Antimicrobial Stewardship: It's for Kids!

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I have no actual or potential conflict of interest in relation to this activity

Illinois Council of Health-System Pharmacists 2014 Annual Meeting

Objectives

Pharmacists:
- List the reasons why antimicrobial stewardship is important in pediatric patients
- Describe key team members to involve in forming a pediatric antimicrobial stewardship team.
- Outline the guideline recommendations for empiric therapy for pediatric community acquired pneumonia.

Technicians
- List the reasons why antimicrobial stewardship is important in pediatric patients
- Describe key team members to involve in forming a pediatric antimicrobial stewardship team.
- Identify commonly used antibiotics in hospitalized pediatric patients with community acquired pneumonia.

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Where are pediatric patients seen most in your facility?

- Pediatric care units
- Pediatric patients are cared for where there are beds available
- Outpatient clinics
- Emergency room
- I work at the VA, I've heard of pediatric patients but never seen one.

Dellit et al. Clin Inf Dis. 44:2; 159-177.

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WHY STEWARDSHIP?

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Pediatric antimicrobial stewardship

- Still in the "toddler" stage
- Majority of current programs started after 2007
- 38% of freestanding children's hospitals have an antimicrobial stewardship program (ASP) in 2014
- 36% of freestanding children's hospitals were in the process of implementing programs.[1]

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Inpatient pediatric antibiotic use

- Greater than 60% of pediatric patients receive at least one antibiotic during their hospitalization.[2]
- Greater than 90% of patients receive an antibiotic if they have surgery, have a central venous catheter, have prolonged ventilation, or are in the hospital for greater than 14 days.[2]

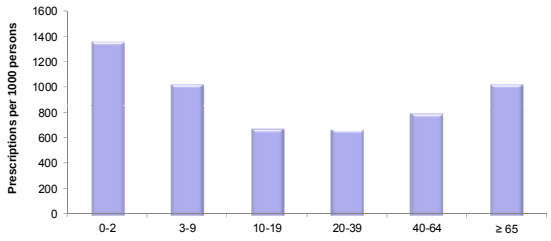
Inpatient pediatric antibiotic use

- Highest using conditions[3]
  - Pneumonia
  - Appendicitis
  - Cystic fibrosis
  - Skin and soft tissue infections
- Represent less than 1% of all conditions but account for more than 10% of antibiotic use[3]
- Pediatric surgical patients received 43% of all antibiotics[3]

Repeated antibiotic use

- Pediatric patient populations
  - Pediatric oncology patients
    - Febrile neutropenia
    - Line infections
  - Pediatric transplant patients
    - Immunosuppression
  - Cystic fibrosis patients
    - Receive antibiotic courses for declining function
    - Receive antibiotics for exacerbations

Outpatient pediatric antibiotic use



Hicks LA et al. N Engl J Med 2013;368:1461-1462

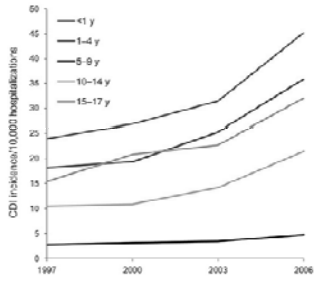
Antibiotics are not benign therapy

- Antibiotics are the class of drugs most frequently associated with dosing errors[4]
- Antibiotics are associated with a third of encounters with the health care system related to adverse drug events[5]
  - Most common ages zero to four years old
  - Most common reaction was dermatologic or gastrointestinal

Pediatric C. difficile infection

- National rate of pediatric hospitalizations due to C. difficile infection has increased over the past 10 years[6]
- Established risk factors for C. difficile infection in adults[7]
  - Antibiotic exposure
  - Hospitalization
  - Advanced age
  - Gastric acid suppression

Pediatric C. Difficile infection



Zilberberg MD et al. Emerg Infect Dis 2010; 16:604-609

Pediatric C. difficile infection

- Pediatric risk factors identified from 95 cases[8]
  - Antibiotics in the past four weeks
    - A fluoroquinolone antibiotic in the past four weeks had a stronger correlation
  - Solid organ transplant
  - G or J tube
  - No hospitalization in the prior 12 weeks

Which of the following reasons is why pediatric antimicrobial stewardship important?

- Increasing rates of *C. difficile*
- High inpatient antibiotic use
- High outpatient antibiotic use
- Risk of prescribing errors
- All of the above

What physician group primarily cares for pediatric patients in your facility?

- Pediatric hospitalists
- Private physicians come in to see their patients
- Emergency room physicians
- Outpatient pediatricians and specialists
- Family practice physicians

Core members for antimicrobial stewardship team[8]

- Infectious disease physician
- Pharmacist with infectious disease training
- Clinical microbiologist
- Information system specialist
- Hospital epidemiologist

Dellit et al. Clin Inf Dis. 44:2;

Barriers to core members

- Availability of a pediatric infectious disease physician
- Availability of a pharmacist with pediatric infectious disease training
- Dedicated time for stewardship
- Smaller facilities
  - Shared microbiologist / lab staff
  - Shared IT resources

Alternatives to core members

- Work with what you have
- Physician champion
  - Pediatric hospitalist
  - Emergency room physician
  - Community physician leader
  - Health care system shared resources
- Physicians like to hear stewardship recommendations from a physician[9]

Alternatives to core members

- Work with what you have
- Only one residency that provides pediatric infectious disease pharmacist training
- Training programs available
  - MAD-ID
  - Society of Infectious Disease Pharmacists
- Don't let perfect get in the way of the good

Methods to use

- Prospective audit with feedback
- Restriction programs
- Require dedicated time and FTE's to be most effective
- Physicians are least fond of restriction programs

Methods to use

- Quality improvement methods work
  - Plan – Do – Study – Act
- Stand alone pediatric children's hospital[10]
  - Interventions in the ER
  - Interventions with resident staff
- Results – within 6 months
  - Appropriate first line prescribing went from 0% to 100% in the ER
  - Appropriate first line prescribing went from 30% to 100%

What would work best in your facility?

- Pharmacist partnering with a pediatric hospitalist to provide stewardship activities
- Pharmacist partnering with an emergency room physician to provide stewardship activities
- Pharmacist partnering with a community physician leader to provide stewardship activities

THE GUIDELINES[11]

Pathogens responsible for CAP

- Most common pathogens: *S. pneumoniae, S. aureus, H. influenzae*
- Most common atypical pathogen: *Mycoplasma pneumoniae* (Legionella, Chlamydia with risk factors)

What would this patient receive in your facility?

KT is a three year old female admitted to the hospital for pneumonia. She has a fever, tachypnea, tachycardia, and cough. Her chest x-ray has findings for left lower lobe consolidation. She has no empyema or effusion on her x-ray.

What would this patient receive in your facility?

- Ampicillin alone
- Ceftriaxone alone
- Ampicillin and azithromycin
- Ceftriaxone and azithromycin
- Cefepime and vancomycin

Recommended empiric therapy for CAP

- Outpatient therapy:
  - 1st line: amoxicillin 90mg/kg/day in two divided doses
  - Alternative: amoxicillin/clavulanate 90mg/kg/day divided
  - When atypical pneumonia is suspected (daycare, older child): azithromycin 10mg/kg x 1, 5mg/kg day x 4 days
  - Alternative for atypical: clarithromycin 15mg/kg/day in two divided doses

Pathogen directed therapy

- S. pneumoniae with MIC to penicillin of less than or equal to 2mcg/ml
  - Ampicillin 150-200mg/kg/day divided into four doses
  - Stepdown therapy: amoxicillin
  - Alternative: ceftriaxone, cefotaxime, clindamycin, levofloxacin

Pathogen directed therapy

- S. pneumoniae with MIC to penicillin of greater than or equal to 4mcg/ml
  - Ceftriaxone 100mg/kg/day daily or divided in two doses
  - Stepdown: levofloxacin dosed on weight and age or clindamycin
  - Alternatives: Ampicillin 300-400mg/kg/day divided into four doses, levofloxacin, vancomycin

Pathogen directed therapy

- Group A streptococcus
  - 1st line: ampicillin 200mg/kg/day divided q6h or penicillin
  - Stepdown: amoxicillin or penicillin
  - Alternatives: ceftriaxone, cefotaxime, or clindamycin

Pathogen directed therapy

- Methicillin susceptible S. aureus (MSSA)
  - 1st line: cefazolin or nafcillin
  - Step down: cephalexin
  - Alternatives: clindamycin or vancomycin

Pathogen directed therapy

- Methicillin resistant S. aureus (MRSA)
  - Clindamycin susceptible
    - 1st line: vancomycin or clindamycin
    - Step down: clindamycin
    - Alternative: linezolid
  - Clindamycin resistant
    - 1st line: vancomycin
    - Stepdown: linezolid
    - Alternative: start with linezolid

Pathogen directed therapy

- Haemophilus influenzae, typeable or non
  - 1st line: ampicillin (if beta lactamase negative), ceftriaxone or cefotaxime
  - Stepdown: ampicillin or amoxicillin/clavulanate
- Alternatives: levofloxacin, cefixime, cefpodoxime, or **cefdinir**

Pathogen directed therapy

- Mycoplasma pneumoniae or suspected chlamydia
  - 1st line: azithromycin
  - Alternatives: clarithromycin, doxycycline (>7 years old), levofloxacin
- Influenza
  - Oseltamivir or zanamivir (>7 years old)

How long to treat?

- 10 days – best studied
- Or less? For mild disease managed in an outpatient setting
- Or more? For severe disease involving specific pathogens

Following the guidelines

MH is an 9 yo male with fever (Tmax 103.7), tachypnea, tachycardia, and productive cough. His chest x-ray shows a right middle lobe consolidation without effusion. His oxygen saturations are 88-90% on room air and he is going to be admitted to the general pediatric unit for therapy. He has no significant past medical history. What empiric antibiotics would be appropriate for MH?

Following the guidelines

- Ampicillin alone
- Ampicillin and azithromycin
- Ceftriaxone alone
- Ceftriaxone and azithromycin
- Ceftriaxone and vancomycin

Do we know narrow spectrum therapy is ok?

- Two retrospective studies have been published[12-13]
- Both found no increase in length of stay or cost associated with narrow spectrum therapy
- No difference in readmission rates

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