PRINCIPLES OF ANTIBIOTIC USE

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Disclosures

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Objectives

Understand why antibiotics are “special” medications
Nuts and bolts of antibiotic selection
Antimicrobial Stewardship Programs
Regulatory interest and resources
Case vignette
We Love Antibiotics

**Inpatient**
At any given time, 65% of inpatients at DUMC are receiving at least one antibiotic.

There are >31,000 antibiotic orders (new starts) placed at DUMC annually.

DUMC spends >$10 million on antimicrobial agents each year.

**Long-term Care**
Up to 70% of residents in a nursing home receive one or more courses of systemic antibiotics when followed over a year.

40-75% of antibiotic prescriptions are inappropriate.

**Outpatient**
423-553 antibiotic prescriptions per 1000 people in the US per year.

30% are unnecessary, (representing 47 million prescriptions/year).
Why We Love Antibiotics

Antibiotics are time-tested placebos

Antibiotic Rx is easy:
- Avoids doing a structured exam or long DDx
- Avoids time-consuming discussions
- i.e. Easier to treat than diagnose or educate

Identifying Infected vs. Not Infected is hard

“Just in case” perceived to be lower risk than “watchful waiting”
Why we HAVE TO improve Antibiotic Use

Antibiotics are unlike any other drug, in that the use of the agent in one patient can compromise its efficacy in another.

A lot of antibiotic prescriptions are unnecessary or sub-optimal.

We are running out of antibiotics.

Antibiotic misuse harms patients.

Improving antibiotic use has many benefits for patients and society.

Slide adapted from Arjun Srinivasan, MD (CDC)
Antimicrobial Use Impacts: Infection Prevention, HAIs, AND Patient Outcomes

- Drug-resistance (MRSA, VRE, CRE, FQR-EC)
- *C. difficile* infection
- Infection treatment success/failure
  - Complications
  - Readmissions
  - Mortality
  - Length of Stay
- Adverse Safety Events
  - Allergic reactions
  - Drug toxicity events
  - Acute Kidney Injury
- Healthcare Resources and Cost
  - (all of the above)
  - Pharmacy budget; ICU days
One in Five Inpatients get an Antibiotic Adverse Drug Event

1488 patients followed for 30 days after antibiotic initiation
Followed 90 days for CDI and MDRO acquisition
General medical inpatients who had at least 24h of antibiotics during admission

20% of patients experienced at least one antibiotic-associated ADE

Making the Right Decision Is Important

Prospective study of febrile adult patients
30 day follow up

All cause mortality 20% vs 11.8% in febrile patients prescribed inappropriate vs. appropriate empiric abx (p=0.01; OR 1.88; 95% CI 1.29-2.72)

Length of stay >2 days longer if inappropriate empiric antibiotics prescribed (p = 0.002)

Wrong Antibiotic = Increased Mortality

655 ICU admissions with underlying infections
- 62% pneumonia
- 34% BSI

Inadequate antimicrobial therapy independently associated with increased mortality
- RR 4.26

sepsis antibiotics
Sometimes, You Don’t Need An Antibiotic

Don’t routinely prescribe antibiotics for acute mild-to-moderate sinusitis unless symptoms last for seven or more days, or symptoms worsen after initial clinical improvement.

Antibiotics should not be used for apparent viral respiratory illnesses (sinusitis, pharyngitis, bronchitis).

Don’t order antibiotics for adenoviral conjunctivitis.

Don’t prescribe oral antibiotics for uncomplicated acute external otitis.

Avoid antibiotics and wound cultures in emergency department patients with uncomplicated skin and soft tissue abscesses after successful incision and drainage and with adequate medical follow-up.

Don’t routinely provide antibiotics before or after intravitreal injections.

Don’t prescribe oral antibiotics for uncomplicated acute tympanostomy tube otorrhea.

Don’t use antimicrobials to treat bacteriuria in older adults unless specific urinary tract symptoms are present.

www.choosingwisely.org
AU represents a modifiable risk

AU in Nursing Homes is highly variable and correlated with AEs

Daneman et al. JAMA IM 2015;175 (8): 1331-1339
Acute Care Academic Hospitals

Polk et al. CID; 2011 Dec;53(11):1100-10
What is optimal antibiotic therapy…?

Right Diagnosis
Right Drug
Right Dose
Right Timing
Right Duration

Improve therapeutic choices (underuse)
Reduce unnecessary use (overuse)
Why “Good” Antibiotics Fail

**Patient-related**
- comorbidities
- organ dysfunction
- immunocompromised host

**Pathogen-related**
- resistance
- virulence
- high inoculum
- biofilms

**Drug-related**
- suboptimal dosing
- poor penetration

**Site-related**
- undrained abscesses
- foreign body

General Indications for Antibiotics

Prophylaxis: prevent infection
- EASY! Guidelines and ordersets

Empiric: when you suspect infection but don’t exactly know with what
- Not easy. Local guidelines help (based on local micro data).

Directed: pathogen known
- Moderately easy. Follow and interpret patient-specific micro data.
De-escalation is a core principle of Antimicrobial Stewardship.

Target/narrow antibiotic therapies after more clinical data returns

Stop therapy when infection has been ruled out
Choice of Empiric Antimicrobials

What class of pathogen am I likely to be treating?
- (Bacterial? Viral? Fungal? Other?)

If bacterial, what organisms are most likely?
- (Gram positive? Gram negative? Anaerobe?)

What information can I get to guide treatment?
- Microbiology data?

Do I need to order any other diagnostic tests?

How sick is my patient? How risky would it be if I miss?
Quick and Dirty Anti-bacterial Classification

Gram positive – skin, lung, guts, devices
Gram negative – guts, urine, some lung
Atypicals – lung, STIs
Anaerobes – gas- and abscess-forming, bad odors
Antifungals – guts, devices, really bad in immunosuppressed hosts
DIAGNOSIS

Direct Visualization

Gram stain
- Often provide clues to etiology (may allow presumptive diagnosis in some cases)
- Gram Positive
- Gram Negative
- Non-staining

Shape
- Cocci
- Rods
GRAM POSITIVE ORGANISMS

Gram positive cocci
- *Staphylococcus aureus*
- Coagulase negative staphylococcus
- *Streptococcus pneumoniae*
- *Streptococcus* sp.
- *Enterococcus* sp.

Gram positive rods
- *Bacillus* sp. (aerobes)
- *Clostridium* sp. (anaerobes)
## Antibiotics with Gram (+) Activity

<table>
<thead>
<tr>
<th><strong>S. aureus</strong></th>
<th><strong>MRSA</strong></th>
<th><strong>VRE</strong></th>
<th><strong>E. faecalis</strong></th>
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<tr>
<td>Nafcillin/Oxacillin</td>
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<td>Amp/Sulb, Pip/Tazo</td>
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<td>Amp/Sulb, Pip/Tazo</td>
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<td>Cephalosporins</td>
<td>Ceftaroline (only)</td>
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<td>Carbapenems (Fluoroquinolones)</td>
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<td>Vancomycin</td>
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<td>Clindamycin</td>
<td>Clindamycin +/-</td>
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<td>Daptomycin</td>
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<td>Telavancin</td>
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<td>TMP-SMX</td>
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<tr>
<td>Dalvabancin, Oritavancin</td>
<td>Dalvabancin, Oritavancin</td>
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</table>
GRAM NEGATIVE ORGANISMS

Gram negative cocci
- *Neisseria meningitidis*
- *Neisseria gonorrhoeae*

Gram negative rods (non-enteric)
- *Pseudomonas aeruginosa*
- *Stenotrophomonas maltophilia*
- *Acinetobacter* sp.

Gram negative rods (enteric)
- *E. coli*
- *Klebsiella* sp.
- *Enterobacter* sp.
- *Proteus* sp.
- *Serratia* sp.
### Antibiotics with Gram (-) Activity

<table>
<thead>
<tr>
<th></th>
<th>E. coli</th>
<th>K. pneumoniae</th>
<th>Enterobacter</th>
<th>P. aeruginosa</th>
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<td>Amp/sulb</td>
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<tr>
<td>Pip/Tazo</td>
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<tr>
<td>Cephalosporins</td>
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<td>3rd, 4th, 5th gen.</td>
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<td>Fluoroquinolone</td>
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<td>Cipro and Levo</td>
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</table>
Antibiotics with Anti-anaerobic Activity

β-lactams
- Ampicillin/Sulbactam*, Piperacillin/Tazobactam*
- Carbapenems (imipenem, meropenem, doripenem, ertapenem)*
- Cefoxitin
- Cefotetan

Chloramphenicol
Metronidazole*
Clindamycin
Moxifloxacin * Highly active
NON-STAINING PATHOGENS

- Not stained by Gram’s method
  - *Legionella* sp.
  - *Chlamydia*
  - *Rickettsia*
  - Mycobacteria
    - *M. tuberculosis*
    - Non-tuberculous mycobacteria

Ziehl-Neelsen Stain of TB
# Atypicals

**Macrolides:**
- Azithromycin
- Clarithromycin

**Tetracyclines:**
- Doxycycline
- Minocycline

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<tr>
<th>Community-acquired pneumonia</th>
<th>Pathogens</th>
<th>CXR pattern</th>
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</thead>
<tbody>
<tr>
<td>Typical pneumonia</td>
<td>Bacterial: $S. Pneumoniae$ $H. Influenzae$</td>
<td>Lobar, dense</td>
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<tr>
<td>Atypical pneumonia</td>
<td>Viral: influenza, RSV Bacterial: $Legionella$ $Mycoplasma$ $Chlamydia$</td>
<td>Diffuse, patchy</td>
</tr>
</tbody>
</table>
Mechanisms of Action of Antibiotics

TMP-SMX = trimethoprim-sulfamethoxazole.
ANTIBACTERIALS: MECHANISMS

Interference with cell wall synthesis (bactericidal)
- **Penicillins:**
  - Oxacillin, ampicillin, piperacillin
- **Cephalosporins:**
  - 1\textsuperscript{o}, 2\textsuperscript{o}, 3\textsuperscript{o}, 4\textsuperscript{o}, 5\textsuperscript{o} cephalosporins
- **Carbapenems:**
  - Imipenem, meropenem, ertapenem, doripenem
- **Monobactams:**
  - Aztreonam
- **Glycopeptides:**
  - Vancomycin, Dalbavancin, Oritavancin, Telavancin

Inhibition of DNA gyrase (bactericidal)
- **Quinolones:**
  - Ciprofloxacin, levofloxacin, moxifloxacin
ANTIBACTERIALS: MECHANISMS

Interference with ribosomal function
- **Aminoglycosides (bactericidal):**
  - Gentamicin, tobramycin, amikacin
- **Tetracyclines:**
  - Tetracycline, minocycline, doxycycline
- **Glycylcyclines:**
  - Tigecycline
- **Macrolides:**
  - Erythromycin, azithromycin, clarithromycin
- **Chloramphenicol**
- **Lincosamines:**
  - Clindamycin
- **Oxzalidinone:**
  - Linezolid, Tedizolid
- **Streptogramin:**
  - Dalfopristin-quinupristin
ANTIBACTERIALS: MECHANISMS

Antimetabolites
- Sulfonamides
- Trimethoprim-sulfamethoxazole

Inhibition of DNA-directed RNA polymerase
- Rifampin, rifapentine, rifabuten

Degradation of DNA
- Metronidazole

Cyclic lipopeptide (effects calcium transport)
- Daptomycin
DIAGNOSIS

Culture
- “Gold standard”
- Requires sampling of site of infection prior to therapy
- Allows determination of antimicrobial susceptibility
DIAGNOSIS

Antigen tests

- Very useful for following (and sometimes diagnosing) viral infections: HIV, HBV, HCV, EBV, CMV
- Occasionally useful for other pathogens (e.g., cryptococcus)
DIAGNOSIS

Serology
- For bacterial infections, generally not useful in early diagnosis (usually requires acute and convalescent tests)
- For viral infections, IgM may allow early diagnosis (e.g., HepA)
DIAGNOSIS

PCR and other “molecular” tests

- Increasingly used allows diagnosis of nonculturable pathogens (e.g., norovirus) and faster identification (e.g., pertussis, MRSA in blood);
- Subject to false positives due to sensitivity (e.g. C. difficile)
Ten Factors to Consider When Selecting an Antibiotic

1. Appropriate diagnostic evaluation
2. Appropriate spectrum of coverage
3. Evidence of efficacy
4. Local, national and international patterns of resistance
5. Evidence or track record for the specified infection
6. Achievable serum, tissue, or body fluid concentration (e.g. cerebrospinal fluid)
7. Patient safety
   - Allergy
   - Toxicity of antibiotic
8. Formulation (IV vs. PO) and bioavailability
9. Adherence/compliance
10. Cost
Evidence for Efficacy

*In vitro* activity (discussed later)

Clinical trials
- Gold standard = randomized clinical trial
- Should be comparative (best available alternative)
- Should use appropriate population
- Small number precludes discovery of rare adverse reactions
Patient Safety

Drug interactions
Age
Pregnancy, breast feeding
Toxicity (idiosyncratic reactions)
Dose adjustment for renal dysfunction
Dose adjustment for hepatic dysfunction
Ability to absorb an oral antibiotic
Adherence/compliance

Frequency of administration
Duration of therapy
Multiple drug therapy
Adverse effects
Reduction of symptoms
Taste
Cost
COMPLIANCE RELATED TO DOSING

Cockburn J BMJ 1987
Key Terms

- **Antibiotic** = A drug that kills or inhibits the growth of microorganisms

- **Resistant** = Somewhat arbitrary designation that implies that an antimicrobial will not inhibit bacterial growth at clinically achievable concentrations

- **Susceptible** = Somewhat arbitrary designation that implies that an antimicrobial will inhibit bacterial growth at clinically achievable concentrations
Key Terms

MIC = Minimal inhibitory concentration. Lowest concentration of antimicrobial that inhibits growth of bacteria. Commonly used in clinical lab

MBC = Minimal bactericidal concentration. Concentration of an antimicrobial that kills bacteria. Used clinically only in special circumstances

Breakpoint = The MIC that is used to designate between susceptible and resistant. Arbitrarily set by a committee
Methods for Testing Resistance: Minimal Inhibitory Concentration

Known quantity of bacteria placed into each tube

Lowest concentration of an antimicrobial that results in the inhibition of visible growth of a microorganism

- 0.25 µg/mL
- 0.5 µg/mL
- 1.0 µg/mL
- 2.0 µg/mL
- 4.0 µg/mL
- 8.0 µg/mL
- 16 µg/mL

Increasing antibiotic concentration

Trials comparing short- vs. longer-course antibiotics have shown short-course is just as effective

<table>
<thead>
<tr>
<th>Disease</th>
<th>Antibiotic Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community-acquired pneumonia</td>
<td>Short: 3-5 days   Long: 7-10 days</td>
</tr>
<tr>
<td>Nosocomial pneumonia (HAP/VAP)</td>
<td>Short: ≤ 8 days    Long: 10-15 days</td>
</tr>
<tr>
<td>Pyelonephritis</td>
<td>Short: 5-7 days   Long: 10-14 days</td>
</tr>
<tr>
<td>Intraabdominal infection</td>
<td>Short: 4 days     Long: 10 days</td>
</tr>
<tr>
<td>Acute exacerbation of chronic bronchitis</td>
<td>Short: ≤ 5 days   Long: ≥ 7 days</td>
</tr>
<tr>
<td>(AECB) and COPD</td>
<td></td>
</tr>
<tr>
<td>Acute bacterial sinusitis</td>
<td>Short: 5 days     Long: 10 days</td>
</tr>
<tr>
<td>Cellulitis</td>
<td>Short: 5-6 days   Long: 10 days</td>
</tr>
<tr>
<td>Chronic osteomyelitis</td>
<td>Short: 42 days    Long: 84 days</td>
</tr>
</tbody>
</table>

5 is the new 7
WHAT IS ANTIMICROBIAL STEWARDSHIP?
IDSA/SHEA/PIDS definition

“coordinated interventions designed to improve and measure the appropriate use of [antibiotic] agents by promoting the selection of the optimal [antibiotic] drug regimen including dosing, duration of therapy, and route of administration.”

-- Infectious Diseases Society of America (IDSA), the Society for Healthcare Epidemiology of America (SHEA), and the Pediatric Infectious Diseases Society (PIDS)

Antimicrobial Stewardship Program

Decision support for prescribers of antimicrobials.

Coordinated program

Multidisciplinary teams
- MD, PharmD, RN, micro, IP, IT

Multi-level interventions:
- Educational
- Systems-based vs. 1:1
- Technology
- Active vs. Passive

Goals of Antimicrobial Stewardship

Primary:
- Improve quality and increase safety through appropriate use of antimicrobials
  - Improve therapeutic choices (underuse)
  - Reduce unnecessary use (overuse)

Secondary:
- Decrease emergence of resistance

Desirable “side effects” from an ASP:
- Decrease costs for health system
- Satisfy regulatory requirements

The goal is NOT to decrease antibiotic use…
It’s to IMPROVE antibiotic use!

Regulators: Reduce Resistance by Imposing Rules with Potential Penalties

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
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<tbody>
<tr>
<td>CDC Core Elements of ASP</td>
<td>Mar 2014</td>
</tr>
<tr>
<td>Presidential Executive Order/NQF Forum</td>
<td>Sept 2014</td>
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<tr>
<td>IDSA AS Guidelines Updated</td>
<td>April 2016</td>
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<tr>
<td>TJC Proposed Standards for AS in ACH</td>
<td>Jun 2016</td>
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<tr>
<td>TJC Standards for AS in ACH Implemented</td>
<td>Jan 2017</td>
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AS, antimicrobial stewardship; ASP, antimicrobial stewardship programs
Resources for Inpatient Stewardship

IDSA/SHEA guidelines on Implementing an ASP: *CID* 2016;62(10):e51–e77

CDC Core Elements Document(s):
https://www.cdc.gov/getsmart/healthcare/pdfs/core-elements.pdf

The Joint Commission Standard:
https://www.jointcommission.org/assets/1/6/New_Antimicrobial_Stewardship_Standard.pdf
CMS: ASP required in Long-term Care

CMS Requirement for Long-term Care ASPs Nov 2017* = Yikes!
*deferred citations for 18 months

Barriers to Implementation of AS in LTC:
Knowledge/Evidence
Expertise
Different stakeholders + processes of care than acute care
Personnel and turnover
Resources for LTC Stewardship

Table 1: Resources for Antibiotic Stewardship in LTC

<table>
<thead>
<tr>
<th>Category</th>
<th>Resource</th>
<th>Resource (type of link)</th>
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<tbody>
<tr>
<td>General Antibiotic Stewardship Principles</td>
<td>CDC</td>
<td>The Core Elements of Antibiotic Stewardship for Nursing Homes (website)</td>
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<tr>
<td>AHRQ</td>
<td>Core Elements of Antibiotic Stewardship for Nursing Homes (pdf)</td>
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<td>AHRQ and BC CDC</td>
<td>Checklist for the Core Elements of Antibiotic Stewardship for Nursing Homes (pdf)</td>
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<tr>
<td>Rochester Patient Safety C difficile Prevention Collaborative</td>
<td>Nursing Home Antimicrobial Stewardship Guide (website)</td>
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<td>Minnesota Department of Health</td>
<td>On-High, Need Drugs? (website)</td>
<td>Rochester Nursing Home Collaborative (website)</td>
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<td>Massachusetts Coalition</td>
<td>CDC</td>
<td>Minnesota Antimicrobial Stewardship Program Toolkit for Long-term Care Facilities (website)</td>
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<td>University of North Carolina</td>
<td>AHRQ</td>
<td>Antimicrobial Stewardship in Long Term Care (pdf)</td>
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<td>Action Steps and Strategies for Implementing Antimicrobial Stewardship in Long-Term Care Facilities (pdf)</td>
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<td>Antibiotic Use Protocol</td>
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<td>New York Department of Health</td>
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<td>Minneapolis Department of Health</td>
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<td>Measures of Antibiotic Prescribing, Use, and Outcomes (website)</td>
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<td>Rochester Patient Safety C difficile Prevention Collaborative</td>
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<td>Working With Your Lab to Improve Antibiotic Prescribing (website)</td>
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<td>Michigan Department of Health</td>
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<td>Using Nursing Home Antimicrobials to Choose the Right Antibiotic (website)</td>
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<td>Antibiotic Use Protocol</td>
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<td>Antibiotic Tracking Worksheet (excel file)</td>
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<td>Antibiotic Cycling Sheet Instructions for Use (word document)</td>
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<td>University of North Carolina</td>
<td>AHRQ</td>
<td>Acyclovirgemcitabine Family Letter Template (pdf)</td>
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<td>CDC</td>
<td>AHRQ</td>
<td>Why Not Antibiotics? (pdf)</td>
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<td>CDC</td>
<td>AHRQ</td>
<td>FAQ for Families, Guardians and Health Care Aides-LTIS in LTC (pdf)</td>
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<td>CDC</td>
<td>AHRQ</td>
<td>FAQ for Families, Guardians and Health Care Aides-SNAP in LTC (pdf)</td>
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<td>Antibiotics for Urinary Tract Infections in Older Adults (pdf)</td>
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</table>

AHRQ, American Board of Internal Medicine; ACS, American Geriatrics Society; AHRQ, Agency for Healthcare Research and Quality; AWS, Alberta Health Services; BC CDC, British Columbia Centre for Disease Control; CDC, Centers for Disease Control and Prevention; LTIS, urinary tract infection.

Special Article

Template for an Antibiotic Stewardship Policy for Post-Acute and Long-Term Care Settings

Robin L.P. Jump MD, PhD, a,b, Swati Gaur MD, MBA, CMD, Morgan J. Katz MD,c, Christopher J. Crinch MD, PhD, d,Ghimwa Dumyati MD,e, Muhammad S. Ashraf MBBS f, Elizabeth Frenzel MPH, g Steven J. Schweon RN, MPH, MSN, CIC, HEM, h Philip Sloane MD, MPH, i David Nace MD, MPH, CMD j on behalf of the Infection Advisory Committee for AMDA—the Society of Post-Acute and Long-Term Care Medicine

CDC Core Elements
AHRQ Guide
CMS Standard Interpretive Guidance
Resources for Outpatient Stewardship

No regulatory requirements (yet)

4 “Core Elements”

Type of outpatient practice setting is highly varied

- Adult/pediatric
- Specialty clinics
- Retail clinics
- Urgent Care

https://www.cdc.gov/antibiotic-use/community/pdfs/16_268900-A_CoreElementsOutpatient_508.pdf
Antimicrobial Stewardship Works

Figure 4. Forest plot of all included studies. IV, inverse variance.

Feazel. JAC 2014 Jul;60(7):1748-54.
Case, Saturday

• 84 yo female w/ worsening dementia. Resident for 9 months following stroke with left-sided hemiparesis.
• Requires assistance with bathing, dressing and toileting.
• She would not answer her son’s questions. He requested that she be checked for a UTI.
Case, Saturday continued

- T 98.4  HR 88  BP 114/76
- Assessment unremarkable
- Urinalysis positive for leukocyte esterase and nitrites.
- The on-call provider, who is from an agency, prescribes a 10-day course of ciprofloxacin.
### Case, Wednesday

#### Urine Culture Results

**Culture Results:**
1. >100,000 *ESCHERICHIA COLI*
2. >100,000 *PROVIDENCIA STUARTII*

**ANTIBIOTIC SUSCEPTIBILITY TEST RESULTS:**

1. *ESCHERICHIA COLI*
2. *PROVIDENCIA STUARTII*

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Susceptibility (SUSC)</th>
<th>Interpreted (INTP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMPICILLIN</td>
<td>4</td>
<td>S</td>
</tr>
<tr>
<td>CEFAZOLIN</td>
<td>&lt;=4</td>
<td>S</td>
</tr>
<tr>
<td>CIPROFLOXACIN</td>
<td>4</td>
<td>R</td>
</tr>
<tr>
<td>TRIMETH/SULFA</td>
<td>&gt;=320</td>
<td>R</td>
</tr>
<tr>
<td>NITROFURANTOIN</td>
<td>&lt;=16</td>
<td>R</td>
</tr>
<tr>
<td>AMPICILLIN/SUL</td>
<td>&lt;=2</td>
<td>S</td>
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* Note: Values in MCG/ML (micrograms per milliliter)
Case, continued

• The nurse manager calls and want to know how to respond to the urine culture results.
• She assessed the resident before calling you and notes that she is at her baseline
• Together, you decide to stop the antibiotics.
Case, continued

• You round at the nursing home and see the resident. She is asymptomatic and does not recall feeling sick. There is nothing in the chart to indicate any signs or symptoms of infection.

• She tells you exactly what happened on Saturday.....
Case – Question 1

Question
There are several possible interventions to reduce the chances of a similar event in the future. Where would you start? (No right/wrong answers—just your opinion)

A. Review protocols for collecting urine samples
B. Educate staff about criteria for testing urine
C. Educate families about risks of antibiotics
D. Develop a protocol that includes non-antibiotic management of residents with concerns for UTI
Loeb Minimum Criteria for Initiating Antibiotics

- Positive urine culture (>10⁵ CFU/mL) and dysuria

OR

- Positive urine culture (>10⁵ CFU/mL) and 2 or more of the following:
  - Fever and/or shaking chills
  - Urgency
  - Flank pain or suprapubic pain
  - New or worsening incontinence
  - Gross hematuria
Establish Criteria for Testing Urine

<table>
<thead>
<tr>
<th>Diagnoses</th>
<th>Urine Culture</th>
<th>Clinical Symptoms</th>
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| Acute, uncomplicated urinary tract infection | >100,000 bacteria, No more than 2 species of bacteria | • Dysuria OR  
• Fever AND 1 of the following:  
  - Frequency  
  - Urgency  
  - Suprapubic pain  
  - Incontinence*  
  - Gross Hematuria** |
| Asymptomatic Bacteriuria         | >100,000 bacteria, No more than 2 species of bacteria | • No signs or symptoms referable to the urinary tract |

Stone *et al.* Infec Control Hosp Epi 2012:

*New or worsening of baseline incontinence

**I have never known hematuria to a sign of infection in an older adult. Rather, it seems to indicate trauma to the mucosa, which can lead to urinary tract infection or urosepsis.
Establish Criteria for Testing Urine

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<td><img src="image1.png" alt="Image" /></td>
</tr>
<tr>
<td>Asymptomatic Bacteriuria</td>
<td>&gt;100,000 bacteria, No more than 2 species of bacteria</td>
<td><img src="image2.png" alt="Image" /></td>
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Stone et al. Infec Control Hosp Epi 2012;
*New or worsening of baseline incontinence
**I have never known hematuria to a sign of infection in an older adult. Rather, it seems to indicate trauma to the mucosa, which can lead to urinary tract infection or urosepsis.
Watchful Waiting

- Evidence for residents & families members that it’s ok to wait to start antibiotics.
- Evidence (*in young women*) with recurrent UTIs that unnecessary treatment* leads to:
  - more symptomatic UTIs
  - higher prevalence of antibiotic-resistant bacteria

*Treatment of asymptomatic bacteriuria
Dufour *et al.*, JAGS Dec 2015 v63(12) 2472.
Cai *et al.*, CID 2012 v55:771
Careful Observation
Watchful Waiting

• This is an active process
• More frequent vital signs
• Oral hydration
• Assess for pain, changes in medicine, other reasons like a bad night’s sleep
• …or no stuffed cabbage
Careful Observation Order Set

- 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 ________.
Manage Family Members

• Set expectations with family members before the crisis

3. Don’t obtain a urine culture unless there are clear signs and symptoms that localize to the urinary tract.

5. Don’t use antimicrobials to treat bacteriuria in older adults unless specific urinary tract symptoms are present.
Potential Policies & Procedures

• Concerns about stinky or cloudy urine should lead to increased hydration and perhaps, watchful waiting/careful observation.

• Automatic review of all medication changes by outside providers.

• Send residents to the Emergency Room with a note clearly stating what you are (and are not) worried about.
Potential Policies & Procedures

• Clear criteria for collecting a urine sample
• Documented protocol for proper sample collection and handling
• Communication tools when nurses call a covering provider
• Proactively talk to residents and their family members—on admission and during change of status
Summary

Antibiotics are life-saving medicines that are often misused.
Antimicrobial decision-making is complex.
Optimized antimicrobial use through antimicrobial stewardship protects patients from unintended consequences.
Antimicrobial use affects individuals AND populations. Healthcare exposed populations are the most at risk.
Antimicrobial Stewardship Programs should be supported in all US healthcare facilities and is a key component of infection prevention.
THANK YOU!

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