Bundles on SAB

S. aureus	Outcomes
Lopez-Cortes Clin Infect Dis 2013	⬇ 14-day mortality (OR 0.49; p=0.016) ⬇ 30-day mortality (OR 0.59; p=0.04)
Nguyen et al. J Antimicrob Chem 2015	⬇ readmission for recurrent SAB (11.0% vs 1.1%; p 0.008)

OR = odds ratio

Outcomes for ID Consultation for SAB

Study	Outcome
Bai et al. CID 2015	⬇ in-hospital mortality 28% ⬇ by 3 days in LOS
Tissot et al J Infect 2015	⬇ 30-day mortality 50% ⬇ in-hospital mortality 55% ⬇ by 5 days infection related LOS
Fries et al. CID 2013	⬇ crude mortality 65% ⬆ source removal/drained 68%
Honda et al. Am J Med 2010	⬇ 28-d mortality 56%

Grady

LOS = length of stay

SAB Data

Data collection period: 9/1/2013 to 8/31/2014	**N = 80**
Overall Mortality, n (%)	9 (11.3)
Received all SAB bundle components, n (%)	20 (25)
Average infection-related length of stay (iLOS), days	19.2
Patients who received an ID consult, n (%)	59 (74)
Adherence to individual SAB bundle components	**N= 80**
Follow up cultures within 96 hours, n (%)	68 (85)
Source control, n (%)	48 (60)
Echocardiography (TEE), n (%)	32 (40)
Appropriate definitive treatment, n (%)	71 (89)
	n = 71*
Adequate treatment duration, n (%)	57 (80)

*patients who expired or were discharged prior to treatment duration being determined were excluded

Grady

* Mortality rate in previously published literature has been reported from 10 to 30%*

Present Data/Bundle Approval

- Antimicrobial Subcommittee
  - Create and agree upon bundle
- P&T Committee
- Infection Control Committee
- Critical Care Committee
- Medical Executive Committee
  - Best practice alert (BPA)
  - Order set

Grady Health System *Staphylococcus aureus* Bacteremia Management Bundle

1.	**CONSULTATION** **Infectious Diseases** • Within first 5 days of first positive blood culture
2.	**SOURCE CONTROL** • Removal of intravascular catheters within 24 hours of diagnosis • Do not insert any central vascular access, prosthesis or other foreign material until negative blood cultures are documented for at least 48 hours • Drainage of abscesses or removal of prosthetic or cardiac devices if thought to be the source
3.	**REPEAT BLOOD CULTURES** • Within 48-72 hours of first positive blood cultures • Follow-up blood cultures every day or every other day, to document clearance of bacteremia
4.	**ECHOCARDIOGRAM** • Transesophageal echocardiogram (TEE) in high risk patients (ie. Prosthetic valve, persistent bacteremia) or in patients is considered complicated and/or clinical suspicion is high to rule out infective endocarditis • Transthoracic echocardiogram (TTE) should be performed in all patients with *Staphylococcus aureus* bacteremia; **TTE is insufficient to rule out infective endocarditis**
5.	**ANTIBIOTIC MANAGEMENT** **Empiric management with vancomycin or known MRSA** • Vancomycin IV (pharmacy to dose) with goal trough of 15-20 mcg/ml obtained prior to 4th or 5th dose; adjusted if not at goal **MSSA** • Nafcillin 6 g IV q12h as continuous infusion or cefazolin 2 g IV q8h • Do not use vancomycin unless contraindication to use nafcillin or cefazolin • Consider desensitization in patient with severe penicillin allergy
6.	**DURATION OF THERAPY** • Patients **NOT** meeting **ALL** of the below criteria would qualify as complicated SAB and will require **minimum ≥ 28 days** of intravenous therapy from first documented clear blood culture • Patients who meet **ALL** of the following criteria below quality as an uncomplicated SAB and must be treated for a **minimum of 14 days** from first documented clear blood culture • Exclusion of endocarditis • No implanted prostheses/graft material • Blood culture clearance within 72 hours of initial positive culture • Full source control (ie removal of central line, drainage of abscess) • Defervescence within 72 hours of initiating effective therapy • Immunocompetent (no comorbid conditions such as diabetes, hemodialysis, HIV/AIDS, malignancy, chronic corticosteroid use, does not use immunomodulatory therapy) • No evidence of metastasis to other sites (ie heart, spine, bone, joints)

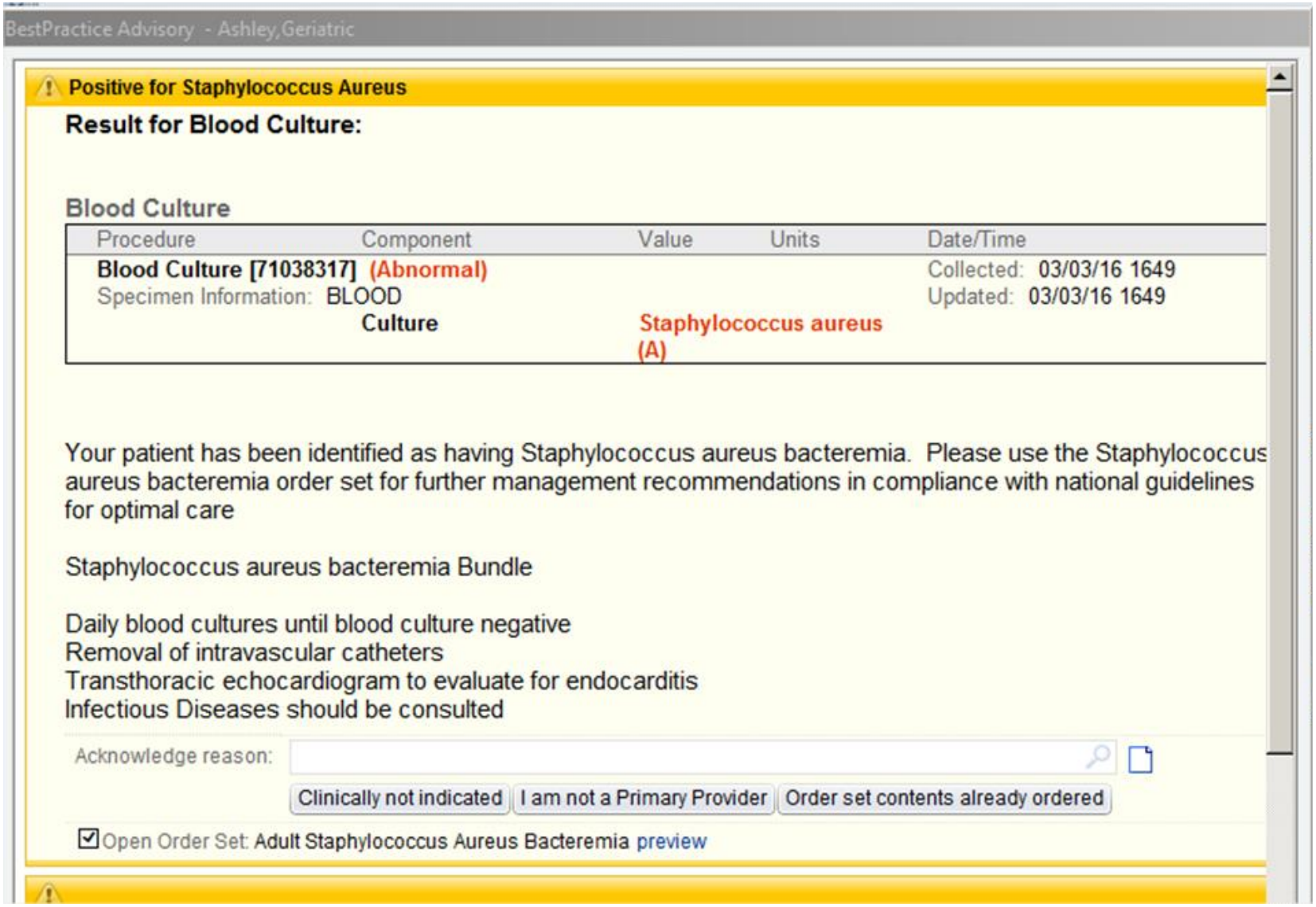
SAB = *Staphylococcus aureus* bacteremia; MRSA = methicillin-resistant *S. aureus*; MSSA = methicillin-susceptible *S. aureus*

Grady

Go-Live!

Pre-Go Live

- Work with information technology department
  - Build:
    - BPA
    - Order set
- Set go-live date
  - August 3rd 2016
- EDUCATION!


BestPractice Advisory - Ashley,Geriatric
Positive for Staphylococcus Aureus
Result for Blood Culture:
Blood Culture
Procedure
Component
Value
Units
Date/Time
Blood Culture [71038317] (Abnormal)
Collected: 03/03/16 1649
Specimen Information: BLOOD
Updated: 03/03/16 1649
Culture
Staphylococcus aureus (A)
Your patient has been identified as having Staphylococcus aureus bacteremia. Please use the Staphylococcus aureus bacteremia order set for further management recommendations in compliance with national guidelines for optimal care
Staphylococcus aureus bacteremia Bundle
Daily blood cultures until blood culture negative
Removal of intravascular catheters
Transthoracic echocardiogram to evaluate for endocarditis
Infectious Diseases should be consulted
Acknowledge reason:
Clinically not indicated
I am not a Primary Provider
Order set contents already ordered
Open Order Set: Adult Staphylococcus Aureus Bacteremia preview

Adult Staphylococcus aureus bacteremia treatment guideline

Consults

Prompt Infectious Disease consultation has been shown to dramatically reduce morbidity and mortality in this situation, and is therefore strongly recommended

Adult Staphylococcus Aureus Bacteremia — 1 of 1 selected

- ☑ Adult Staphylococcus Aureus Bacteremia order set used
  Details

Consult — 1 of 1 selected

- ☑ Inpatient consult to Infectious Diseases (Emory) - Please notify Infectious Diseases Team
  Reason for Consult? Positive Stahylococcus Aureus blood culture

Consults

Labs

Blood Culture

Repeat blood cultures

- ☑ Blood Culture
  P STAT, INPATIENT: Lab will collect all STAT and ASAP Blood Cultures. 5KSW, 5KE and 4ANB will be UNIT COLLECT for all Blood Cultures regardless of priority. TIMED should be used when the specimen is collected by the UNIT, ie; Nurse collect, collect from a procedure or central line insertion. AMBULATORY: Order as ASAP or STAT. Collect as usual. , ONE TIME First occurrence Today at 1435
  Draw blood culture from peripheral sites., Normal
- ☑ Blood Culture
  P STAT, INPATIENT: Lab will collect all STAT and ASAP Blood Cultures. 5KSW, 5KE and 4ANB will be UNIT COLLECT for all Blood Cultures regardless of priority. TIMED should be used when the specimen is collected by the UNIT, ie; Nurse collect, collect from a procedure or central line insertion. AMBULATORY: Order as ASAP or STAT. Collect as usual. , ONE TIME First occurrence Today at 1435
  Draw blood culture from peripheral sites., Normal

Remove / replace lines - only use lines needed- indicate by making one choice from each group below — Required

PICC lines — Required

If possible, avoid replacing PICC line for 48 hours to allow clearance of systemic infection.

- ○ PICC Line Needed
- ○ PICC line not needed

Central lines — Required

If possible, avoid replacing central line for 48 hours to allow clearance of systemic infection.

- ○ Central line needed
- ○ Central line not needed

Midline catheter — Required

- ○ Midline catheter
- ○ Midline Catheter not needed

Line management (source control)

Imaging

Transesophageal Echocardiogram

- ☐ CV Transesophageal Echo (TEE)
  ONE TIME
- ☑ CV Echocardiogram Transthoracic
  Routine, ONE TIME First occurrence Today at 1435

Echocardiograph

Antibiotics

Intervention Analysis

Outcome	Pre-Bundle (n=117)	*Post-Bundle (n=75)
In-hospital all-cause mortality, n (%)	14 (12.0)	5 (6.7)
30-day readmission rate, n (%)	30 (25.6)	12 (16.0)
Hospital LOS (days), median (IQR)	16 (10-32)	17 (10-25)
Infection-related LOS (days), median (IQR)	13 (9-25)	15 (10-21)
SAB order set utilization, n (%)	N/A	52 (69.3)

*preliminary data

▲ Outcomes

▼ Costs

Grady

Intervention Analysis

- In progress
  - Overall Total Bundle Compliance
  - Individual Bundle Element Compliance
- Present data to various groups

Bundle Implementation Timeline

- Identifying the problem
- Collect data
- Present data
- Bundle approval
- Go-live!
- Intervention analysis

Staphylococcus aureus Bacteremia Bundle Implementation

Jordan Wong, PharmD, BCPS

Grady Health System

Atlanta, Georgia

November 29, 2017

Grady