EVIDENCE BASED MEDICINE:
ANTIBIOTIC RESISTANCE IN THE ELDERLY

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GERIATRIC MEDICINE WEEK
EPIDEMIOLOGY AND BACKGROUND

• “Every year, more than 2 million people in the United States acquire antibiotic-resistant infections, with at least 23,000 people dying as a result, according to a new report from the Centers for Disease Control and Prevention (CDC).” - Today Geriatric Medicine

• **Main Concern:** We are decreasing the ability to get rid of common infections thus leading to more medical complications

• **Main Cause:** Either from Over-prescription or inappropriate prescribing

• **The Upper Respiratory Infection Conundrum:** Most are viral, but physicians still justify (uncertainty, severity, and satisfaction)

• MRSA infections vs MSSA: cost of treatment ranging from $9275 to $13,901, VRE can be $27,190

• In 1998, estimated annual cost of treatment for antibiotic resistant bacteria was $4-5 billion
Changes in antimicrobial use are paralleled by changes in the prevalence of resistance. Antimicrobial resistance is more prevalent in health care–associated bacterial infections, compared with those from community-acquired infections. Patients with health care–associated infections caused by resistant strains are more likely than control patients to have received prior antimicrobials. Areas within hospitals that have the highest rates of antimicrobial resistance also have the highest rates of antimicrobial use. Increasing duration of patient exposure to antimicrobials increases the likelihood of colonization with resistant organisms.

NOTE. A causal association between antimicrobial use and the emergence of antimicrobial resistance has been reviewed elsewhere [9, 19–22] and is strongly suggested on the basis of several lines of evidence that are derived from patient and population levels of analysis, colonization and infection data, and retrospective and prospective studies [23–31]. Adapted from [10].
METHODS TO REDUCE ANTIBIOTIC RESISTANCE

• 1. Prevention: Personal hygiene of providers and patients, staying UTD on vaccinations
  • Tdap, Influenza, Pneumococcal, Varicella/Zoster, Meningococcal, Hepatitis A/B (if appropriate)
• 2. Education: Teaching your patients the importance of only using antibiotics for bacterial infections and even the dangerous side effects (i.e. C. Diff)
• 3. Stay Informed: Health providers can regularly be aware of risk factors for antibiotic resistant infectious organisms
• 4. Delayed Prescribing efficacy
• 5. Developing novel diagnostic tests and antibiotics
• 6. Improving antibiotic stewardship

Cochrane Database of Systematic Reviews
Interventions to improve antibiotic prescribing practices in ambulatory care
Cochrane Systematic Review - Intervention | Version published: 19 October 2005  see what's new
ANTIBIOTIC STEWARDSHIP POLICY

“Antibiotic stewardship refers to a set of coordinated strategies to improve the use of antimicrobial medications with the goal of enhancing patient health outcomes, reducing resistance to antibiotics, and decreasing unnecessary costs.” –Society for Healthcare Epidemiology of America
• Major Goals include: limiting inappropriate prescribing while improving proper selection, dosing, route, and duration of therapy

• The Team: Infectious Disease physician, Clinical pharmacist, clinical microbiologist, Information system specialist, Hospital epidemiologist, (other members can include nurses, PAs, Administration)

• Comprehensive Program Includes:
  • Support and Promote Antibiotic Use Protocols
  • Develop and Maintain a System to Monitor Antibiotic Use and Resistance Data
  • Provide education on antibiotic stewardship
ANTIBIOTIC USE PROTOCOLS

McGeer Criteria: Antibiotic Prescribing for Urinary Tract Infections

**Without Urinary Catheter**

Criteria 1 and 2 must be present:
1. At least one of the following:
   - Acute dysuria or acute pain, swelling, or acute tenderness of the testes, epididymis, or prostate
   - Fever or leukocytosis

And at least one of the following subcriteria:
- Acute costovertebral angle/pain/tenderness
- Suprapubic pain
- Gross hematuria
- New or marked increase in incontinence
- New or marked increase in urgency
- New or marked increase in frequency

In the absence of fever or leukocytosis, then two or more of the following subcriteria:
- Subcutaneous pain
- Shaking chills
- Urinary incontinence
- Frequency
- Gross hematuria
- Suprapubic pain

2. One of the following:
- At least 10^5 cfu/mL of no more than two species of microorganisms in voided urine sample
- At least 10^5 cfu/mL of any number of organisms in a specimen collected by in-and-out catheter

**With Urinary Catheter**

Criteria 1 and 2 must be present:
1. At least one of the following:
   - Fever, rigors, or new onset hypotension, with no alternate site of infection
   - Either acute change in mental status or functional decline, with no alternate site of infection
   - New onset suprapubic pain or costovertebral angle/pain/tenderness
   - Purulent discharge from around the catheter or acute pain, swelling, or tenderness of the testes, epididymis, or prostate

2. And the following:
   - Urinary catheter specimen culture with at least 10^5 cfu/mL of any organism(s)

* Respiratory symptoms include increased shortness of breath, increased cough, increased sputum production, new pleuritic chest pain.
* Gastrointestinal symptoms include nausea or vomiting, new abdominal pain, new onset of diarrhea
* Skin and soft tissue symptoms include new redness, warmth, swelling, purulent drainage

## Table 1.
Comparison of Preauthorization and Prospective Audit and Feedback Strategies for Antibiotic Stewardship

<table>
<thead>
<tr>
<th>Preauthorization</th>
<th>Prospective Audit and Feedback</th>
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<tbody>
<tr>
<td>Advantages</td>
<td>Advantages</td>
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<tr>
<td>• Reduces initiation of unnecessary/inappropriate antibiotics</td>
<td>• Can increase visibility of antimicrobial stewardship program and build collegial relationships</td>
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<tr>
<td>• Optimizes empiric choices and influences downstream use</td>
<td>• More clinical data available for recommendations, enhancing uptake by prescribers</td>
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<td>• Prompts review of clinical data/prior cultures at the time of initiation of therapy</td>
<td>• Greater flexibility in timing of recommendations</td>
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<td>• Decreases antibiotic costs, including those due to high-cost agents</td>
<td>• Can be done on less than daily basis if resources are limited</td>
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<td>• Provides mechanism for rapid response to antibiotic shortages</td>
<td>• Provides educational benefit to clinicians</td>
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<td>• Direct control over antibiotic use</td>
<td>• Prescriber autonomy maintained</td>
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<td></td>
<td>• Can address de-escalation of antibiotics and duration of therapy</td>
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<tr>
<td>Disadvantages</td>
<td>Disadvantages</td>
</tr>
<tr>
<td>• Impacts use of restricted agents only</td>
<td>• Compliance voluntary</td>
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<tr>
<td>• Addresses empiric use to a much greater degree than downstream use</td>
<td>• Typically labor-intensive</td>
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<tr>
<td>• Loss of prescriber autonomy</td>
<td>• Success depends on delivery method of feedback to prescribers</td>
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<tr>
<td>• May delay therapy</td>
<td>• Prescribers may be reluctant to change therapy if patient is doing well</td>
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<td>• Effectiveness depends on skill of approver</td>
<td>• Identification of interventions may require information technology support and/or purchase of computerized surveillance systems</td>
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<td>• Real-time resource intensive</td>
<td>• May take longer to achieve reductions in targeted antibiotic use</td>
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<td>• Potential for manipulation of system (eg, presenting request in a biased manner to gain approval)</td>
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<td>• May simply shift to other antibiotic agents and select for different antibiotic-resistance patterns</td>
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RESULTS OF ANTIBIOTIC STEWARDSHIP

Preauthorization

• Associated with large reduction in antibiotic use and costs especially among gram negative bacteria

• One study reported a 32% in total parenteral antibiotic expenditures and increased % of gram negative bacteria that were susceptible without changes to hospital duration or survival

• Restrictive policies like preauthorization were found to be more effective in reducing incidence of C.Diff infections than PAF

• Clinical Pharmacist and ID Physician >> Off-Hour ID Fellow in Recommendation Appropriateness (87% vs 47%)

Prospective Audit with Feedback

• Also shown to reduce antibiotic use and resistance and reduce C. Diff rates

• 22% reduction in parenteral broad spectrum antibiotics

• RCT with no intervention vs 1-on-1 education by clinical specialist showed 37% reduction in # of days of unnecessary levofloxacin or ceftazidime use

• Another RCT noted 74 suggestions given from physicians for 62 patients of 127, 85% were implemented leading to 1.6 fewer days of parenteral therapy and $400 savings per patient without altering clinical response vs control
WHICH IS BETTER?

• There has been limited literature in regards to differentiating the two strategies.

• However one meta-analysis was done by Cochrane Review that revealed:
  • At 1 Month: there was a statistically significant benefit to use preauthorization in prescribing outcomes.
  • At 6 Months: statistically significant benefit to use preauthorization in reducing C. Diff Colonization and antibiotic resistance bacteria.
  • At 12 or 24 months: both methods were considered to be equivalent.

• Conclusion: When there is a urgent or acute need, then it is best to use preauthorization as the method. But overall, no matter what type you choose to implement in your facility whether preauthorization or PAF or combination, the main focus should be centered on proper allocation of necessary resources to the patients and dedication the comprehensive program with proper communication.
“As part of the revised Requirements for Participation, the Centers for Medicare and Medicaid Services (CMS) will require all long-term care (LTC) facilities to have an antibiotic stewardship program by November 28, 2017.”

Multiple studies have been cited to prove the efficacy of antibiotic stewardship in the acute care thus supporting these guidelines to implement these policies.

However, there is minimal literature surrounding the benefit in long term care setting (most are focused on academic and hospital affiliated nursing home and not so much community settings), needless to stay, CMS is still requiring these AS programs to be implemented.
• National campaign by the Center for Disease Control to decrease antibiotic resistance and improve prescribing of antibiotics

• Go to: https://www.cdc.gov/antibiotic-use/index.html

• Information to Patients
SUMMARY

• Antibiotics have become the most commonly prescribed medication and have attributed to the development of resistance to many bacterial organisms each year

• Coupled with driving up medical costs and leading to more medical complications attributing to more hospitalizations

• There is an abundant amount of evidence proves the need for the development of more antibiotic stewardship programs

• Whether you use preauthorization techniques or PAF, the importance is reduction of unnecessary antibiotic use and resistance

• Educating your patients and staying up to date on the current EBM guidelines can further help patient care and survival
REFERENCES


- https://www.cdc.gov/antibiotic-use/index.htm