Georgia Department of Public Health

Bundle Up! Utilizing Care Bundles for Infectious Diseases

Presentation to: Antimicrobial Stewards

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Date: November 29th, 2017

We Protect Lives.

Learning Objectives

- Discuss the purpose of utilizing care bundles in clinical practice
- Identify specific infectious diseases for which evidence supports the use of care bundles
- Recall the benefits of utilizing bundles in the care of patients with infectious diseases
- Describe how care bundles can be utilized to enhance antimicrobial stewardship activities

Bundles in Healthcare

- The Institute for Healthcare Improvement (IHI) is one of the main drivers of the bundle concept
- Framework for addressing clinical conditions with evidence-based practices
- Consist of a set of interventions
  - Greater impact when performed together rather than individually
- Aim to ensure that patients receive recommended interventions on a consistent basis

http://www.ihi.org/Topics/Bundles/Pages/default.aspx

Bundles Versus Checklists

Bundles

- Consist of only critical tasks
- Tasks must be evidence-based
- Limited number elements
- Tied to accountability

Checklists

- Mixture of nice-to-do and have-to-do tasks
- Not necessarily evidence-based
- Many elements
- No one group/person accountable

http://www.ihi.org/Topics/Bundles/Pages/default.aspx

Successful Bundles

Necessary and Sufficient	• All components are needed • Removal of a component impacts patient outcomes
Evidence-based	• All components based on level 1 evidence • No controversy involved in components
Straightforward	• All-or-nothing measurement • No partial credit for doing some steps

http://www.ihi.org/Topics/Bundles/Pages/default.aspx

Audience Question

- Which of the following is true of bundles in healthcare?
  a. They aim to ensure patients receive recommended interventions on a consistent basis
  b. They generally consist of a long list of necessary tasks
  c. They can be applied successfully to scenarios where a clinical controversy exists
  d. All of the above

Bundles in Infectious Diseases

Infection Prevention

Care/Treatment

Care Bundles in Infectious Disease

- Sepsis
- *Staphylococcus aureus* Bacteremia
- Candidemia

Sepsis Bundle

To Be Completed Within 3 Hours of Time of Presentation
Measure lactate level
Obtain blood cultures prior to administration of antibiotics
Administration of broad spectrum antibiotics
Administer 30ml/kg crystalloid for hypotension or lactate ≥4mmol/L
To Be Completed Within 6 Hours of Time of Presentation
Apply vasopressors to maintain a mean arterial pressure (MAP) ≥65mmHg*
Re-assess and document volume status and tissue perfusion for patients with persistent hypotension (MAP < 65mmHg) after initial fluid administration or if initial lactate was ≥4mmol/L
Re-measure lactate if initial lactate was elevated

*only for hypotension that does not respond to initial fluid resuscitation

http://www.survivingsepsis.org/SiteCollectionDocuments/SSC_Bundle.pdf

Sepsis Bundle

- Purpose: Determine association between compliance with the Surviving Sepsis Campaign (SSC) performance bundles and mortality

- Setting: 218 community, academic, and tertiary care hospitals in the United States, South America and Europe

- Methods: enrolled facilities participated in a multi-faceted collaborative change intervention aimed at facilitating adoption of the SSC bundle

Intensive Care Med. 2014 Nov;40(11):1623-33

Sepsis Bundle

- Primary outcome: compliance with SSC bundles and associated mortality

- Characterized sites as either high or low compliance sites based on proportion of patients in compliance with bundle

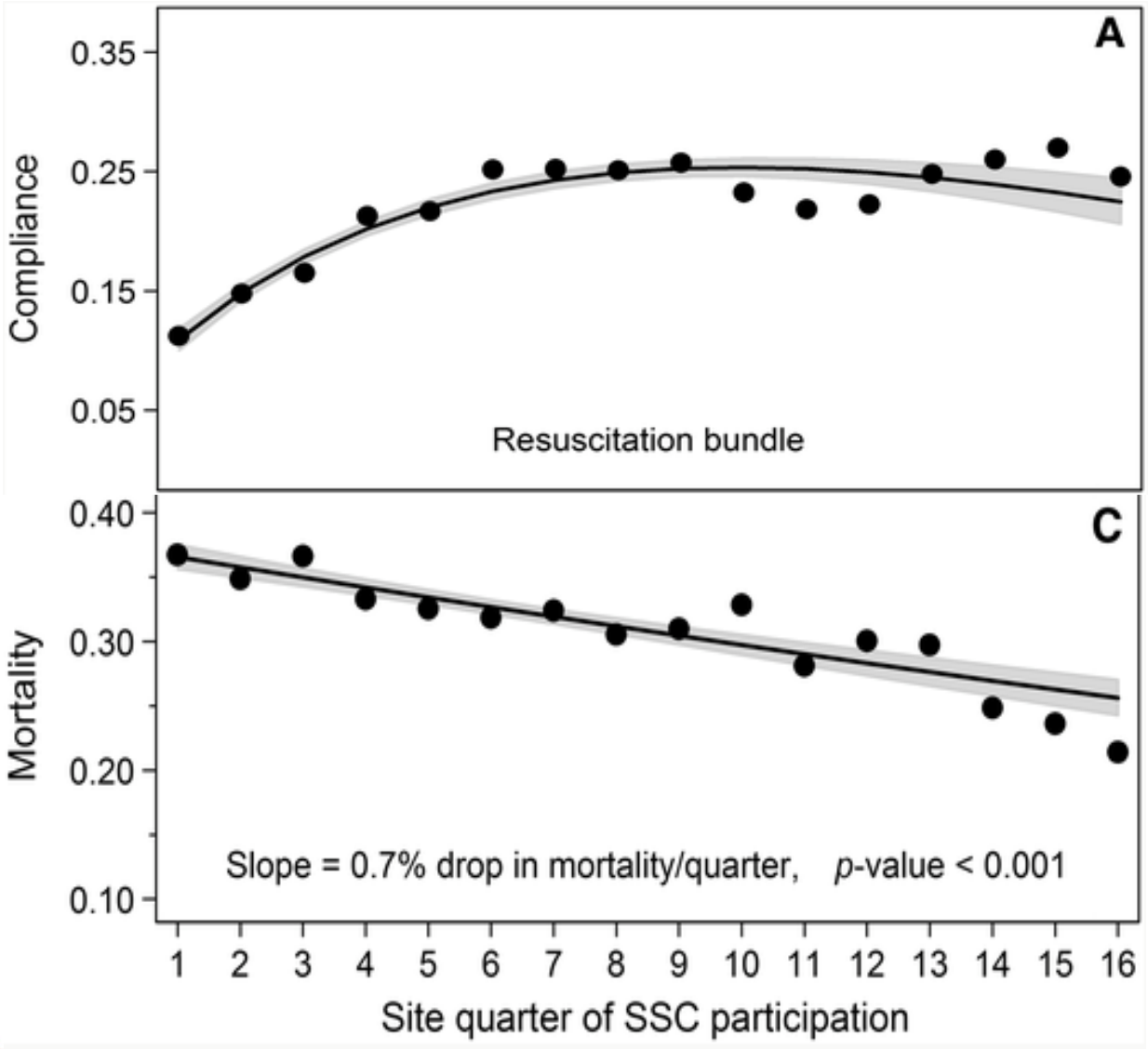
Intensive Care Med. 2014 Nov;40(11):1623-33

Sepsis Bundle

- Results
  - Lower mortality in high versus low compliance sites (29% vs. 38.6%, $p<0.001$)
  - Mortality rates dropped 0.7% per site for every 3 months of participation ($p<0.001$)
  - Hospital and intensive care unit length of stay decreased 4% for every 10% increase in site compliance with bundle ($p = 0.012$)

Intensive Care Med. 2014 Nov;40(11):1623-33

Sepsis Bundle



Intensive Care Med. 2014 Nov;40(11):1623-33

Audience Question

- Which of the following effects of bundle compliance were seen in this study?
  a. Decreased mortality
  b. Decrease hospital length of stay
  c. Decrease intensive care length of stay
  d. All of the above

Staph aureus Bacteremia Bundle

- Purpose: Evaluate the impact of a quality-of-care indicator based bundle on the management and prognosis of *Staph aureus* bacteremia

- Setting: 12 Spanish hospitals
  - 287 patients in the pre-intervention group
  - 221 patients in intervention group

- Methods: Bundle was developed based on systematic review of literature
  - Bundle's impact was assessed using a quasi-experimental study design

Clin Infect Dis. 2013 Nov;57(9):1225-33.

Staph aureus Bacteremia Bundle

Quality-of-Care Indicator	Definition
Follow-up blood cultures	Repeat blood cultures 48-96h after antimicrobial therapy is initiated
Early source control	Removal of nonpermanent vascular catheter or drainage of an abscess in < 72h
Echocardiography	Echocardiogram performed in patients with complicated bacteremia
Early use of beta-lactam therapy for methicillin-sensitive *Staph aureus* (MSSA)	Definitive therapy of beta-lactam started within first 24h after MSSA identified
Adjustment of vancomycin dose to target trough levels	Measure trough levels in patients treated for at least 3 days, with adjustments made to achieve trough level between 15 and 20mg/L
Treatment duration according to complexity of infection	At least 14 days of therapy for uncomplicated cases and 28 days for complicated cases

Staph aureus Bacteremia Bundle

- Primary outcome: adherence to bundle components and mortality

- Intervention: consisted of a set of written recommendations provided in a structured form by an infectious disease specialist at each hospital

Clin Infect Dis. 2013 Nov;57(9):1225-33.

Staph aureus Bacteremia Bundle

Quality-of-Care Indicator	Preintervention Period	Intervention Period	Median Improvement in Percentage of Adherence to QCI (IQR)	Relative Risk for Adherence to CQI (95% CI)	*P* Value	Adjusted OR for Adherence to QCI (95% CI)[a]	*P* Value
Follow-up blood culture	131/214 (61.2)	159/198 (80.3)	25 (5.9–54.4)	1.31 (1.15–1.49)	<.001	2.83 (1.78–4.49)[b]	<.001
Source control	86/122 (70.2)	105/115 (91.3)	22 (10.2–50)	1.29 (1.13–1.49)	<.001	4.56 (2.12–9.79)[c]	<.001
Echocardiography	76/144 (52.8)	74/101 (73.3)	18.8 (0–65.7)	1.38 (1.13–1.68)	.001	2.50 (1.42–4.41)[d]	.002
Early cloxacillin in MSSA	120/211 (56.9)	124/174 (71.3)	11.1 (0–51.1)	1.25 (1.07–1.45)	.014	1.79 (1.15–2.78)[e]	.009
Vancomycin dosing	23/49 (46.9)	30/54 (55.6)	20 (0–54.3)	1.18 (.80–1.73)	.38	1.42 (.65–3.10)[f]	.38
Treatment duration	151/207 (72.9)	161/189 (85.2)	10.2 (2–20.2)	1.16 (1.05–1.29)	.003	2.13 (1.24–3.64)[g]	.006

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Staph aureus Bacteremia Bundle

- Results
  - Intervention independently associated with improved adherence to:
    - Follow up blood cultures (OR 2.83, CI 1.78-4.49)
    - Early source control (OR 4.56, CI 2.21-9.79)
    - Early beta-lactam therapy for MSSA (OR 1.79, CI 1.15.3.78)
    - Appropriate treatment duration (OR 2.13, CI 1.24-3.64)
  - Decrease in 14-day mortality in post-intervention group (OR 0.47, CI 0.26-0.85)
  - Decrease in 30-day mortality in post-intervention group (OR 0.56, CI 0.34-0.93)

Clin Infect Dis. 2013 Nov;57(9):1225-33.

Audience Question

- Which of the following was NOT a component of the *Staph aureus* bacteremia bundle used in this study?
  a. Beta-lactam definitive therapy for MSSA
  b. Treatment duration of 14 days for uncomplicated cases
  c. Early infectious diseases consultation
  d. Echocardiography for complicated cases

Candidemia Bundle

- Purpose: Evaluate the impact of a nation-wide candidemia management bundle on clinical outcomes

- Setting: nation-wide study in Japan
  - 608 patients analyzed

- Methods: Bundle was developed by a committee under the Mycoses Forum in Japan
  - Compared clinical outcomes in patients with bundle compliance to those without bundle compliance

J Antimicrob Chemother. 2015 Feb;70(2):587-93

Candidemia Bundle

To be accomplished at the start of therapy
Removal of central venous catheter within 24h of diagnosis
Initial appropriate selection of antifungal agent
Initial appropriate dosing of antifungals
To be accomplished after initiation of therapy
Ophthalmological examinations
Follow-up blood cultures until clearance of candidemia
Assessment of clinical efficacy on the 3rd or 5th day to consider necessity of alternative therapy
Appropriate choice of alternative antifungals
At least 2 weeks of therapy after documented clearance of *Candida* from blood cultures
Step-down oral therapy for patients with favorable clinical course

Candidemia Bundle

- Primary outcome: bundle compliance rate and clinical success

- Clinical success was defined as resolution of all attributable signs and symptoms associated with candidemia

Candidemia Bundle

Phase	Elements of the bundles	Population	No. of patients with achievement of the elements (%)
Bundles at the start of therapy	1. removal of existing CVCs within 24 h of diagnosis	patients with CVC placement	414/510 (81.2)
	2. initial appropriate selection of antifungals	all	534/608 (87.8)
	3. initial appropriate dosing of antifungals	all	464/608 (76.3)
Bundles after initiation of therapy	4. ophthalmological examinations	all	326/608 (53.6)
	5. follow-up blood cultures until clearance of candidaemia	all	368/608 (60.5)
	6. assessment of clinical efficacy on the third to fifth day	all	514/608 (84.5)
	7. appropriate choice of alternative antifungals	patients with alternative therapy	269/345 (78.0)
	8. at least 2 weeks of therapy after documented clearance of *Candida* from bloodstream	all	327/608 (53.8)
	9. step-down oral therapy	all	148/608 (24.3)

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Candidemia Bundle

- Results
  - Higher rate of clinical success in patients with bundle compliance (92.9% vs 75.8%, p=0.011)
  - Compliance with bundles failed to be an independent factor associated with clinical success
    - Exclusion of step-down oral therapy from elements of compliance
  - Individual bundle elements contributing to clinical success included:
    - Removal of central venous catheters within 24h
    - Assessment of clinical efficacy on day 3 or 5 of treatment
    - At least 2 weeks of therapy after clearance of candidemia
  - Decrease in mortality also noted in bundle compliant group (p=0.054)

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Audience Question

- Which of the following outcomes was associated with bundle compliance in this study?
  a. Decreased hospital length of stay
  b. Decreased infection-related readmission
  c. Increase in clinical success
  d. Increase in infection-free survival

Conclusions

- Care bundles aim to ensure that all patients receive recommended interventions on a consistent basis
- Successful care bundles are evidence-based, concise, and straightforward
- Evidence supports use of care bundles for sepsis, *Staph aureus* bacteremia, and candidemia
- Care bundles have been shown to reduce mortality for the above disease states

Questions?

- Type any questions you have in the chat box and we will address them at the end of the webinar