THE INTERSECTION OF ANTIMICROBIAL STEWARDSHIP AND LONG TERM CARE

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INTRODUCTION

- Assistant Professor of Infectious Diseases at the University of Alabama at Birmingham
- Member of the Antimicrobial Stewardship Committee at UAB
- Co-chair of Antimicrobial Stewardship Program at Birmingham VA Medical Center

LEARNING OBJECTIVES

- Define antimicrobial stewardship
- Advocate for the role of nursing in antimicrobial stewardship
- Communicating the risks and benefits of antibiotics with patients and families

DISCLOSURES

- None relevant to today's discussion

WHAT IS ANTIMICROBIAL STEWARDSHIP

- Five Rights of Medication Use
  - Right Drug
  - Right Patient
  - Right Time
  - Right Dose
  - Right Route
- Right duration
- Measure and improve these rights as they apply to antibiotics

OUTLINE

- Overview of Antimicrobial Stewardship
- Review of McGeer's Criteria
- Application of:
  - Right Patient
  - Right Duration
- Question and Answer

WHY?

- Improve patient outcomes
- Reduce adverse events
- Limit antibiotic resistance

WHO CAN PERFORM THESE ROLES?

- Everyone can and should
- Most stewardship programs are designed around the inpatient setting
- Outpatient and long-term care have different needs and structures, design of stewardship program and/or initiatives must take this into account

WHO?

- Should be multi-disciplinary – Teamwork makes the dream work
- Medical Director
- Infection preventionist(s)
- Nursing – no one spends more time with the patient
- Administration

NURSING

Table 1. Overlap of Nursing Activities With Function Attributed in Current Antimicrobial Stewardship Models

	Nursing	Microbiology	Case Management	Pharmacy	Infectious Diseases	Infection Control	Inpatient Physician	Administration
Patient admission								
Triage and appropriate isolation	•					•		
Accurate allergy history	•			•	•		•	
Early and appropriate cultures	•				•		•	
Timely antibiotic initiation	•				•		•	•
Medication reconciliation	•			•			•	
Daily(24 h) clinical progress monitoring								
Progress monitor and report	•		•		•		•	
Preliminary micro results and antibiotic adjustment	•	•		•	•		•	
Antibiotic dosing and de-escalation	•			•	•		•	
Patient safety & quality monitoring								
Adverse events	•			•	•		•	
Change in patient condition	•				•		•	
Final culture report and antibiotic adjustment	•	•		•	•	•	•	
Antibiotic resistance identification	•	•			•	•	•	
Clinical progress/patient education/discharge								
IV to PO antibiotic, outpatient antibiotic therapy	•		•	•	•		•	
Patient education	•				•	•	•	
Length of stay	•		•		•		•	•
Outpatient management, long-term care, readmission	•		•		•	•		•

Abbreviations: IV, intravenous; PO, per os (oral).

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Olans et al, Clin Infect Dis, 2016

CASE #1

- Elderly woman with a history of recurrent “UTIs” complains of symptoms similar to prior episodes
- When asked to describe further, symptoms are cloudy urine with odor. No dysuria or suprapubic pain. Further states this is always how it starts, always resolves with antibiotics.
- No fevers, no other symptoms
- U/A and culture are sent, empiric antibiotics started
- 5 days later, begins having profuse watery diarrhea, abdominal pain, and ultimately requires transfer to the local ER

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ANTIBIOTICS ARE RISKY

- Direct toxicity – risks exists for every organ
  - Liver
  - Kidney
  - Bone Marrow
  - Dermatologic
  - Electrolytes
  - Neurologic
- Allergic reactions
- Risk of sepsis after a hospital stay higher if patient received antibiotics
- 13% of adult ED visits for adverse drug events (ADE) are due to antibiotics
- Promotion of antimicrobial resistance

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Baggs et al, Clin Infect Dis, 2018;
Geller et al, J Gen Intern Med 2018
Tamma et al, JAMA Intern Med 2017

C. DIFFICILE COLITIS

- Most common organism that causes a healthcare associated infection (HAI)
- Gastrointestinal infection is the second most common HAI, after pneumonia
- Rate is stable over time, while overall HAI rates decline

Magill et al, NEJM, 2018

MCGEER'S CRITERIA - DEFINITIONS

CONSTITUTIONAL DEFINITION

- Fever
  - Single oral temp >100°
  - Repeated temp >99° (oral) or 99.5° (rectal)
  - Rise of 2° from baseline regardless of site
- Leukocytosis
  - >14k total white blood cells
  - >6% or >1,500 bands
- Change in mental status
  - Acute
  - Fluctuating
  - Inattention
  - Disorganized or decreased consciousness
- Acute functional decline
  - 3 point increase in dependence compared to baseline
  - 0-4 scale
  - 7 categories
    - Bed mobility
    - Transfer
    - Locomotion
    - Dressing
    - Toileting
    - Personal hygiene
    - Eating

RESPIRATORY TRACT INFECTION

- Common cold syndrome or pharyngitis (must meet two)
  - Runny nose, stuffy nose, sore throat or hoarseness or trouble swallowing, dry cough, or cervical LAD
- Influenza-like
  - Must have Fever + any 3 of: chills, headache or eye pain, myalgias or body aches, malaise or anorexia, sore throat, or new/increased cough
- Pneumonia
  - New infiltrate on CXR, at least 1 constitutional criterion, at least 1 of the following: new/increased cough, new/increased sputum, new/increased hypoxia, new lung physical exam findings, pleuritic chest pain, or tachypnea
- Lower RTI
  - Same as pneumonia with no or negative CXR with at least 2 symptom/exam criteria

URINARY TRACT INFECTION

- Without catheter:
  - At least 1 of:
    - Acute dysuria or pain/swelling/tender testes/epididymis/prostate
    - Fever or leukocytosis with at least 1 corresponding symptom: CVA tenderness, suprapubic pain, hematuria, new/increased incontinence/urgency/frequency
    - Lacking fever/leukocytosis then 2 or more signs/symptoms
  - Microbiologic criteria:
    - Voided urine: >100,000 cfu/mL
    - In/out catheter: >100 cfu/mL
- With catheter
  - At least 1 of:
    - Fevers/rigors/hypotension without alternative site of infection
    - Leukocytosis plus: acute change in mental status or functional decline
    - New suprapubic or CVA tenderness
    - Purulent discharge around catheter with testicle/epididymis/prostate pain
  - Culture >100,000 cfu/mL (after catheter replacement)

SKIN AND SOFT TISSUE INFECTION

- Cellulitis, soft tissue, or wound infection
  - Pus at wound/skin/soft tissue
  - New/increasing evidence of at least 4 of the following: heat, redness, edema, tenderness, serous drainage, constitutional criterion
- Scabies
- Candidiasis
- Herpes virus (HSV, Zoster)
- Conjunctivitis

CONSIDER THIS MORE A SET OF GUIDELINES THAN ACTUAL RULES

RIGHT PATIENT

CASE #1 - REVISITED

- Elderly woman with mild dementia and a history of recurrent “UTIs” complains of symptoms similar to prior episodes
- When asked to describe further, symptoms are cloudy urine with odor.
- No dysuria or suprapubic pain.
- States this is always how it starts, always resolves with antibiotics.
- No fevers, no other symptoms

WHAT NEXT?

- Urinalysis and culture?
- Urinalysis, but only culture if abnormal?
- Treat empirically?
- Do nothing?
- Presume treatment chosen…
- What is the goal? Normalization of odor?
- If odor gone the next day, stop antibiotics then or complete a course?
- What if the odor is gone before labs come back and/or antibiotics are started?
- What if the odor never leaves?

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Nace et al, JAMDA, 2014

MULTIPLE CAUSES REQUIRE MULTIPLE SOLUTIONS

- ☐ Obtain vital signs (BP, Pulse, Resp Rate, Temp, Pulse Ox) every ____ hours for ____ days.
- ☐ Record fluid intake each shift for _____ days.
- ☐ Notify physician if fluid intake is less than _____ cc daily.
- ☐ Offer resident _____ ounces of water / juice every _____ hours.
- ☐ Notify physician, NP, or PA if condition worsens, or if no improvement in _____ hours.
- ☐ Obtain the following blood work _____.
- ☐ Consult pharmacist to review medication regimen.
- ☐ Contact the physician, NP, PA with an update on the resident's condition on _____.

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METHODS TO IMPROVE STEWARDSHIP

- Small group educational sessions
- Utilization of an ID Consult service/team
- Algorithms and guidelines, ideally developed with input of staff and not just external consultants
- Empowering nurses to question decisions that occur outside algorithms and guidelines
- Audit and feedback of individual practices +/- comparison with peers
- Pocket cards, resources for guidance
- Repetition of the above for reinforcement

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CASE #2

- Male patient with 24 hours of cough. Subjective fevers with myalgias and arthralgias
- On exam:
  - Temperature 99.0, HR 90, BP 135/76, O2 sat 99% on room air
  - Chest clear with the exception of scattered, slight wheezes
  - Remainder of exam consistent with baseline
- Family present, worried about pneumonia

WHAT NEXT?

- Chest x-ray?
- Labs or other diagnostics?
- Empiric antibiotics?

- Presume clear chest x-ray:
- Antibiotics for bronchitis?

- Change patient presentation – sinus pressure with post-nasal drainage and productive cough?
- Antibiotics vs. watchful waiting?

ACUTE SINUSITIS

- From ENT Clinical Practice Update Guidelines, when bacterial infection suspected:
  - Cure or improvement rates at 7 to 15 days favored antibiotics but the clinical benefit was small: 91% for antibiotic therapy vs 86% for patients who received placebo. The number needed to treat for benefit ranged from 11 to 15 patients and odds ratios for overall treatment effect ranged from 1.25 to 1.87.
  - Duration of pain or illness associated with ABRS did not show any consistent relationship to initial management.[113]
  - Adverse events were more common in the antibiotic-treated patients (odds ratio, 1.87 to 2.10; number needed to harm, 8.1), but the rate of dropout due to adverse events was small (1%-1.5%) and similar between both groups.
  - Complications were similar regardless of initial management.

BRONCHITIS

- Generally viral, but an increasingly common reason for the prescription of antibiotics
- Color/character of the sputum does not help discern bacterial vs. viral
- Minimal apparent benefit of antibiotics in published literature
- Framing of condition, education of potential risks of antibiotics can help patients/families understand need to avoid unless truly indicated

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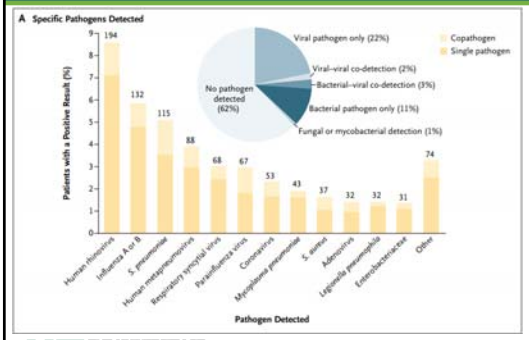
Baggs et al, Clin Infect Dis, 2018;
Geller et al, J Gen Intern Med 2018
Tamma et al, JAMA Intern Med 2017

PNEUMONIA – BACTERIAL VS. VIRAL



Jain et al, NEJM, 2015

RIGHT DURATION

CASE #3

- Female patient admitted to the hospital for bacterial pneumonia.
- Stayed for 4 days receiving IV antibiotics
- Discharged to complete a further 6 days of oral antibiotics

CASE #4

- 68yo M with heart failure, chronically volume overloaded
- Legs stay edematous
- Noticed to have increasing erythema of the right lower leg with warmth, tenderness, and subjective fevers
- Started on oral antibiotics
- Some symptomatic relief noted quickly, but no improvement of erythema until day 4
- On day 7, improving but still a fair amount of residual erythema

RIGHT DURATION

- Old dogma: take the full course of antibiotics or the infection may return with resistance
- New reality: the more we expose micro-organisms to antibiotics, the more likely they are to develop resistance. Goal should be treat only for shortest required duration.

SHORTER CAN BE BETTER

The New Antibiotic Mantra – "Shorter is Better" – Brad Spellberg
Clinical Infectious Diseases, 2019

Diagnosis	Short (d)	Long (d)	Result
Community-acquired pneumonia [6–14]	3 or 5	7, 8, or 10	Equal
Hospital-acquired/ventilator-associated pneumonia [15, 16]	7–8	14–15	Equal
Complicated urinary tract infections/pyelonephritis [17–22]	5 or 7	10 or 14	Equal
Complicated/postoperative intraabdominal infections [23, 24]	4 or 8	10 or 15	Equal
Gram-negative bacteremia [25]	7	14	Equal
Acute exacerbation of chronic bronchitis/chronic obstructive pulmonary disease (meta-analysis of 21 trials [26])	≤5	≥7	Equal
Acute bacterial skin and skin structure infections (cellulitis/major abscess) [27–29]	5–6	10	Equal
Chronic osteomyelitis [30]	42	84	Equal
Empiric neutropenic fever [31]	Afebrile and stable × 72 h	Afebrile and stable × 72 h and with absolute neutrophil count > 500 cells/μL	Equal

CONSIDERING CASE #3

- Pneumonia duration of therapy
- 5 days for CAP, 7 days for HAP/VAP
- Vaughn et al – 2/3 of patients received longer than expected duration
- Did not decrease rate of adverse outcomes
- Did increase rate of antibiotic associated adverse event – 5% per day

Vaughn et al, Annals Int Med, 2019

CONSIDERING CASE #4

- Infectious mimics
  - Stasis dermatitis
  - Contact dermatitis
  - Lymphedema
  - Lipodermatosclerosis
- True cellulitis – patients with heart failure slower to show improvement
  - Ihm et al – heart failure and obesity known risk factors for development of cellulitis
  - Longer duration group had more treatment failures

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Ihm et al, OFID, 2019

RISKS OF MULTI-DRUG RESISTANCE

- What are the costs of MDRO?
  - Excess cost and length of stay for infection caused by MDRO vs. not[5]
  - Society costs of excess mortality and lost productivity exceed $10 million, on the basis of 188 patients with MDRO infection[5]
- Mortality and risk related to MDRO
  - Mortality in patients with infection compared to colonization
    - Carbapenem-resistant *K. pneumonia*
    - If pneumonia or bloodstream infection, 2-3x increased hazard of in-hospital death
  - ESBL carrier and surgical site infection
    - 2x risk of infection
    - 2x risk of deep infection
    - 4x risk of the infection being caused by ESBL

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1. Anderson et al, Clin Infect Dis 2017 (Suppl1)
2. Barnes et al, Infect Control Hosp Epidemiol 2017
3. Barlam et al, Clin Infect Dis 2016
4. Tamma et al, Clin Infect Dis 2017
5. Roberst et al, Clin Infect Dis 2009

WRAP-UP

- Six Rights of Antimicrobial Stewardship
  - Right Patient
  - Right Drug
  - Right Time
  - Right Dose
  - Right Route
  - Right Duration

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THANK YOU

- Questions?
- Feel free to email me: tmccarty@uabmc.edu