Antimicrobial Stewardship in the Community Setting

Objectives

- Identify the antimicrobial resistant organisms that pose threats to the community and outline evidence-based prevention strategies.
- Define the role of antimicrobial stewardship in preventing drug-resistant infections in the community setting.
- Describe antimicrobial stewardship strategies that can be implemented in the community setting.
- Discuss how to communicate and collaborate effectively with other healthcare environments.

Sir Alexander Fleming (1881–1955)

- Discovered Penicillin in 1928
- Made the following cautionary statement on June 26, 1945 in a NY Times article.
  "...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 a man who finally succumbs to infection with the penicillin-resistant organism. I hope this evil can be averted."

“...The healthcare system needs to improve how it detects patients with drug–resistant infections, controls the spread of such infections, prevents them from happening in the first place and incentivizes drugmakers to develop new antibiotics."

CDC Director Thomas Frieden, July 2014

Background

- Two million Americans develop resistant infections each year.
- 23,000 Americans die from drug–resistant infections annually.
- Antimicrobial agents typically account for a large proportion of the pharmacy expenditures.
- It has been estimated that 30–50% of antimicrobial use is inappropriate.
- Inappropriate antibiotic use has been associated with propagation of antimicrobial resistance and other adverse effects.
- Appropriate use of antimicrobial agents may improve patient outcomes AND reduce healthcare costs.

Antimicrobial Resistance

- Estimated cost of resistance in US–$30 billion annually
- Resistance to antimicrobials can be increased by misuse and overprescribing
- The use of antimicrobials forces bacteria to either adapt or die—leading to selective pressure
- Bacteria that adapt and survive antimicrobial therapy carry genes for resistance—these genes are transmitted to future generations of bacteria

www.cdc.gov

http://www.who.int/drugresistance/documents/surveillancereport/en/

Institute of Medicine – www.iom.edu
### Public Health Significance

- “Deadly MERS Virus May Be Airborne, Study Says” (Newsweek)
- “Nigeria government confirms Ebola case in megacity of Lagos” (Reuters)
- “Tarrant County measles case has possible Dallas County connections” (Dallas Morning News)
- “Drug-resistant malaria in Thailand threatens deadly global ‘nightmare’” (NBC World News)

### Antimicrobial Stewardship

**Definition**
The Infectious Diseases Society of America (IDSA) in association with the Society for Healthcare Epidemiology of America (SHEA) developed guidelines that define antimicrobial stewardship as an activity that promotes:

- the appropriate selection of antimicrobials
- the appropriate dosing of antimicrobials
- the appropriate route and duration of antimicrobial therapy

### Patient Impact

- Increased office visits
- Loss of time from work
- Increased severity of illness
- If admitted to the hospital, increased length of stay
- Adverse events from multiple antimicrobials
- Death

### Antimicrobial Stewardship Programs

- Are composed of a core group of team members that typically include:
  - Infectious Diseases Physician(s)
  - Clinical pharmacist with infectious diseases training
  - Clinical microbiologist
  - Information system specialist
  - Infection control professional
  - Hospital epidemiologist
- Require the support and collaboration of hospital administration, medical staff leadership, and local providers.

### Benefits of Antimicrobial Stewardship

- Improves clinical outcomes
- Provides more cost effective care
- Decreases use of costly antimicrobial agents
- Decreases length of stay
- Reduces readmissions
- Prevents Healthcare Associated Infections
- Decreases adverse event rates
- Curtails antimicrobial resistance
- Reduce overall healthcare expenditures
### Antimicrobial Stewardship Strategies

- **Core strategies**
  - Prospective audit with intervention and feedback
  - Formulary restriction and preauthorization

- **Supplemental strategies**
  - Education
    - Including availability of an up-to-date antibiogram
  - Guidelines and clinical pathways
  - Streamlining or de-escalation of therapy
  - Dose optimization
  - Parenteral to oral conversion
  - Computer-assisted decision support
  - Others

### Assessment Question: What is ESKAPE?

**A.** A fun way to spell vacation

**B.** The place we go so we cannot receive pages for antibiotic approvals

**C.** Walking faster than students on rounds so you can lose them

**D.** Microorganisms that are developing resistance before we develop drugs

### Antimicrobial Resistance

- The incidence of antimicrobial resistance has been steadily increasing over the past 2-3 decades.
- Development of new antimicrobial agents has decreased.

### Antimicrobial Use and Resistance

- Patient with a history of antimicrobial use have an increased risk of resistance
- Regions with prevalent antimicrobial use have higher rates of resistance
- Changes in use can lead to changes in the prevalence of resistance
- Changes in prescribing patterns can lead to resistance with new antimicrobials
- Dose–response relationships exist between antimicrobials and resistance patterns

### Patient Risk of Resistance

- Age <2 or >65
- Immunocompromised or Comorbidities
- Antimicrobial Exposure
  - Treatment of infection
  - Environmental exposure
  - Travel to endemic areas
- Healthcare environments
  - Long term care
  - Hospitals
- Daycare centers
- Close quarters
  - Jail
  - College dorms
  - School gyms - wrestling, football, rugby

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**Staphylococcus aureus**
**Klebsiella pneumoniae**
**Acinetobacter baumannii**
**Pseudomonas aeruginosa**
**Enterobacter species** (E.coli, Klebsiella, Enterobacter, Proteus)

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Inappropriate Antimicrobial Use

- Prescribing courses of antibacterial therapy that are not necessary or longer than necessary
- Prescribing antibacterial agents at inappropriate doses (either too high or too low) or intervals
- Treating infectious processes with agents that do not provide activity against the causative agent(s)
- Using alternate agents (e.g., vancomycin) in patient’s without documentation of a true penicillin allergy
- Failing to prevent vaccine-preventable infections

Inappropriate Antimicrobial Use

- Use of antibacterial agents for treatment of syndromes that are not caused by bacteria (e.g., “colds,” acute bronchitis, most sore throats, “fever”)
- Treatment for culture results that reflect colonization or contamination rather than infection (e.g., asymptomatic bacteriuria)
- Administration of an antibacterial with a broader-than-necessary spectrum of activity (e.g., failure to narrow spectrum based on culture results)
- Failure to consider likely pathogens and resistance patterns in selecting empiric antibiotic regimen

Role of the Pharmacist

- Review culture data and de-escalate therapy when appropriate
- Optimize dosing using pharmacokinetics
- Utilize pharmacodynamics to make treatment decisions
- Medication use evaluations
- Develop and promote antibiograms
- Monitor adverse drug events

Other Responsibilities of the Pharmacist

- Facilitate discharge planning and help patients stay out of the hospital.
- Provide education to other healthcare providers.
- Perform formulary reviews of new or reformulated antimicrobials.
- Precept and mentor pharmacy students.
- Precept and mentor pharmacy residents.
- Provide presentations and publications at the local, state, regional, and national levels.
- Conduct collaborative research to test the effectiveness of new methods of antimicrobial control/restriction/reporting that may increase the effectiveness of antimicrobial stewardship.

Assessment Question

True or False:

- The pharmacist on the Antimicrobial Stewardship Program must have specialty training in Infectious Disease.

Clostridium difficile Initiative
**What is Clostridium difficile?**

- *C. difficile* is a spore-forming, gram-positive anaerobic bacillus that produces two exotoxins:
  - toxin A
  - toxin B
- It is a common cause of antibiotic-associated diarrhea (AAD). It accounts for 15–25% of all episodes of AAD.

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**Prevention of Clostridium difficile**

- Use antibiotics judiciously
- Only use acid suppression agents when appropriate
- Hand hygiene
- Use Contact Precautions: for patients with known or suspected *C. difficile* infection:
  - Place these patients in private rooms.
  - If private rooms are not available, these patients can be placed in rooms (cohorted) with other patients with *C. difficile* infection.
  - Use gloves when entering patients’ rooms and during patient care.

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**Example of Prevention Strategy: Clostridium difficile**

- High Risk Patient report in electronic health record
  - Real time report
  - Risk factors:
    - Age greater than 65 yrs old
    - Broad Spectrum antibiotics
    - Levofoxacin
    - Ceftriaxone
    - Piperacillin/tazobactam
    - Linezolid
    - Acid suppression medications
    - Pantoprazole
    - Famotidine
- Prospective patient review
  - Critical Care rounds
  - Decreased antimicrobial spend by $10 per patient day from baseline
  - Culture review daily
  - Antimicrobial dosing per protocol
**Proton pump inhibitor (PPI) medication use evaluation**
- 23.9% days of IV therapy without an indication
- $10,155 annual cost savings due to appropriate prescribing

**PPI Criteria for Use**
- Indications: erosive or Barrett’s esophagitis, gastritis, GIB, GERD, H pylori treatment, PUD, Zollinger–Ellison, NSAID induced ulcer, stress ulcer prophylaxis only in critical care and only if appropriate (coagulopathy, GIB, prolonged vent, etc.)
- Indication selected by provider on order entry
- Pharmacists to make recommendation
  - Stress ulcer prophylaxis
  - IV to PO automatic substitution

**Clostridium difficile**

**Next Steps**
- Pharmacy residents to identify patients for outpatient taper of PPI
- Warm hand off to Medical Home providers
- PPI taper protocol to be initiated

**Example of Prevention Strategy:**
**Daptomycin Criteria for Appropriate Use**
- Microbiology proven gram-positive infections
  - resistant to vancomycin;
  - inadequate clinical response to vancomycin
  - allergic or intolerant to vancomycin
- Invasive infections caused by Vancomycin Resistant Enterococcus
- One dose prior to discharge on outpatient IV antibiotics

**Strategies to Improve Antimicrobial Use**
- Increased adherence to clinical practice guidelines by physicians and pharmacists
- Use of appropriate dose and duration; only when antimicrobial is necessary
- Improved communication between providers and patients
  - Adverse events—what to do when they occur
  - Adherence
  - Symptom management
  - Antimicrobial resistance

**Upper Respiratory Infections**
- Associated with 15 million infections/year
- Account for 68% of outpatient antibiotics
- Majority are caused by viruses
  - 15-30% of pharyngitis is caused by bacteria
  - ~80% of acute sinusitis has a viral cause
  - 80% of acute otitis media (AOM) cases resolve spontaneously
- Most cases can be treated by watch and wait approach with symptomatic management
Acute Otitis Media: Treatment Guidelines

**Low-Risk Children**
- >2 yrs old, no recent antibiotics, no h/o AOM
- 1st-line: standard-dose amoxicillin or observe for 24-72hrs

**High-Risk Children**
- <2 yrs old, antibiotics in prior month, recurrent AOM
- 1st-line: high-dose amoxicillin

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**Watch and Wait Approach**

**Acute Otitis Media**
- 20 children need to be treated to prevent one case of ear pain
- 33 children need to be treated to prevent one perforation
- One in every 14 children will develop diarrhea, rash, or vomiting from antimicrobial therapy
- Wait 1–3 days before initiating antimicrobial therapy

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**Patient Case**

- A 3-year-old boy who has been irritable and tugging at his ear for 1 day comes into the pharmacy with his mom. He has been afebrile. What would you recommend for this patient?
  - A. Go to the nearest emergency room
  - B. High dose antihistamine
  - C. Influenza Vaccine
  - D. Watch and wait and symptom management

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**Pharyngitis: Treatment Guidelines**

- Viral infection in children < 3 years of age
- Most common bacterial pathogen is Group A Strep and is diagnosed by symptom criteria and throat swab/culture
- Peak incidence of Group A Strep is between 5–15 years of age
- Need to consider noninfectious causes
  - Allergies/Postnasal drip
  - Malignancy
  - Chemical exposure (i.e. cigarette smoke)
  - Direct trauma
- Penicillin is drug of choice if antibiotics are necessary

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**Pharyngitis: Criteria for Rapid Strep Test**

- Close contact with infected individual
- Age 4-15 yrs with ↑ temp and sore throat
- Sudden onset vs. persistent cough or rhinorrhea
- Patients with a history of rheumatic fever
- Epidemic of Group A Strep
- Centor Criteria
  - 2 or more of the following s/sx:
    - Fever (> 101°F), tonsillar exudate, absence of cough, cervical lymph nodes

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**Patient Case**

- A 25-year-old male with 2 days of sore throat comes into the office. He has been afebrile, has rhinorrhea, cough and one day of diarrhea associated with his sore throat. The throat is mildly erythematous with otherwise normal appearing tonsils. Which of the following would be the best option for this patient’s therapy?
  - A. Swab his throat and give a 10 day course of antibiotics, you will call him if the culture is negative for group A strep so that he can stop antibiotic treatment.
  - B. Swab his throat, withhold antibiotics unless his culture is positive.
  - C. Advise him on symptomatic treatment.
  - D. Give him antibiotics without testing for group A strep
**Sinusitis: Treatment Guidelines**

- Onset with persistent symptoms lasting for ≥10 days without improvement
- Onset with severe symptoms or high fever (≥39°C [102°F]) and purulent nasal discharge or facial pain lasting for at least 3–4 days
- Onset with worsening symptoms: new onset of fever, headache, or increase in nasal discharge following a viral upper respiratory infection (URI) that lasted 5–6 days and were initially improving—“double sickening”

**Patient Case**

A patient presents to your pharmacy with a 3-day history of mild nasal congestion, postnasal drip, headache, low grade fever, and malaise. She has had some relief from OTC products. What is the next best step for this patient?

A. Recommend high-dose amoxicillin for 14 days.
B. Avoid antibiotics; this infection is likely viral.
C. Send to the emergency room for a CT scan of the head to confirm diagnosis.
D. Recommend a 1st generation cephalosporin for 14 days.

**When to refer?**

- Extreme lethargy, neck stiffness, difficulty breathing, high fever or seizures
- Any infant < 6 months old with high fever + /- other symptoms
- Lack of wet diapers, significant changes in appetite/poor feeding, persistent diarrhea
- Rash

**Patient Counseling**

- Finish full course of antibiotics
- Review adverse effects—rash, diarrhea
- Emphasize adherence
- Symptom management—antipyretics, analgesics
- Provide appropriate tools—syringe or spoon
- Environmental factors—daycare, smoke exposure, pacifier use
- Watch for alarm symptoms

**Example of Prevention Strategy**

- Prevent vaccine—preventable infections
  - Influenza
  - Pneumococcal infection
  - Pertussis (Tdap)
  - Measles
  - Mumps
  - Zoster
- Travel Vaccines/Infection treatment
  - Malaria

**Influenza Vaccine: Treatment Guidelines**

- **Everyone** 6 months of age and older are recommended to receive an influenza vaccination each year
- **High risk individuals**—
  - Adults age 65 years and older
  - Children younger than five years of age
  - Pregnant women
  - People of any age with certain chronic medical conditions—asthma, diabetes, chronic lung disease
  - Household contacts and caregivers of young children

www.cdc.gov
Influenza Vaccine

- In a systematic review, well-matched influenza vaccines prevented pneumonia in individuals ≥65 years of age living in long-term-care facilities
- Reduced the risk of hospitalization for pneumonia and death in all patients ≥65 years of age
- Reduced the risk of hospitalization for comorbid conditions associated with community-acquired pneumonia such as cardiac disease or cerebrovascular disease

Pneumococcal Vaccine

- 23-valent pneumococcal polysaccharide vaccine reduced the risk of hospitalization for pneumonia by 38% in a cohort of high-risk, elderly patients
- Pneumococcal vaccination was associated with reduced mortality, complications, and length of stay in hospitalized adults with CAP
- Significantly reduced the risk of pneumococcal bacteremia in patients ≥65 years of age

Pneumococcal Vaccine: Treatment Guidelines

- All adults 65 years of age and older
- Anyone age 2-64 years of age who has a chronic disease (ex. heart disease, lung disease, diabetes, etc.)
- Anyone age 2-64 years of age who is immunocompromised (ex. HIV infection or AIDS, asplenia, organ transplant, etc.)
- Anyone age 2-64 years of age who is taking immunosuppressive medication (ex. long-term steroids, certain cancer drugs, or radiation therapy)
- Adults age 19-64 years of age who is a smoker or has asthma
- Residents of nursing homes or long-term care facilities

Pertussis (Whooping Cough)

- Highly contagious respiratory disease spread from person to person by coughing and sneezing
- Caused by Bordetella pertussis
- Most common in unvaccinated young children
- Increasing in US and VA
- 399 cases in 2011; 3x the rate of 2007
- Vaccine preventable—recommend TdAIP booster

Travel Health

- Vaccine appointment 4-6 weeks before travel
  - Routine vaccines up-to-date (especially measles)
  - Other vaccines according to destination
  - Antimicrobial prophylaxis if needed (ex. malaria)
- Patient counseling points
  - Be careful what you eat and drink
  - Avoid bug bites. In malaria risk areas, make sure you sleep in an air conditioned or screened room or under a bed net
  - Wash your hands often with soap and water or alcohol-based hand sanitizer
  - Don't touch animals, especially monkeys, dogs and birds

Collaboration

- Warm hand off across continuum of care
  - Medical home model
  - Bedside Rx model
  - Education
    - Patient
    - Physician and physician extender
    - Pharmacist
  - Prevention strategies
    - Vaccine
    - Avoid antimicrobial use
  - Local and global partnerships
Stewardship Interest Group of Virginia

SIGoVA’s Goals
- Survey healthcare facilities across Virginia
- Recruit members and encourage participation from interested healthcare facilities
- Share successful antimicrobial stewardship across Virginia

SIGoVA’s Accomplishments/Plans
- VSHP Seminars presentations
  - Spring, 2013: Survey Results
  - Fall, 2013: CMS draft mandates
  - Spring, 2014: *Clostridium difficile* and fecal transplant
- Hold a Richmond regional meeting for SIGoVA members
- SIGoVA List-Serv and Facebook page
- Quarterly webinars
- Continue reaching out to hospitals, long term care, and community facilities in Virginia
- Develop a statewide antibiogram
- Collaborate with the Virginia Department of Health

Global Collaboration

Transatlantic Taskforce on Antimicrobial Resistance (TATFAR)
- Appropriate therapeutic use of antimicrobial drugs in medical and veterinary communities
- Prevention of drug–resistant infections
- Strategies for improving the pipeline of new antimicrobial drugs and diagnostic devices and maintaining existing drugs on the market

Generating Antibiotics Incentives Now (GAIN) Act
- Bipartisan legislation– July 2012
- Incentivize research and development of antibiotics
- 12 antibiotics have received fast track designation
- 17 out of 20 applications for qualified infectious disease products granted by the FDA

Summary
- Antimicrobial resistance may lead to a Post–Antibiotic era in the 21st century
- Pharmacists can play a role in antimicrobial stewardship across the continuum of care
- Local and global collaboration are key ensuring judicious antimicrobial use
Questions?

If you would like to be a member of SIGoVA, please email stewardship@vshp.org to become a member.

We will invite you to join our google list–serv.

“Improving Antimicrobial Use for the Future”

Resources

- CDC Get Smart Program: www.cdc.gov
  http://www.cdc.gov/CDCTV/SnortSniffleSneeze/
- IDSA Guidelines: www.idsociety.org
- Stewardship Interest Group of Virginia (SIGoVA): www.vshp.org
- American Hospital Association Toolkit: www.ahaphysicianforum.org/ASP
- MAD-ID: mad-id.org
- Society of Infectious Disease Pharmacists (SIDP): www.sidp.org
- ASHP: www.leadstewardship.org/resources.php
- ASP toolkit from GNYHA: http://www.gnyha.org/antimicrobial/toolkit

Suggested Reading

- http://www.cdc.gov/drugresistance/healthcare/htm
- www.gnyha.org/antimicrobial