Antibiotic Stewardship for the 21st Century Webinar

Health Services Advisory Group (HSAG)
Thursday, February 22, 2018
Nearly 25 percent of the nation’s Medicare beneficiaries

HSAG is the Medicare QIN-QIO for Arizona, California, Florida, Ohio, and the U.S. Virgin Islands.

*QIN-QIO=Quality Innovation Network-Quality Improvement Organization
Antibiotic Stewardship Across Settings

- Hospitals
- Nursing Homes
- Outpatient Settings
Antibiotic Stewardship for the 21st Century

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Keck School of Medicine at USC

Disclosures (past year)
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Consultant: Entasis, Nabriva, Pfizer, Cempra, Bayer, Forge, Shionogi, Alexion,
Synthetic Biologics, Paratek, TheoremDx
Shareholder: Motif, BioAIM, Synthetic Biologics, Mycomed, ExBaq
The “Dark Ages”

- 4 yo girl in excellent health suddenly developed facial cellulitis
- Spread relentlessly, fever to 104°F
- Could not sleep because her face and neck so swollen she could not swallow her own secretions
- Began gasping for breath

Herrell ’43 Proc Staff Meetings Mayo Clinic 18:65-76
On arrival to the hospital

“Moribund”
“dead within 2 days”

After 14 days of penicillin

Totally fine... for >65 years
# Power of Antibiotics

<table>
<thead>
<tr>
<th>Disease</th>
<th>Pre-Antibiotic Death Rate</th>
<th>Death With Antibiotics</th>
<th>Change in Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community Pneumonia¹</td>
<td>~35%</td>
<td>~10%</td>
<td>-25%</td>
</tr>
<tr>
<td>Hospital Pneumonia²</td>
<td>~60%</td>
<td>~30%</td>
<td>-30%</td>
</tr>
<tr>
<td>Heart Infection³</td>
<td>~100%</td>
<td>~25%</td>
<td>-75%</td>
</tr>
<tr>
<td>GNB Bacteremia⁴</td>
<td>~80%</td>
<td>~10%</td>
<td>-70%</td>
</tr>
<tr>
<td>Brain Infection⁵</td>
<td>&gt;80%</td>
<td>&lt;20%</td>
<td>-60%</td>
</tr>
<tr>
<td>Skin Infection⁶</td>
<td>11%</td>
<td>&lt;0.5%</td>
<td>-10%</td>
</tr>
</tbody>
</table>

By comparison...treatment of myocardial infarction with aspirin or fibrinolytic drugs⁶

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Power of Antibiotics

THE ANTIBACTERIAL PIPELINE: WHY IS IT DRYING UP, AND WHAT MUST BE DONE ABOUT IT?

Brad Spellberg, MD

Antibiotics caused US deaths to decline by ~220 per 100,000 in 15 years

Sulfa

Penicillin

All other medical technologies reduced deaths by ~20 per 100,000 over the next 45 years

FIGURE A18-1 Change in deaths from infection in the United States following the intro of antibiotics.

2010 IOM Forum on Microbial Threats: Antibiotic Resistance: Workshop Summary Chapter 18
Antibiotic Resistant Problems

Target the ESKAPE Bacteria

• *Enterococcus* (VRE)
• *S. aureus* (MRSA)
• *Klebsiella*
• *Acinetobacter*
• *Pseudomonas*
• ESBL (e.g., *E. coli*, *Enterobacter*)

Current Primary Needs for New Antibiotics

#1) R to almost all agents
#2) R to all oral agents
Figure 1. Discovery of new classes of antibiotics.

No New Classes to Treat Gram Negative Bacilli For 4 Decades
### Commentary: The FDA Reboot of Antibiotic Development

Shlaes et al AAC ‘13 57:4605-7

<table>
<thead>
<tr>
<th></th>
<th>Non-urinary Isolates (N)</th>
<th>Urinary Isolates (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>K. pneumoniae</strong></td>
<td>11.5% (1907)</td>
<td>7.1% (3834)</td>
</tr>
<tr>
<td><strong>A. baumannii</strong></td>
<td>52.0% (535)</td>
<td>56.7% (230)</td>
</tr>
<tr>
<td><strong>P. aeruginosa</strong></td>
<td>23.2% (2869)</td>
<td>17.5% (3285)</td>
</tr>
</tbody>
</table>
Geography of Carbapenem Resistant Enterobacteriaceae (CRE)

Nov, 2006
Geography of Carbapenem Resistant Enterobacteriaceae (CRE)

2007
Geography of Carbapenem Resistant Enterobacteriaceae (CRE)

2011
Geography of Carbapenem Resistant Enterobacteriaceae (CRE)

2012
Geography of Carbapenem Resistant Enterobacteriaceae (CRE)
Geography of Carbapenem Resistant Enterobacteriaceae (CRE)

Current (Jan ‘18) http://www.cdc.gov/hai/organisms/cre/TrackingCRE.html
Mortality Impact of XDR

• CRE and XDR A. baumannii and P. aeruginosa cause mortality rates ranging from 32-44%, triple to quadruple the rate for non-XDR strains.

• Bacteremia and VAP with these organisms results in 50% mortality, and >50% with initially ineffective therapy.
XDR/PDR Gram Negatives

• 11/6/10, New York Times, report on antibiotic resistant infections

“For these infections, we're back to dancing around a bubbling cauldron while rubbing two chicken bones together.”

Page A1 (front page) Quote of the Day—Brad Spellberg
Community Infections Changing

• For >40 years, quinolones were the answer for outpatient Gram neg infections

• 20-30% of community *E. coli* is now quinolone resistant in the US

• Resistant UTIs, prostate infections, abdominal infections (e.g. diverticulitis)

• No longer can we assume empiric therapy will work—follow up is key
### Microbes vs. Humans

<table>
<thead>
<tr>
<th>Factor</th>
<th>Microbes</th>
<th>Humans</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number on Earth</td>
<td>$5 \times 10^{31}$</td>
<td>$6 \times 10^9$</td>
<td>$\sim 10^{22}$</td>
</tr>
<tr>
<td>Mass (metric tons)</td>
<td>$5 \times 10^{16}$</td>
<td>$3 \times 10^8$</td>
<td>$\sim 10^8$</td>
</tr>
<tr>
<td>Generation Time</td>
<td>30 min</td>
<td>30 yr</td>
<td>$\sim 5 \times 10^5$</td>
</tr>
<tr>
<td>Time on Earth (yrs)</td>
<td>$3.5 \times 10^9$</td>
<td>$4 \times 10^5$</td>
<td>$\sim 10^4$</td>
</tr>
</tbody>
</table>

Microbiology in the 21st century, ASM, 2004; Spellberg et al 2008 Clin Infect Dis
Ecological Tidal Wave of Antibiotics

- In 2014, 15.3 million kg (34 million pounds = 17,000 tons) in animals
- In 2013 3.5 million kg (7.7 million pounds = 4,000 tons) in humans
- Animal use increased 20% from ‘09 to ‘14

Washington, we have a problem!
Does This Happen In Your World Too?

• 1/3/18: Emerging Infections Network Post

“The problem is that every multi-cellular organism that even accidentally wanders across the threshold of an ED gets slammed with 5 antibiotics, usually with both pseudomonal and MRSA activity. Flies that inadvertently buzz their way into the ED get tiny little IVs for Zosyn and vanco.”

Brad Spellberg
Lechuguilla caves in Carlsbad Caverns in New Mexico, isolated from surface for >4 million years, no human contact—extensive antibiotic resistance found
Microbes have been creating and defeating antibiotics for 20 million times longer than humans have even known antibiotics existed.
There are already, widespread in nature, resistance mechanisms to antibacterial agents we have not yet invented.
The Future Unless...

- Resistance will continue, guaranteed—death, taxes, resistance
“… the microbes are educated to resist penicillin and a host of penicillin-fast organisms is bred out... In such cases the thoughtless person playing with penicillin is morally responsible for the death of the man who finally succumbs to infection with the penicillin-resistant organism. I hope this evil can be averted.”

- Sir Alexander Fleming, NY Times June 1945
How’re We Doing 70 Yrs Later?

- From 2006-2012, overall days of therapy in hospital did not go down—broad spectrum abx use went up

- In a second study, modest initial outpatient declines plateaued, and broad spectrum use went up
Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America
New Guidelines on Stewardship

• Entirely focused on the tactical
  - Tools for stewardship in hospitals, e.g.: up front restriction, downstream de-escalation, and other processes
  - Composition of stewardship teams

• Minimal focus on strategic (provider)
  - No definition of fundamental principles
  - How to alter human behavior?
  - How to mitigate provider fear driving scripts?
  - How to overcome patient forces?
New Guidelines on Stewardship

• No focus on grand strategy (societal)

  ➢ How to financially align societal interests with provider and patient interests?
  ➢ How to incentivize healthcare organizations to arm their programs with teeth?
  ➢ How to get payers, regulators, and specialty societies aligned with basic principles?
Are We Serious About This Or Not?

• Tactics don’t work if not backed by strategy and grand strategy
• We’ve been using the same daggumned tactics for decades
• Things are not any better

“I’d love to implement antibiotic restrictions, but our docs won’t tolerate it.”
#1: The Surgical Intern

• **Them:** “Yeah I’ve got a patient with (perforated appendix, cholecystitis, cholangitis, etc). They’re spiking through ceftriaxone + metronidazole. I need Zosyn.”

• **Me:** “It was community onset, right? Why would *Pseudomonas* be in there?”

• **Them:** “Probably not *Pseudomonas*. But they’re spiking through CTX/Flagyl.”
#1: The Surgical Intern

- **Me**: “Zosyn doesn’t kill susceptible *E. coli* any deader than ceftriaxone, and this is not *Pseudomonas.*”

- (but note the fear is contagious—the more I insist it’s not *Pseudomonas* the more likely it is the universe will make it be to spite me!)
Common Scenarios

#2: The ED or Medicine Resident

- **Them**: “Yeah I’ve got a patient with GNB in the urine.”
- **Me**: “Do they have symptoms?”
- **Them**: “No. But they have GNB in urine.”
- **Me**: “Right. That’s asymptomatic bacteriuria. We don’t treat that.”
- **Them**: “I know. But there’s GNB in the urine, so I need the antibiotics.”
#3: The ICU Fellow

- **Them**: “I need meropenem and vancomycin.”
- **Me**: “What are the indications?”
- **Them**: “I have a crashing patient.”
- **Me**: “Okay. I hear you. But looking at the computer, this is CAP, right?”
- **Them**: “Yeah, it’s CAP. But the patient’s really sick. I need broad coverage.”
Is This Really Education Deficit?

• Do we really believe physicians don’t know not to treat asymptomatic bacteriuria?

• Do we think that the surgical team has logically thought through options and simply misunderstands how abx work?

• Do we think the ICU Fellow believes *Pseudomonas* and MRSA are common CAP pathogens?
Or Is This About Fear?

- Abx are among the most potent psychoactive drugs in the pharmacopeia—they act on prescribers rather than patients.

- When providers are afraid, they act instinctively, Abx soothe their fears.

- This is about fear—and fear cannot be overcome by rational education.

- It must be countered by psychology.
<table>
<thead>
<tr>
<th>Heroin Withdrawal Sign/ Symptom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anger</td>
</tr>
<tr>
<td>Tachycardia</td>
</tr>
<tr>
<td>Diaphoresis</td>
</tr>
<tr>
<td>Tremulousness</td>
</tr>
<tr>
<td>Cursing</td>
</tr>
<tr>
<td>Diarrhea</td>
</tr>
<tr>
<td>Potential Violence</td>
</tr>
</tbody>
</table>
The Psychology of Abx Prescription

<table>
<thead>
<tr>
<th>Heroin Withdrawal Sign/ Symptom</th>
<th>Antibiotic Restriction Sign/ Symptom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anger</td>
<td>Anger</td>
</tr>
<tr>
<td>Tachycardia</td>
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<td>Diaphoresis</td>
</tr>
<tr>
<td>Tremulousness</td>
<td>Tremulousness</td>
</tr>
<tr>
<td>Cursing</td>
<td>Cursing</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>Diarrhea (of the mouth)</td>
</tr>
<tr>
<td>Potential Violence</td>
<td>Potential Violence</td>
</tr>
</tbody>
</table>
Conclusion: Antibiotic stewardship is like prescribing methadone for antibiotic addicted providers
Antibiotic Stewardship

New Societal Approaches to Empowering Antibiotic Stewardship

**Substantial concern** regarding the ever-worsening crisis of antibiotic resistance has been raised by the World Health Organization, US Centers for Disease Control and Prevention (CDC), European Centre for Disease Prevention, and other organizations across the globe.

Antibiotics are unique because they are the only pharmaceutical agents that have transmissible loss of efficacy over time.

Estimated more than 50% of antibiotic use that is unnecessary or inappropriate.¹ The US government has recently emphasized the need for implementation of antibiotic stewardship programs at all hospitals.² To be effective, antibiotic stewardship programs must incorporate best practices, which include dedicating sufficient resources to the program, appointing a single leader to be accountable for performance, having appropriate antibiotic expertise, implementing active surveillance and reporting, fostering collaboration among medical personnel and patients to optimize antibiotic use.

Fleming, who noted, “the microbes assist penicillin and a host of penicillin-resistant organisms be averted.”³ However, in the 70 years since Fleming's discovery, antibiotic resistance has become a major global health threat. The overuse and misuse of antibiotics have contributed to the evolution of highly resistant strains of bacteria, making many infections difficult to treat. The World Health Organization estimates that 25% of antibiotics are used unnecessarily or ineffectively.

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Arjun Srinivasan, MD
US Centers for Disease Control and Prevention, Atlanta, Georgia.

Henry F. Chambers, MD
Division of Infectious Diseases, University of California at San Francisco.

*JAMA* March 22/29, 2016 Volume 315, Number 12 1229
Antibiotic Stewardship

• We need to recognize that antibiotics are unique among drugs
• Only they have transmissible resistance
• Those that work today won’t work in the future—they must be continually replaced
• Every person’s use affects everyone else’s
• Antibiotics are a shared societal trust—not true of any other type of drug
Antibiotics Are a Societal Trust

• No one has a right to waste antibiotics—wasting them hurts everyone.
Traditional Approaches

• Focus on what the stewardship team should look like—process

• Methods include:
  ➢ Education (yawn)
  ➢ Up front restrictions
  ➢ Downstream de-escalation
  ➢ Care pathways, order sets, etc.
Instead: Focus on the Diagnosis!

• What is the DDx?
• What organisms cause those diseases?
• What abx cover those organisms?
• Don’t talk to me about your fear—what are you treating?
Basic Stewardship Principles

- URIs are usually viral and generally do not require Abx therapy

- Don’t treat viral infections with antibiotics—duh?

- Asymptomatic patients don’t require antibiotics irrespective of culture results—skin, urine, respiratory (yes even BAL) results irrelevant if no symptoms!
Basic Stewardship Principles

- Pseudomonal coverage not warranted for hospitalized patients with community infections (e.g., quinolones outpt oral drugs, & no Zosyn for CAP or cellulitis!)

- MRSA coverage not required for most CAP, cellulitis, IAI, UTI

- Don’t treat *Candida* in the urine or sputum
Oh, and by the way:

- FDA indication irrelevant
- The fact that drugs worked in clinical trials irrelevant
- FDA indication depends only on how the trials were done, with no consideration for stewardship principles
- Be a responsible steward please
“The most viable strategy for reducing antimicrobial selective pressure is to treat infections only for as long as is necessary.”

Dr. Lou Rice, Executive Chair of Medicine, Warren Alpert School of Medicine of Brown University. 2008 Maxwell Finland Lecture at IDSA Annual Meeting
The New Antibiotic Mantra—“Shorter Is Better”

Brad Spellberg, MD

JAMA Internal Medicine

In AD 321, Roman Emperor Constantine the Great codified that there would be 7 days in a week. Even in the modern era of evidence-based-medicine, this 1695-year-old decree remains a primary reference for duration of antibiotic therapy: it leads physicians to treat infections in intervals of 7 days. Thus, it is gratifying when clinical trials challenge the standard antibiotic duration of 7 to 14 days.

Standard Abx durations: 1-2 Constantine units—based on 1695 year old decree
**Stewardship: Shorter = Better**

- Studies of numerous infection types

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Short (d)</th>
<th>Long (d)</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAP</td>
<td>3 or 5</td>
<td>7, 8, or 10</td>
<td>Equal</td>
</tr>
<tr>
<td>HAP</td>
<td>7</td>
<td>10-15</td>
<td>Equal</td>
</tr>
<tr>
<td>VAP</td>
<td>8</td>
<td>15</td>
<td>Equal</td>
</tr>
<tr>
<td>Pyelo</td>
<td>7 or 5</td>
<td>14 or 10</td>
<td>Equal</td>
</tr>
<tr>
<td>Intra-abd</td>
<td>4</td>
<td>10</td>
<td>Equal</td>
</tr>
<tr>
<td>AECB</td>
<td>≤5</td>
<td>≥7</td>
<td>Equal</td>
</tr>
<tr>
<td>Cellulitis</td>
<td>5-6</td>
<td>10</td>
<td>Equal</td>
</tr>
<tr>
<td>Osteo</td>
<td>42</td>
<td>84</td>
<td>Equal</td>
</tr>
<tr>
<td>Neutropenic Fever</td>
<td>AF x 72 h</td>
<td>+ANC &gt; 500</td>
<td>Equal</td>
</tr>
</tbody>
</table>
CAP: Short Course

- Multiple randomized trials showing 5 (or even 3) days NI to 7 to 10 days of Abx

- Now includes a study of pts with PORT IV and V (Uranga et al. JAMA IM)

- Reduced emergence of resistance with shorter course therapy

### Table 3. Clinical Success Rates at Days 10 and 30 Among Different Severity Groups Defined by PSI Class

<table>
<thead>
<tr>
<th>PSI Class</th>
<th>No. (%) of Participants</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control Group</td>
<td>Intervention Group</td>
</tr>
<tr>
<td></td>
<td>PSI classes I-III</td>
<td></td>
</tr>
<tr>
<td>Intent to treat</td>
<td>41/86 (47.7)</td>
<td>58/101 (57.4)</td>
</tr>
<tr>
<td>Per protocol</td>
<td>39/80 (48.8)</td>
<td>58/94 (61.7)</td>
</tr>
<tr>
<td>PSI classes IV-V</td>
<td>PSI classes IV-V</td>
<td></td>
</tr>
<tr>
<td>Intent to treat</td>
<td>30/60 (50)</td>
<td>32/59 (54.2)</td>
</tr>
<tr>
<td>Per protocol</td>
<td>28/53 (52.8)</td>
<td>28/50 (56)</td>
</tr>
<tr>
<td>Clinical Success at Day 30</td>
<td>PSI classes I-III</td>
<td></td>
</tr>
<tr>
<td>Intent to treat</td>
<td>83/88 (94.3)</td>
<td>93/102 (91.2)</td>
</tr>
<tr>
<td>Per protocol</td>
<td>80/82 (97.6)</td>
<td>89/95 (93.7)</td>
</tr>
<tr>
<td>PSI classes IV-V</td>
<td>PSI classes IV-V</td>
<td></td>
</tr>
<tr>
<td>Intent to treat</td>
<td>49/61 (80.3)</td>
<td>54/58 (93.1)</td>
</tr>
<tr>
<td>Per protocol</td>
<td>46/54 (85.2)</td>
<td>47/49 (95.9)</td>
</tr>
</tbody>
</table>
1 Dose Is Effective!

- 2 daptomycin pivotal trials for CAP, an initial pre-study dose of CTX allowed.
- Overall dapto inferior cure vs. CTX: 71% vs. 77%.
- For pts who received 1 dose CTX prior, cure rate was 91% vs. 88%, for others 75% vs. 88%.
- 1 dose cures a substantial number of pts.

Pertel CI D 2008 46:1142-51
HAP/VAP: Short Course

• Several randomized trials showing that 7-8 days as effective as 10-15 days

• Reduced emergence of resistance with shorter course therapy

• New guidelines recommend 7 days for all, irrespective of pathogen

VAP: “Ultra-Short Course”

Klompas et al. ‘17 Clin Infect Dis 64:870-6

- Retrospective study of VAP at Brigham 2006-14 of patients started on Abx for “suspected VAP”
- All had PEEP ≤ 5 & FiO₂ ≤ 40% on the day Abx started and for 2 days following
- Suspected VAP = endotracheal or BAL Cx ≥ 3 days after intubation + Abx given within 2 days of Cx
### Table 3. Competing Risk Analyses of Outcomes Among Patients Prescribed 1–3 Days Versus >3 Days of Antibiotics

<table>
<thead>
<tr>
<th>Patient Population</th>
<th>Time to Extubation Alive</th>
<th>Ventilator Death</th>
<th>Time to Hospital Discharge Alive</th>
<th>Hospital Death</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>HR (95% CI)</td>
<td>PValue</td>
<td>HR (95% CI)</td>
</tr>
<tr>
<td>All patients</td>
<td>1290</td>
<td>1.16 (.98–1.36)</td>
<td>.08</td>
<td>0.82 (.55–1.22)</td>
</tr>
<tr>
<td>Propensity-matched population</td>
<td>514</td>
<td>1.15 (.97–1.38)</td>
<td>.12</td>
<td>0.89 (.57–1.38)</td>
</tr>
<tr>
<td>Patients with VAP diagnosis codes (propensity-matched population)</td>
<td>104</td>
<td>1.27 (.86–1.88)</td>
<td>.24</td>
<td>0.69 (.26–1.79)</td>
</tr>
<tr>
<td>Patients with ≥25 neutrophils per low-power field and positive cultures for potentially pathogenic organisms (propensity-matched population)</td>
<td>100</td>
<td>1.00 (.67–1.49)</td>
<td>.98</td>
<td>0.85 (.29–2.50)</td>
</tr>
</tbody>
</table>

Hazard ratios >1 indicate a greater probability of extubation per day and hence less time to extubation alive and hospital discharge. Hazard ratios <1 indicate a lower probability of death per day and hence greater overall probability of survival.

Abbreviations: CI, confidence interval; HR, hazard ratio; VAP, ventilator-associated pneumonia.
VAP: “Ultra-Short Course”

Klompas et al. ‘17 Clin Infect Dis 64:870-6

• Author’s conclusion: can treat with ≤3 days of Abx for patients with VAP with low PEEP and FiO₂

• My conclusion: can treat with ≤3 days of Abx for patients who don’t have VAP

• If you’re going to treat uninfected patients with antibiotics, at least do the courtesy of treating for short period of time
Neutropenic Fever: Short Course

- 6 hospitals in Spain, open label randomized study of pts with high risk neutropenic fever—all heme CA or HSCT
- Tx until afebrile for 72 h and “stable” vs. same criteria AND the ANC >500
- Tx was anti-pseud b lactam +/- vanco, aminoglyc, or quinolone

Aguilar-Guisado ’17 Lancet Haematology ePUB
Neutropenic Fever: Short Course

- Antibiotic-free days:
  ITT = 16.1 vs. 13.6 control (p = 0.026)
  modified PP = 17.5 vs. 11.3 (p = 0.0003)

- Mortality 1% vs. 4% (control)—p = 0.6

- No difference in #days fever (4.9 vs. 5.4)
  or recurrent fevers (14% vs. 18%)

- SAEs: 14% vs. 34% (!), including
  infections 7% vs. 20% (!) (p = 0.009)

Aguilar-Guisado ‘17 Lancet Haematology  ePub
Stewardship: The Power of Diagnostics

- Fear drives inappropriate abx use
- Fear based on diagnostic uncertainty
- Rapid diagnostics provide psychological reassurance to overcome the fear
- Procalcitonin is a biomarker indicating it is safe to withhold or shorten antibiotic therapy—it is not a diagnostic
Stewardship: New Psychological Approaches

Original Investigation

Nudging Guideline-Concordant Antibiotic Prescribing
A Randomized Clinical Trial  

Daniella Meeker, PhD; Tara K. Knight, PhD; Mark W. Friedberg, MD, MPP; Jeffrey A. Linder, MD, MPH; Noah J. Goldstein, PhD; Craig R. Fox, PhD; Alan Rothfeld, MD; Guillermo Diaz, MD; Jason N. Doctor, PhD

**RESULTS** Baseline rates were 43.5% and 42.8% for control and poster, respectively. During the intervention period, inappropriate prescribing rates increased to 52.7% for controls but decreased to 33.7% in the posted commitment letter condition. Controlling for baseline prescribing rates, we found that the posted commitment letter resulted in a 19.7 absolute percentage reduction in inappropriate antibiotic prescribing rate relative to control (*P* = .02).

Antibiotic Judo Working Gently With Prescriber Psychology to Overcome Inappropriate Use

Brad Spellberg, MD  
*JAMA Intern Med. 2014 March ; 174(3): 432–433*
Audit and feedback (peer comparison)

“Accountable justification” in EMR

“Suggested alternatives” in EMR
Stewardship: Expected Practices

• Providers may push back on stewardship recs due to concerns of “liability” or “I’m in the hot seat, not you”

• Establishing an Expected Practice around stewardship, signed off on by MEC, redistributes responsibility to the facility

• EP can be around short-course therapy and around basic stewardship principles
Stewardship: Benchmarking Abx Use

• Need align physician and public interests

• Antibiotic use should be publicly reported and payments to healthcare systems (and possibly providers) benchmarked to reward low use and penalize high use

• Analogous to infection prevention—always had IP programs, but infection rates didn’t go down until public reporting and pay-for-performance
The Curse of the Urban Legend

• “If you want to prevent resistance take every dose of antibiotics even after you feel better.”

“This may be excellent advice when one wants to have the patients take an adequate course to treat an infection, but it is poor advice for preventing resistance.” L. Rice
• In the mid 1940s, PCN studies for CAP

• PCN administered “until there was definitive clinical improvement...then given for another two to three days” (Mead et al. ‘45 NEJM 232:747-55)

• Explanation was desire to reduce relapses—but they weren’t relapses, they were new infections by different strains
Confront Urban Legend

• Stop telling patients to complete course of Abx even if their symptoms are gone

• No data to support this practice—it makes no sense, not how natural selection works

• Taking antibiotics after symptom resolution provides no efficacy but selects for resistant among microbiome

• If patients feel better, they should call their doctor to ask to stop early
Take Home Messages

1. Antibiotics are a societal trust—no one has the right to waste them

2. Fear drives most inappropriate Rx

3. Successful antibiotic stewardship is about psychological intervention

4. Recognize and combat fear and entitlement—keep it objective, what’s the DDx, what organisms are a concern?
5. Use short-course therapy

6. Encourage diagnostics/biomarkers

7. Consider novel psychological approaches ("gentle nudge", "audit and feedback", "accountable justification", "Expected Practices"

8. The future is audit/feedback and pay for performance to align societal, provider, and patient interests
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