The Integration of Infection Control and Antimicrobial Stewardship with Sepsis Initiatives

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About Kennedy Health

Fast Facts

- 2016 revenue: $610.7 million
- 4,800+ associates in all hospitals and subsidiaries
- More than 1,000 physicians

Total # Licensed Beds: 607

- 196 - Kennedy-Cherry Hill
- 181 - Kennedy-Stratford
- 230 – Kennedy - Washington Township
Learning Objectives

• Define Sepsis and Antimicrobial Stewardship
• Understand how infection prevention can help prevent cases of sepsis
• Review of cultures can help to combat sepsis
The Kennedy Health Integrated Model of Stewardship

Infection Control  Antimicrobial Stewardship  Sepsis
Define Sepsis and Antimicrobial Stewardship
Sepsis Defined

Understanding Sepsis

What is Sepsis?
Sepsis is a toxic response to an infection. Every year, severe sepsis strikes more than a million Americans. According to the Centers for Disease Control (CDC), up to 50 percent of these people die — far more than the number of U.S. deaths from prostate cancer, breast cancer and AIDS combined. Sepsis occurs when the body is fighting an infection, like pneumonia or a urinary tract infection (UTI). Sepsis is a medical emergency that requires early detection and treatment.

What are Some Signs and Symptoms of Sepsis?
- a fast heart rate
- fever
- breathing too quickly
- low blood pressure
- too little urine
- mental confusion
Treating Sepsis

How Is Sepsis Treated?
With antibiotics. Patients are also often given IV fluids.

How can Sepsis be Prevented?
- If you have an infection and generally don’t feel well, see your primary healthcare provider.
- Ask people to wash their hands to prevent the spread of germs.
- Get your flu shot!
- If you have certain medical conditions, or are elderly, ask your doctor or nurse if you should get a pneumonia vaccine.

How Can I Get More Information?
Visit the Centers for Disease Control & Prevention (CDC) website: http://www.cdc.gov/sepsis/.
Speak Up! Let's Beat Sepsis Together.

Tell your nurse if you or a loved one experience these symptoms:

- Fever or Chills
- Faster Heartbeat
- Confused, "Not Acting Right"
- Faster Breathing
Sepsis and Survival
Sepsis: Putting It All Together

**SEPSIS**
- Sepsis is two of the following, plus a source of infection:
  - Temperature < 96.8 or > 100.4
  - Heart rate > 90
  - Respiratory rate > 20
  - WBC > 12 or < 4
  - Bandemia > 10%

If you have identified Sepsis, draw a STAT Lactate in accordance with RN Initiated Lactate Aodd Policy.

Call a physician immediately if lactate > 2.

**SEVERE SEPSIS**
- Sepsis (see left column) plus evidence of organ damage/dysfunction. End-organ damage is any of the following:
  - Lactate > 2
  - Altered mental status
  - Acute kidney injury
  - Elevated troponin levels
  - Acute respiratory distress syndrome
  - New/Worsened elevation of ALT and AST
  - Urine output < 0.5 ml/kg/hr
  - New/Worsened platelet count < 100

Call an RRT for sepsis evaluation in your patient.

**SEPTIC SHOCK**
- Septic Shock is Severe Sepsis (see middle column) plus hypotension despite a 30 ml/kg NSS IVF bolus.

Call an RRT if this is your patient. If your patient remains hypotensive, after the above bolus, he/she will be transferred to the ICU.
Sepsis Cascade

SEPSIS

SIRS CRITERIA WITH INFECTION

SEVERE SEPSIS

SEPSIS AND ORGAN DYSFUNCTION
LACTIC ACID > 2

SEPTIC SHOCK

SEVERE SEPSIS WITH
BP REFRACTORY TO 30 cc/kg, PRESSOR(S)
LACTIC ACID > 4
3-Hour Bundle to Beat Sepsis

**LACTIC ACID AND BLOOD CULTURES**
- Blood cultures BEFORE antibiotics!

**BROAD-SPECTRUM ANTIBIOTICS**
- Antibiotic(s) tailored to the specific patient and the possible bacteria

**30 cc/kg IVF FOR HYPOTENSION OR LACTIC ACID ≥ 4**
- Exact amount must be reached for 30 cc/kg bolus
qSOFA Score

• Quick Sepsis Organ Failure Assessment Score – when suspect infection, predict who is at risk for mortality. Higher the score = greater risk.

• Score = 0 to 3.

• 1 point for low blood pressure (SBP≤100 mmHg), high respiratory rate (≥22 breaths per min), or altered mentation (Glasgow coma scale<15).

• qSOFA reference site: www.qsofa.org
qSOFA Calculator

qSofa Calculator: http://qsofa.org/calc.php
Sepsis-3


• 2015 Definition of sepsis as “life-threatening organ dysfunction caused by a dysregulated host response to infection.”

• 2015 Clinical Criteria for sepsis: Suspected or proven infection and organ dysfunction (an increase in SOFA score of ≥2 points).
Sepsis-3: Sepsis and Septic Shock

• 2015: No more mention of severe sepsis.
• 2015 Definition of septic shock as “a subset of sepsis in which underlying circulatory and cellular/metabolic abnormalities are profound enough to substantially increase mortality.”
• 2015 Clinical Criteria for septic shock: sepsis + vasopressor for MAP ≥ 65 and lactic acid > 2, even with adequate IVF.
Antibiotic Stewardship, Defined

Infectious Diseases Society of America (IDSA):

– “…coordinated interventions designed to improve and measure the appropriate use of antimicrobials by promoting the selection of the optimal antimicrobial drug regimen, dose, duration of therapy, and route of administration.”

– Antibiotic dose, duration, and route for a specific indication.
Antibiotic Stewardship: Goals

• IDSA:
  – “Antimicrobial stewards seek to achieve optimal clinical outcomes related to antimicrobial use, minimize toxicity and other adverse events, reduce the costs of health care for infections, and limit the selection for antimicrobial resistant strains.”
  – Reduction in *Clostridium difficile* infection (CDI).
# Antimicrobial Stewardship: Admission Through Discharge

<table>
<thead>
<tr>
<th>AT ADMISSION</th>
<th>HOSPITAL COURSE</th>
<th>AT DISCHARGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source of the infection</td>
<td><strong>Antibiotic Time-Out:</strong> Antimicrobial necessity</td>
<td><strong>Medication Reconciliation</strong></td>
</tr>
<tr>
<td>Labs, cultures &amp; studies</td>
<td>- If NO infection, STOP</td>
<td>- Assess necessity for</td>
</tr>
<tr>
<td>Review old cultures</td>
<td><strong>De-escalate antimicrobials to most narrow spectrum based on culture results,</strong></td>
<td>antimicrobials, narrow</td>
</tr>
<tr>
<td>Clarify antibiotic allergies</td>
<td>if available</td>
<td>spectrum, dose,</td>
</tr>
<tr>
<td>Age/Cr/seizures/QTC</td>
<td><strong>Antimicrobial dose, duration, and stop date based on site of infection</strong></td>
<td>duration, and stop date</td>
</tr>
<tr>
<td>Antimicrobial selection based</td>
<td></td>
<td></td>
</tr>
<tr>
<td>on most likely source/pathogen(s)</td>
<td></td>
<td>If antimicrobials are</td>
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<td></td>
<td>no longer needed, STOP</td>
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<tr>
<td></td>
<td></td>
<td>Counsel patient on</td>
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<td></td>
<td></td>
<td>taking antimicrobials as</td>
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<td>prescribed</td>
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Kennedy Health, CDiff Task Force, 2015
The Right Antibiotic Makes a Difference!

**Figure 2.** Survival rate according to the presence of shock and empiric antibiotic treatment (log-rank test, p < 0.001).

- **A:** Sepsis/Severe sepsis and appropriate treatment
- **B:** Sepsis/Severe sepsis and inappropriate treatment
- **C:** Septic shock and appropriate treatment
- **D:** Septic shock and inappropriate treatment

*CHEST 2003; 123:1615–1624,*
Understand How Infection Prevention Can Help Prevent Cases Of Sepsis
The Relationship of Infection Prevention to Sepsis and Antimicrobial Stewardship

- To reduce the chances of employing broad-spectrum antibiotics for sepsis, prevent infections from occurring in the first place.

- To reduce the chances of acquiring multi-drug resistant pathogens, which makes treatment of sepsis more challenging, emphasize infection control measures.
For example: How to Prevent Multi-Drug Resistant CRE

- CRE – Carbapenem-Resistant Enterobacteriaceae
- Hand Hygiene
- Contact precautions if infected/colonized with CRE
- Minimize use of devices (ventilator, central line)
- Antimicrobial Stewardship
- Environmental cleaning
Educate Patients (and their Families) About Infection Prevention, Antibiotic Stewardship & More

• The informed patient is more likely to be compliant with therapy, and can be a “co-pilot” in preventing infection and in understanding when antibiotics are needed - and when they are not.

• The informed family member can also learn how to prevent infection.
Staff Reminders

PREVENT SEPSIS BEFORE IT OCCURS!

PREVENT CLABSIs and CAUTIs
Follow Central Line & Urinary Catheter Policies. Remove all lines and Foleys if not medically necessary.

PREVENT CDIFF
Choose appropriate antibiotic dose, duration, and stop date. Use PPIs and H2 blockers when medically indicated.

PREVENT SURGICAL-SITE INFECTIONS
Follow SCIP protocol. Practice appropriate post-op incisional care.

REMEMBER:
• Wash your hands. Every time – everyone!
• Proactively manage high-risk patients.
• Educate patients about infection prevention.

PREVENT ASPIRATION PNEUMONIA
Maintain 30 degree elevation for feeding and oral care.

PREVENT PERITONITIS
Be aware of constipation, obstruction, and abdominal perforation.

Kennedy Health
Patients Can Acquire Device-Related Infections and Get Septic From This.

Any device foreign to the human body is a risk factor for infection, but the risk for infection can be decreased with attention to infection prevention at insertion, maintenance, and removal when no longer necessary.
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Life Cycle Approach

CLABSI Prevention: Preventing Infections throughout the Life Cycle of a Central or PICC Line

Before Insertion: Evaluate Peripheral IV options, IV to PO meds, and line necessity

Line Insertion Bundle: Perform Hand Hygiene, Time-Out, Upper Site Preferred, Chlorhexidine Prep, Maximal Barrier Precautions, US Guidance

Maintenance Bundle: Execute Hand Hygiene, Hub Care, Site Care, Tubing Care, # Line Days and Line Site

Line Removal: Ask daily if line is absolutely necessary. Remove central lines before leaving ICU!

THE KENNEDY CLABSI TASK FORCE, 2013

KENNEDY HEALTH SYSTEM
Five Precautionary Steps

- Wash Your Hands!
- Scrub the Hub!
- Change Tubing Every Four Days!
- Change Dressing Every Seven Days or if Loose or Soiled!
- Document Daily!
Focus on Hand Hygiene

Prevent Catheter-Associated Urinary Tract Infections (CAUTIs)

**Hand Hygiene**

**Insertion**
- Indicators for Foley
- Peri-Care prior to insertion
- Each insertion attempt requires new kit
- Alternatives:
  - Straight catheter
  - Urinal
  - Texas catheter

**Maintenance**
- Red seal intact
- Peri-care
- Keep bag below the bladder & above floor
- Empty bag before transport
- Stat lock present
- Proper technique if hand irrigation needed (U-1 Policy)

**Removal**
- Reassess daily if Foley is needed
- Assess for constipation, a risk factor for urinary retention
- Reassess if catheter is chronic

**Re-insertion**
- Reassess indicators for Foley
- Bladder scan and straight catheter x 2
- Check U1 (Foley) Policy for reinsertion

Kennedy CLABSI and CAUTI Task Force
**CDiff Colonization vs. CDiff Infection**

- Colonization is more common than infection.
  - No symptoms AND +CDiff test.
- Infection = CDiff symptoms AND +CDiff test.
- **CDiff FAQ**
  https://www.cdc.gov/hai/organisms/cdiff/cdiff_faqs_hcp.html
Clostridium difficile (CDiff) Infection

- Is the diarrhea just antibiotic-associated/tube-feeds/laxatives? If yes, would NOT check CDiff.
- If the patient has two infections - CDiff and a second infection - can the antibiotic for the infection be changed to one less likely to irritate the CDiff?
- If an infection needs to be treated (and there is no CDiff), can one be chosen which is less likely to induce CDiff?
# Antibiotics: A Risk Factor for CDiff

## High Risk for CDiff
- Clindamycin (Cleocin®)*
- Ceftriaxone (Rocephin®)*
- Ciprofloxacin (Cipro®)*
- Levofloxacin (Levaquin®)*
- Cefepime (Maxipime®)
- Ceftazidime (Fortaz®)
- Cefuroxime (Ceftin®)
- Ertapenem (Invanz®)
- Meropenem (Merrem®)

*Highest Association with CDiff

## Medium Risk for CDiff
- Piperacillin/tazobactam (Zosyn®)*
- Amoxicillin/clavulanic acid (Augmentin®)*
- Ampicillin/sulbactam (Unasyn®)
- Amoxicillin (Amoxil®)
- Ampicillin
- Azithromax (Zithromax®)
- Aztreonam (Azactam®)
- Cefazolin (Ancef®)
- Cephalexin (Keflex®)
- Dalfopristin/-quinupristin (Synercid®)

## Low Risk for CDiff
- Amikacin (Amikin®)
- Daptomycin (Cubicin®)
- Doxycycline (Vibramycin®)
- Fosfomycin (Monurol®)
- Gentamicin
- Linezolid (Zyvox®)
- Nitrofurantoin (Macrobid®)
- Polymixin (Colistin®)
- Rifampin (Rifadin®)
- Trimethoprim/-sulfamethoxazole (Bactrim®)

*Kennedy CDiff Task Force, 2015*
Additional Nursing Initiatives

- Device infection drill-down with key stakeholders.

- Lessons learned shared through shift huddles, department newsletters, safety call reports.

- Urinary Catheter Rounds: shift Nursing Supervisor rounds with Charge Nurse.

- Charge Nurse and Nursing Supervisor rounds: all patients discharged from ICU to intermediate unit to assess transition status.
Infection Control and Prevention
Drill-Down Case Review

The following data points used for discussion and review of any device related/non-device infections:

- Attendees
- Date of hospital admission
- Date of drill-down
- Reason for case review
- Unit/location of patient when device inserted
- Date/time of device insertion
- Date of positive cultures
- Antibiotics used
- Review of bundle elements—met/unmet
- General discussion of clinical course
- Lessons learned

- How information to be disseminated back to clinical staff:

This form is not part of the permanent record. Review of information is shared at Patient Safety Committee.
Review of Cultures Can Help Combat Sepsis
Nursing Antibiotic Rounds: Reviewing a Culture

- To promote awareness of antimicrobial stewardship for nursing systemwide.
- Nurse rounds 1:1 with IP and clinical nurse to review why patient is on antibiotic(s).
- Discussed microbiology report and its relation to ordered antibiotic.
- Brought discussion to physician.
Kennedy Health: Preliminary Findings of Nursing Antibiotic Rounds

Findings:

• Not familiar with how to interpret microbiology report.
• Not familiar with all classes of antibiotics.
• Do not see uniqueness of antibiotics.
• *Potassium analogy to antibiotics.*
Kennedy Nursing
Antimicrobial Stewardship Course

• Synthesize the interpretation of the Culture and Sensitivity report.
• Identify actions, indications and dosing for Antibiotics.
Match a Culture with an Antibiotic

• Pre- and post-knowledge assessment in one Critical Care Unit.
• Results -> review by IP and Clinical Educator.
• Post knowledge assessment -> improved understanding/reading of microbiology report.
Tailoring an Antibiotic to a Culture

• Get on an appropriate antibiotic to fight against sepsis.
• IP and clinical nurse rounded -> informed primary service or infectious diseases to review antibiotic and microbiology report.
• Teamwork to get the patient on a susceptible antibiotic.
Examples of Kennedy’s Antimicrobial Stewardship Initiatives


• Mandatory ID Consult for any patient
  1) who has sepsis, severe sepsis, and septic shock.
  2) on more than two antibiotics.
  3) who has *CDiff*.
Blood Cultures

- Blood cultures = 24 hrs category, 48 hrs name of pathogen, 72 hrs sensitivity results.
- Bacteria can come in different categories and different shapes.
  - Cocci looks like a circle.
  - Rod looks like a small rod.
- Two of the most common bacterial types are categories of gram negative or gram positive.
- If you put them together, you might get a preliminary result called to nursing, eg., “gram negative rods,” or “gram positive cocci.” These are “positive blood cultures.”
Timing

• However, that initial *preliminary result* takes time to come back. It roughly takes about 24 hours after bcx are drawn, and sometimes 36 hours if drawn in the afternoon or evening.

• So, if a patient has an infection or is septic (think 3-hour bundle), *empiric antibiotics* are often given. Empiric means you choose an antibiotic that could work for the patient—specific to the type of infection you *believe is going on* (while you wait for cultures to incubate).
Sepsis and Blood Cultures

• It is important to recognize that people who have sepsis do not necessarily have positive blood cultures.

• Also, if you have a positive blood culture, they can be pathogenic (=sepsis), or contaminants, eg., if the skin is not cleaned properly, if the technician does not properly handle specimen (=Not a pathogen).

• Every blood culture is held – incubated for 5 straight days—sneaky—HD patients who have positive blood cultures can have “late growth” – positive blood cultures after more than 24 hours.
Adjustments in Antibiotics

• **Example:** Let’s say that a 70-year-old man comes in septic. He is given empiric cefazolin pending cultures.
• Microbiology calls that this patient has *gram positive cocci* in the blood. RN calls physician.
• Physician reviews differential diagnosis of *gram positive cocci*.
• Let’s say the physician chooses to continue cefazolin.
Sensitivity Results

• In the petri dish, which antibiotics would definitely work for your bugs? Generally speaking:
  
  ▪ **S** = sensitive; it works (some exceptions, eg. MSSA, MRSA)
  ▪ **I** = indeterminate
  ▪ **R** = resistant; that antibiotic does NOT work.
Sensitivity Results, cont’d

• A number is listed next to each sensitivity result = minimum inhibitory concentration -> lowest concentration of antimicrobial to inhibit growth of bacteria after overnight incubation.

• For MRSA, if vancomycin is sensitive but MIC = 1.5 to 2, chance vancomycin might not work.
### Blood Culture Example Sensitivity Results

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th><em>Staphylococcus aureus</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ceftaroline</strong></td>
<td>0.5 S</td>
</tr>
</tbody>
</table>
Summary

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How to Contact Us

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