INFECTION CONTROL AND ANTIBIOTIC STEWARDSHIP

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Key Issues in Infection Control

- Common errors in infection diagnosis and management
- Key aspects of infection control
  - Surveillance
  - Resident infection prevention and monitoring
  - Employee infection prevention and monitoring
  - Precautions and Isolation
  - Outbreak control
  - Antibiotic stewardship

Does this person need antibiotics?

82 year-old man; two weeks of increased swelling in both legs, that often goes down at night. One week history nontender, red rash on his right leg, which has been gradually growing in size and redness. Temperature 98.1; leg has mildly indurated, nontender, scaly bright red inflammation on the anterior and medial shin. Pulses palpable; no calf tenderness; Homan’s sign negative; WBC 5,800 without a left shift; venous Doppler examination normal.

Antibiotics for this wound?

Does this need antibiotics? One week later

Empirically Chosen Antibiotics for UTI

- Data from 75 prescriptions and 1,580 positive cultures in 31 NHs -

<table>
<thead>
<tr>
<th>Antibiotic Prescribed Empirically (% of the time)</th>
<th>Percent Resistant (% of isolates)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Escherichia Coli (44%)</td>
</tr>
<tr>
<td>Ciprofloxacin (26%)</td>
<td>%</td>
</tr>
<tr>
<td>TMP-SMX (16%)</td>
<td>%</td>
</tr>
<tr>
<td>Nitrofurantoin (12%)</td>
<td>%</td>
</tr>
<tr>
<td>Ceftriaxone (11%)</td>
<td>%</td>
</tr>
<tr>
<td>Levofloxacin (7%)</td>
<td>%</td>
</tr>
</tbody>
</table>

Recommended Duration of Antibiotic Therapy (non-hospitalized patients)

<table>
<thead>
<tr>
<th>Type of infection</th>
<th>Sanford Guide, 2015</th>
<th>ID Society</th>
<th>ID Specialist</th>
<th>YOUR Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple UTI (cystitis)</td>
<td>3 days 1</td>
<td>3 days 1</td>
<td>3 days</td>
<td>?</td>
</tr>
<tr>
<td>COPD exacerbation</td>
<td>3-10 days 2</td>
<td>--</td>
<td>3-5 days</td>
<td>?</td>
</tr>
<tr>
<td>Pneumonia without sepsis</td>
<td>Until afebrile for 3d</td>
<td>≥5 days 4</td>
<td>≥5 days</td>
<td>?</td>
</tr>
<tr>
<td>Cellulitis (lower extremity)</td>
<td>10 days 3</td>
<td>5 days</td>
<td>5-7 days</td>
<td>?</td>
</tr>
</tbody>
</table>

1. TMP-SMX – 3 days; Nitrofurantoin – 5 days; 2. Varies with drug. No therapy required in most cases; 3. Not diabetic; 4. Minimum 5 days (should be afebrile 48-72 hours). "non-ambulatory tract as HCAP; assess using score for severity"
Reducing Antibiotic Overuse Works: Impact of fluoroquinolone restriction on rates of C. difficile infection in a Community Hospital

Options Available to Reduce C Diff Post Hospitalization

1. Try to Reduce Antibiotic Burden
   - Re-evaluate need for antibiotics in the first place
   - Re-evaluate duration of antibiotic treatment
   - Re-evaluate choice of antibiotic

2. Probiotics
   - Cochrane review (2013): “moderate quality evidence suggests that probiotics are both safe and effective for preventing Clostridium difficile-associated diarrhea”


Case Description

- Mr. Leonard, 76 year old non-smoker
- 5 days of nasal congestion, sore throat and sneezing
- Hacking cough worse at night
- Decreased appetite, more tired
- Temp 99.4, other vitals normal, pulse ox 97%
- Placed on antibiotics

Common Respiratory Tract Infections

<table>
<thead>
<tr>
<th>Infection Type</th>
<th>Common Cause</th>
<th>Common Symptoms</th>
<th>Distinguishing Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Cold</td>
<td>Viral</td>
<td>Nasal congestion, sneezing, Sore throat</td>
<td>Normal symptoms, Normal vitals (+/‐ fever), Unchanged lung exam</td>
</tr>
<tr>
<td>Acute bronchitis</td>
<td>Viral</td>
<td>Cough (+/‐ sputum), Dry cough,</td>
<td>Normal chest X‐ray, Normal vitals (+/‐ fever)</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>Bacterial or Viral</td>
<td>Cough (+/‐ sputum), Pneumonia, Chest pain, Fever</td>
<td>Abnormal vital signs, Abnormal lung exam, Infiltrate on chest X‐ray, Mental status changes</td>
</tr>
<tr>
<td>Influenza‐like illness</td>
<td>Viral</td>
<td>Sore throat, Dry cough, Fever</td>
<td>Chills, Body aches, Malaise</td>
</tr>
</tbody>
</table>

Another Case History

- Mrs. Jenkins, a 79 year old with stroke, incontinence
- Wet incontinence pad has odor
- No complaints
- Normal vital signs

What would you do and why?

Is Cloudy or Smelly Urine a Reason To Give Antibiotics?

- Nurses
- Geriatricians

Yes No

What Causes Changes in Urine Color or Odor?

- Diet
- Medications
- Dehydration
- Bacteria in urine
  - If person is not sick, it’s asymptomatic bacteriuria

Yes, Bacteria Are Often Normal in the Bladder of Older Persons

Changes in:
- Anatomy
- Hormones
- Immunity
- Personal hygiene

Asymptomatic Bacteriuria

Leaving the situation alone does NOT increase risk of illness, hospitalization, or death…..but antibiotic treatment DOES.

How Common is Asymptomatic Bacteriuria?

<table>
<thead>
<tr>
<th>Percentage with positive culture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetic Adults</td>
</tr>
<tr>
<td>Community Elderly</td>
</tr>
<tr>
<td>LTC Elderly</td>
</tr>
<tr>
<td>Indwelling Catheter</td>
</tr>
<tr>
<td>Up to 30%</td>
</tr>
<tr>
<td>Up to 50%</td>
</tr>
<tr>
<td>Up to 75%</td>
</tr>
<tr>
<td>Nearly 100%</td>
</tr>
</tbody>
</table>

What should you do for Mrs. Jenkins?

Should you get a urine culture ‘just in case’?

Two Case Descriptions

**Mrs. White**
- 84 year old with arthritis and moderate dementia
- Uncooperative with dressing
- Irritable
- Eats half of breakfast
- Says she’s tired

**Ms. Blue**
- 34 year old nurse
- Divorced, alone this weekend
- You were going to have lunch with her, but she cancels
- Low energy; not hungry
- Doesn’t want to get dressed
- Doesn’t want to deal with people

The Big Seven

- Dehydration
- Medication side effect
- Coming down with a virus
- Didn’t sleep well
- Pain
- Constipation
- Stress / anxiety / depression
Active Interventions for Non-Specific Symptoms

✓ Assess hydration status (and encourage fluids)
✓ Review current medications
✓ Look for signs of a respiratory or GI virus
✓ Think about sleep problems
✓ Ask about pain / discomfort
✓ Ask about constipation
✓ Look for sources of stress, anxiety or depression
✓ Monitor symptoms and vital signs (especially temperature)
✓ Use nursing interventions where appropriate

Should we get a urine culture “just in case”

Key Infections for Surveillance

<table>
<thead>
<tr>
<th>Infection Type</th>
<th>Transmissible in LTC</th>
<th>Preventable</th>
<th>V. Severe Morbidity</th>
<th>Feared Outbreaks</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTI</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Upper respiratory infection</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bronchitis / COPE exacerbation</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumonia</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Influenza</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Septicemia</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Herpes zoster (shingles)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin infections</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scabies</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedbugs</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viral gastroenteritis (Norovirus)</td>
<td>X</td>
<td>at times</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Bacterial gastroenteritis</td>
<td>X</td>
<td>at times</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. difficile</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRSA</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other MDROs</td>
<td>X</td>
<td></td>
<td></td>
<td>at times</td>
</tr>
</tbody>
</table>

Key Issues

How to identify when an infection has been diagnosed?
- Antibiotic prescriptions
- Providers inform quality staff member
- Morning meeting
- Electronic health record

Defining when an infection is present

Modified McGeer Surveillance Definition of UTI (no indwelling device)

Acute dysuria or acute pain, swelling, or tenderness of the testes, epididymis, or prostate

OR

Fever or leukocytosis and at least one of the following: acute CVA pain or tenderness; suprapubic pain; gross hematuria; new or marked increase in incontinence, urgency, or frequency

PLUS

Positive Urine Culture, defined as:
- >100,000 cfu/mL if voided specimen
- >1,000 cfu/mL if in-and-out cath specimen


Key Principles of Infection Control

QUALITY
IT'S EVERYONE'S RESPONSIBILITY

Key Infections

Infections

Reporting Surveillance Data:

Rates
Reporting Surveillance Data: Reasons Antibiotics Prescribed

- Urinary Tract Infection: 37.5%
- Skin/Soft Tissue Infection: 18.2%
- Respiratory Infection: 36%
- Gastrointestinal Infection: 6.8%
- Prevention: 0.4%
- Other: 0.7%
- Unexplained Fever: 0.4%
- Other: 0.7%

Standard Precautions
- Hand hygiene
- Gloves (when touching body fluids)
- Masks (when at risk for spray)
- Gowns (when contamination of clothing is likely)
- Avoidance of needlestick and other sharp injuries
- Surface disinfection

Hand Hygiene
- Most effective and least costly means of preventing infection transmission
- Still have poor compliance of around 40% (range 30-60%)

Soap and Water Versus Alcohol-Based Rubs
- Alcohol-based rubs:
  - More readily available
  - Faster to use
  - Effective against bacteria
  - Cause less dryness.
- Soap and water:
  - Better at removing dirt, debris, grease
  - Always use after care for diarrhea, handling food, or using the bathroom
  - More effective against viruses and C. difficile (C. diff)

Respiratory Hygiene and Cough Etiquette
Environmental Disinfection

- What to disinfect: Anything that people might touch
  - Special attention to medical equipment
  - Remember light switches, doorknobs, telephones, keyboards
- First step: Remove obvious dirt and particles
- Next step: Clean using a disinfectant registered with the US Environmental Protection Agency
- Don’t forget to rub

Screening and Immunization

Staff Immunization
- Flu
- Hepatitis B (medical)
- Measles / mumps / rubella

Participant Immunization
- Flu
- Pneumonia
- Shingles
- Tdap

When Should Employees Be Excused From Work?

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Diagnoses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>Salmonella</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>Shigella</td>
</tr>
<tr>
<td>Vomiting</td>
<td>Norovirus</td>
</tr>
<tr>
<td>Jaundice</td>
<td>E coli</td>
</tr>
<tr>
<td>Sores that are bleeding or contain pus</td>
<td>Hepatitis A</td>
</tr>
</tbody>
</table>

Types of Precautions

1. Standard –
   - Hand hygiene; gloves
   - Key situations:
2. Droplet
   - Mask
   - Key situations : influenza, common cold, strep throat
3. Contact
   - Gown and gloves, dedicated equipment, limited movement
   - Key situations: condition-based and symptom-based

Condition-Based Contact Precautions

<table>
<thead>
<tr>
<th>Disease/Condition</th>
<th>Duration of Isolation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-Drug Resistant Bacteria (MRSA, VRE, etc.)</td>
<td>Until symptoms resolve</td>
</tr>
<tr>
<td>Clostridium difficile (C. diff)</td>
<td>24-48 hours after symptoms resolve</td>
</tr>
<tr>
<td>Norovirus</td>
<td>48 hours after symptoms resolve</td>
</tr>
<tr>
<td>Scabies and Lice</td>
<td>24 hours after treatment started</td>
</tr>
<tr>
<td>Viral Conjunctivitis (pink eye)</td>
<td>Until symptoms resolve</td>
</tr>
</tbody>
</table>

Symptom-Based Contact Precautions

- Active symptoms of a contagious infection
- Nausea/vomiting
- New or worsening diarrhea
- New or worsening respiratory symptoms
- New, undiagnosed fever
- Precautions and restrictions are time limited
- Infection is ruled out and/or symptoms resolve
Policies should include guidelines for key infections

Definition of an “Outbreak”

• Threshold for declaring an outbreak should be low
  – Influenza – one laboratory confirmed case or a sudden increase in acute febrile respiratory illness
  – TB, Legionella, Salmonella, scabies – one case
  – Viral gastroenteritis / norovirus – two cases
• Have case definitions for norovirus and influenza determined in advance

Antibiotic Stewardship: the New Mandate

“a coordinated program that promotes the appropriate use of antimicrobials (including antibiotics), improves patient outcomes, reduces microbial resistance, and decreases the spread of infections caused by multidrug-resistant organisms.”
Association for Professionals in Infection Control and Epidemiology

“Using antibiotics responsibly: right drug, right time, right dose, right duration”

“Crisis of Antibiotic Resistance”

• Multi-drug resistance increasingly common
• Over 20,000 deaths annually in U.S.A. from multi-drug resistant infections
• Projected 317,000 deaths per year by 2050

Between 25-75% of antibiotic prescriptions in long term care do not meet evidence-based clinical guidelines

Prescribing antibiotics “just in case” was accepted in the past, but now antibiotics should be given after careful, evidence-based consideration of risks and necessity.
What will YOU prioritize when you add antibiotic stewardship to your quality goals?

1. Urine appearance and odor
2. Positive urinalyses and cultures
3. Nonspecific symptoms
4. Cough
5. Wounds
6. Red and swollen legs
7. Emergency departments and hospitals
8. Choice of empirical antibiotics
9. Length of antibiotic treatment

Joint Accountability for Infection Control and Antibiotic Stewardship

Laboratory

Medical Director and Providers

Nursing Staff

Data and QAPI

Quality / Infection Control

Pharmacy Staff

Suggested QAPI Measures

- Antibiotic prescriptions / 1,000 resident-days
- Percent of time on antibiotics
- C. difficile infection rate
- Urine cultures: multidrug resistance rate
- Rate of hospitalization for sepsis
- Rate of fever among persons who had antibiotics initiated in the nursing home, by infection site
- Proportion of prescriptions that are “high C. diff risk” antibiotics, by infection site
- Urine cultures per 1,000 resident-days

Education and QI Works: Results from Randomized Trial - Antibiotic Prescriptions Per 100 Resident-Days

Intervention Began

24% Reduction in Intervention Group

Intervention Group

Comparison Group

Facts about Antibiotic Overuse in Nursing Homes

- Adverse effects such as C. difficile infection are increasing.
- Between 25-75% of prescriptions do not meet clinical guidelines.
- Few new antibiotics are being developed, so we need to preserve what we have.

Why is this important?

Health and well-being of nursing home residents is the goal of care.

Inappropriate overuse of antibiotics leads to serious complications.

We need to change our thinking from “just in case” to “only when needed”

What you can do

Nurses

Medical providers

Residents and Families

nursinghomeinfections.unc.edu