Overuse of Antibiotics: The Case for Improved Prescribing

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Disclosure

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Objectives

- Identify common pitfalls in antibiotic prescribing
- Recognize components of a successful practice based ASP
- Define targets for ASP practice activities

What’s the Big Deal?

- Although antibiotics have saved countless lives, their use is not benign
  - Antibiotic resistance
  - At least 5% of hospitalized patients experience an adverse reaction
  - *C. difficile* infection
- 50% are prescribed for people who do not need them or are not prescribed appropriately
  - URI, bronchitis, OME
  - AOM, sinusitis, strep throat-diagnostic errors, inappropriate drugs
- Very few antibiotics are being developed
Antibiotics Linked to

- **Adverse events-outpatients**
  - Estimated ED 142,505 visits/yr for drug-related adverse events attributable to systemic antibiotics
    - beta lactams most common but sulfa most serious
- **C difficile disease**
  - High-risk antibiotics-clindamycin, CMCs, and fluoroquinolones
- **Antibiotic resistance**-60% human use is outpatient; animal/food industry (animals=80% of all use)


TMP/SMX Reaction
Length of stay and *Clostridium difficile* infection in children

Mortality rates were significantly higher among HO-CDI compared with matched subjects (OR, 6.73 [95% CI, 3.77–12.02])
The Epidemic of Antibiotic-Resistant Infections: A Call to Action for the Medical Community from the Infectious Diseases Society of America

Brad Spellberg, Robert Guidos, David Gilbert, John Bradley, Helen W. Boucher, W. Michael Scheld, John G. Bartlett, and John Edwards, Jr., for the Infectious Diseases Society of America

Clinical Infectious Diseases 2008; 46:155–64

2nd and 3rd cephalosporins
Emerging Resistance Patterns—in our own backyard

CRE, or carbapenem-resistant Enterobacteriaceae, have been deemed “nightmare bacteria” by CDC, which classified the pathogen as an urgent threat.

As of 2001, CRE was reported in one state.
As of early 2016, CRE was found in 48 states.

Animal Industry

On the farm:
21 million pounds of antibiotics important to human medicine were sold for use in food animals in 2015.
Other Unintended Consequences

Autoimmune and metabolic syndromes

Obesity
Low burden *Actinobacteria* and a high burden *Firmicutes* at 3 mos likely to have high BMI at 5–6 yrs, only if they received several courses of antibiotics

Congenital birth defects
Clindamycin, doxycycline >>quinolones, macrolides, penicillin in utero exposure were linked to ↑malformations; no link amoxicillin, cephalosporins and nitrofurantoin
What can the individual practitioner do and why will it make a difference?

Goals for pediatric outpatients vs inpatients

Most physicians think others misuse antimicrobials while most do not think they themselves misuse antimicrobials

Abbo, et al Evaluation of Faculty and Resident Physicians' Knowledge and Perceptions about Antimicrobial Use and Resistance: A Web Based Survey
5th Decennial International Conference on Healthcare-Associated Infections 2010
Variability in Antibiotic Use in Hospitalized Children

Gerber et al. Pediatrics 2010

Antibiotic Prescribing for Sick Visits

Excluding: preventive visits, CCC
Standardized by: age, sex, age-sex, race, Medicaid
Antibiotic Prescriptions per 1000 Persons of All Ages According to State, 2010.

- Optimizes patient outcomes
  - Improved clinical outcomes
  - Decrease in ADR
- Optimizes patient safety
  - Reduces *C. difficile* infection
- Reduces resistance
- Decreases cost

Carling P et al. ICHE 2003; Fowler S et al. JAC 2007; White AC et al. CID 1997; Staniford HC et al. ICHE 2012
Hospital ASP Call to Action 2007

- Leadership resources
  - Human, financial and IT
- Accountability
  - Single leader, physician
- Drug expertise
  - ASP pharmacist
- Action
  - Restriction, prospective audit and feedback
- Tracking - benchmarks
- Reporting - metrics
- Education
  - Regarding resistance and optimal prescribing

Percent of Hospitals with Antibiotic Stewardship Programs by State, 2015*

Nationally, 48.1% of all hospitals have stewardship programs (2,199 of 4,549); the national goal is 100% of hospitals by 2020.

*An antibiotic stewardship program is defined as a program following all 7 of CDC’s Core Elements of hospital antibiotic stewardship programs. Source: CDC’s National Healthcare Safety Network (NHSN) survey.
Outpatient Call To Action

Most antibiotics are used in outpatient setting and up to 50% are unnecessary

- Improved patient care
- Cost savings
- Reduction in *C. difficile* infections
- Reduction in adverse drug events
- Reduction in antimicrobial resistance

5 at-risk conditions and practice deviation

- Unnecessary
  - antibiotics not indicated -- bronchitis, URI
- Overdiagnosis
  - when condition dx w/o fulfilling the diagnostic criteria or w/o testing→strep throat
- Wrong agent, dose, or duration
  - Wrong agent--azithromycin for AOM
  - Needlessly broad—cefixime for UTI
- Underuse of watchful waiting
  - AOM or ABS
- Need for timely antibiotics is not recognized
**Broad Antibiotic Prescribing**

Excluding: preventive visits, CCC, antibiotic allergy, prior abx
Standardized by: age, sex, age-sex, race, Medicaid

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**How often are broad-spectrum antibiotic used in practice?**

- Examined BSA <18 yrs 2006-07
- Amox-clav, 2nd, 3rd gen cephalosporins, macrolides, clindamycin, FQ
- 51% of pediatric visits → abx prescribed
- 38% macrolides, 30% cephalosporins, 27% amoxicillin-clavulanate
- ARTI- most frequent diagnosis
  - In the South & Midwest
  - Children ≤ 5 years

*Adam L. Hersh, MD, PhD and Daniel J. Shapiro, BA, U California, San Francisco, CA IDSA Vancouver, 2010*
Principles Judicious Use

- Correct diagnosis = stringent guidelines
  - Diagnosis is a bacterial infection that requires antibiotic rx
- Right drug - most narrow, effective
- Right duration
- Counseling re: potential adverse events, expected outcome

Scenario 1

Antibiotic prescribed when none indicated

Antibiotic prescriptions for URI, bronchitis
Judicious Use-URI

- URI-may present with moderate or high fever, cough, congestion, rhinorrhea
- Identify child who can decompensate
- Symptomatic care
- Counsel re: expected course
- No antibiotics
**Scenario 2**

Diagnostic criteria?
Wrong empiric drug based on knowledge of antibiotic susceptibility
A 2 year old has fever and middle ear effusion
Given azithromycin

**Diagnosing AOM is tricky**
Judicious Use - AOM

- Acute otitis media - accurate diagnosis; identify when watchful waiting is appropriate, amoxicillin
- Appropriate vs inappropriate antibiotics

Taking ACTION!

- Accurately diagnose acute otitis media
- Consider watchful waiting for non-severe cases
- Treat pain in all
- Identify drug of choice = amoxicillin
- Observe for response in all instances
- Need for follow up at 72 hours if no better

Amoxicillin for bilateral AOM in 6-23 mos
OR ≥6 mos for unilateral or bilateral OM when temp >102.2°F
Most common respiratory pathogen: *Streptococcus pneumoniae*

**Trends in Pneumococcal Susceptibility**

- Pre-vaccine serotypes
  - Penicillin and macrolide R
- PCV7
  - Serotype 19A and others emerge
- PCV13
  - Changing trends once again
  - Increase in penicillin susceptible serotypes
Scenario 3

My child has a sinus infection—just like last time when he got a “Z pak”

Background of Pediatric EBP

ABS

- ABS is a complication of URI
- 6% and 7% of children 1-18 years of age seeking care for respiratory symptoms
- Two guidelines both omit < 1 year, anatomic defects, immunodeficiency, CF or ciliary dyskinesia
maxillary: 4-5 months; ethmoids: 12 months; sphenoid: 4 years; frontal: 5-6 years

https://www.google.com/search?q=sinuses+child&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjByO_XtevTAhVmA2oMKHW2HDcMQ_AUIBigB&biw=1920&bih=963#imgrc=lDSBxCfrF0AkWM:&spf=1494628671405

**Definition: Acute Uncomplicated Bacterial Sinusitis**

- Rhinorrhea, daytime cough for 10 days or longer without improvement
- Rhinorrhea with fever >102.2°F for at least 3 days
- Cold worsens after improvement with new fever and cough/rhinorrhea
Scenario 4

- Injudicious testing contributes to injudicious antibiotic use
- Example: streptococcal pharyngitis

80% viral and cannot be distinguished by exam
Judicious Use-Streptococcal pharyngitis

- Group A streptococcus - impact of treatment
  - Speeds recovery
  - Reduces suppurative complications
  - Reduces non-suppurative sequelae
- Test those >3 years with sore throat in the absence of viral symptoms of rhinorrhea, congestion, cough
- Only treat those with positive RADT → amoxicillin single daily dosing

*Most patients who give a history of penicillin allergy are not allergic - explore this history carefully and document in the chart*

Typical Clinical Approach to Patient with Pharyngitis

IDSA Guidelines [http://www.journals.uchicago.edu/doi/pdf/10.1086/340949](http://www.journals.uchicago.edu/doi/pdf/10.1086/340949)
Practice Agreement

- Amoxicillin - drug of choice
- Unless allergy to penicillin, non-adherence risk
  - Confirmation of allergy

Discontinue antibiotics if negative testing

Office Steps

- Diagnose as group A streptococcal pharyngitis using a laboratory test
  - If clinical and epidemiological findings met
- Antibiotics should not be given to a child with pharyngitis only if positive RADT
- Amoxicillin remains the drug of choice
  - Use single daily dose for 10 days
  - Antibiotic should be discontinued if initiated empirically and testing negative
Scenario 5

- Drug bug mismatch or needlessly broad drug choice
- You suspect UTI in a 3 month old
- 10 years ago, TMP-SMX an appropriate choice; resistance rates for E coli >25%

UTI

- ~1.6 million pediatric UTI visits/yr
- TMP-SMX: most commonly prescribed 49%
- 1/3 visits were prescribed broad-spectrum antibiotics
  - 3rd generation cephalosporins
  - Increase risk <1 year and high fever
- Doubling in use of 3rd generation cephalosporins=opportunities to promote more judicious antibiotic prescribing

Copp and Shapiro AAP 2010 Abstract 10063
Antibiotic Prescribing Patterns for Pediatric Urinary Tract Infection:
Testing for UTI?

- A urinalysis and urine culture should be obtained from children <3 years of age with a fever (>39.0°C rectal) with no apparent source
  - Infants with a fever >39°C for >48 h without another source for fever on examination are highly likely to have a UTI
- For children ≥3 years of age, the presence of urinary symptoms (dysuria, urinary frequency, hematuria, abdominal pain, back pain or new daytime incontinence)
- Right specimen and interpretation of UA
  - negative dipstick for nitrates and LE, pyuria or bacteruria on microscopic examination= <1% chance of UTI

CMH Antibiogram 2015

[Antibiogram image]
Feedback Tool

- Visual cues
- Can be educational tool
- Pre-printed scripts
- Trigger tool linked to testing guidelines
- Evaluate/re-evaluate
- Add intervention as needed

Outpatient Stewardship Partners

- Acute care hospitals
- State and local health departments
- Health plans and payers-quality-based payments.
- Health care professional societies
  - Create and share CPG, provide CME, bolster national, local, and regional initiatives
- Community pharmacies and pharmacists
  - Screening for drug interactions and allergies, and patient education
- Local microbiologic laboratories
  - Antibiograms, diagnostic stewardship
Office Nurse’s Role in Stewardship Activities

- Outpatient coordination and flu
- Allergy history
- Obtaining testing, cultures
- Clinical monitoring
- Review labs
- Identify adverse event

Morgan, et al. JAMA. Published online July 31, 2017.
Goals 2017

- Use stringent rules for diagnosis
  - Clinical and laboratory
- Determine if antibiotics needed
- Culture to confirm pathogen
- Use antibiotic susceptibility data to determine appropriate drug
- Counsel every time re: expected course, risks of antibiotics
- Track and improve your antibiotic use-AAP EQIPP module

Clinician Checklist