Antimicrobial Resistance

Erica Reed, PharmD, BCIDP, FIDSA
Lead Specialty Practice Pharmacist, Infectious Diseases/Antimicrobial Stewardship
The Ohio State University Wexner Medical Center

MedNet21
Center for Continuing Medical Education

The Ohio State University Wexner Medical Center

Objectives

- Highlight the burden of antimicrobial resistance (AMR)
- Discuss factors contributing to the emergence of AMR
- Review common pathogens displaying AMR

Antimicrobial Resistance (AMR)

"If we do not act to address the problem of AR, we may lose quick and reliable treatment of infections that have been a manageable problem in the United States since the 1940s. Drug choices for the treatment of common infections will become increasingly limited and expensive - and, in some cases, nonexistent."

-A Public Health Action Plan to Combat Antimicrobial Resistance

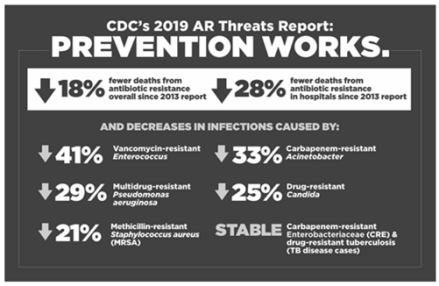
CDC 1999

Background

- Antibiotics are unlike any other agent in that use in one patient can compromise efficacy in another
- Prevalent use
  - 200-300 million antibiotic prescriptions annually
    - 45% outpatient
- 25-40% of hospitalized patients receive antibiotics
  - 10-70% are unnecessary or sub-optimal
  - 5% of hospitalized patients who receive antibiotics experience an adverse reaction
- Changes in antibiotic use are paralleled by changes in resistance patterns

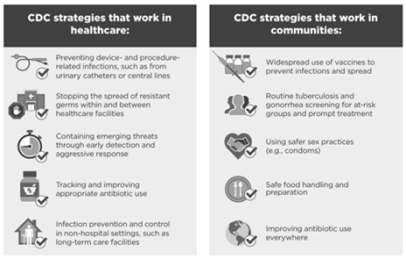
Klevens et al. *Public Health Rep.* 2007;122(2):160-166.
Stone et al. *Am J Inf Control.* 2005;33(9):542-547.

Antimicrobial Resistance (AMR)



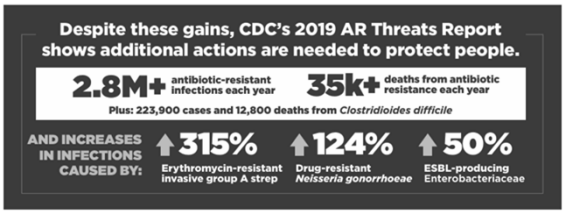
CDC. Antibiotic Resistance Threats in the United States, 2019. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2019.

Strategies to Reduce AMR

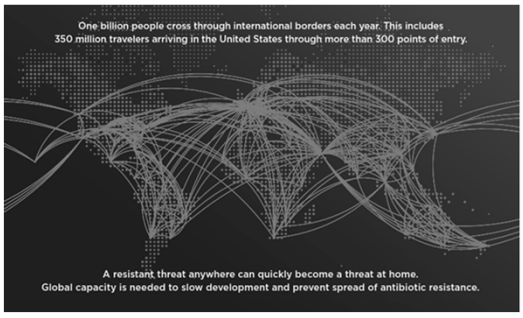


CDC. Antibiotic Resistance Threats in the United States, 2019. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2019.

AMR Challenges

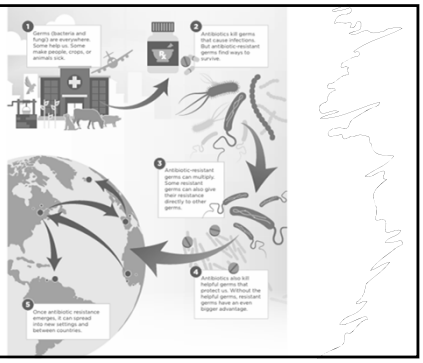


CDC. Antibiotic Resistance Threats in the United States, 2019. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2019.



CDC. Antibiotic Resistance Threats in the United States, 2019. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2019.

How Antibiotic Resistance Spreads



CDC. Antibiotic Resistance Threats in the United States, 2019. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2019.

Bacterial Resistance

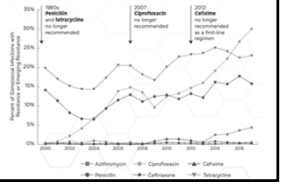
CDC's *Antibiotic Resistance Threats in the United States, 2019*

Antibiotic Resistance Can Emerge Quickly

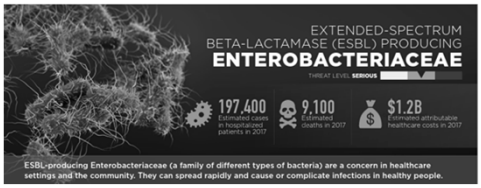
Antibiotic Approved or Released	Year Released	Resistant Germ Identified	Year Identified
Penicillin	1941	Penicillin-resistant *S. aureus*	1942
Methicillin	1960	MRSA	1960
Extended-spectrum cephalosporins	1980	ESBL-producing *E. coli*	1983
Daptomycin	2003	Daptomycin-resistant MRSA	2004
Ceftazidime-avibactam	2015	Ceftazidime-avibactam KPC-producing *K. pneumoniae*	2015

CDC Antibiotic Resistance Threat Report

- Gonorrhea spreads easily & is often asymptomatic
- Can cause serious health issues including ectopic pregnancy and infertility
- Timely diagnosis & routine screening with prompt & effective treatment is crucial
- Ceftriaxone last reliable agent
- CDC STI Treatment Guidelines excellent resource



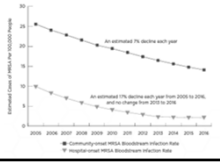
CDC. Antibiotic Resistance Threats in the United States, 2019. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2019.



- Infections include UTIs, intra-abdominal infections, pneumonia, and bacteremia
- ESBL enzymes easily spread from one bacteria to another
- Hydrolyze penicillins and cephalosporins
  - May require hospitalization for IV carbapenem therapy (unless urinary isolate susceptible to PO options)

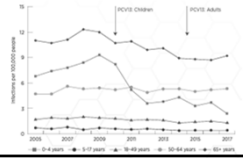
CDC's Antibiotic Resistance Threats in the United States, 2019

- Hospital reductions in MRSA have stalled
- Community MRSA infections may be connected to the opioid crisis
- Now resistant to many first-line options including clindamycin



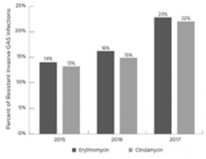
CDC. Antibiotic Resistance Threats in the United States, 2019. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2019.

- One of the only drug-resistant bacteria with an effective vaccine to prevent infections
- Encouraging vaccination can slow the spread of pneumococcal resistance
- Resistance to penicillin (PO), tetracycline, and erythromycin common



CDC. Antibiotic Resistance Threats in the United States, 2019. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2019.

- Implicated in “strep throat”
- No resistance to penicillin/amoxicillin but allergies commonly reported
- Resistance to erythromycin and clindamycin is rising



CDC. Antibiotic Resistance Threats in the United States, 2019. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2019.

- Can be passed from mother to infant during labor threatening newborns with sepsis
- Clindamycin resistance limits prevention and treatment options for adults with severe penicillin allergies

CDC. Antibiotic Resistance Threats in the United States, 2019. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2019.

Antimicrobial Stewardship 101

Sydney Agnello, DO
Assistant Professor
Infectious Diseases
The Ohio State University Wexner Medical Center

MedNet21
Center for Continuing Medical Education

The Ohio State University Wexner Medical Center

Objectives

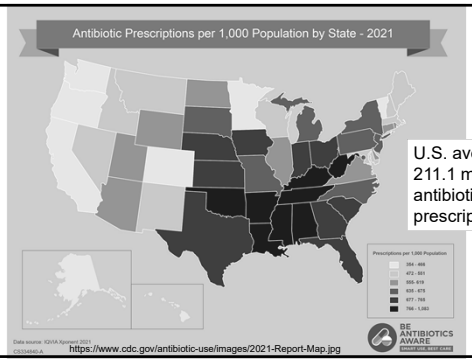
- Examine the core elements of outpatient antimicrobial stewardship
- Discover resources available (QR codes)
- Discern how to best implement in your clinical setting

PROUD TO SUPPORT
BE ANTIBIOTICS AWARE
www.cdc.gov/antibiotic-use

Inpatient Antimicrobial Stewardship

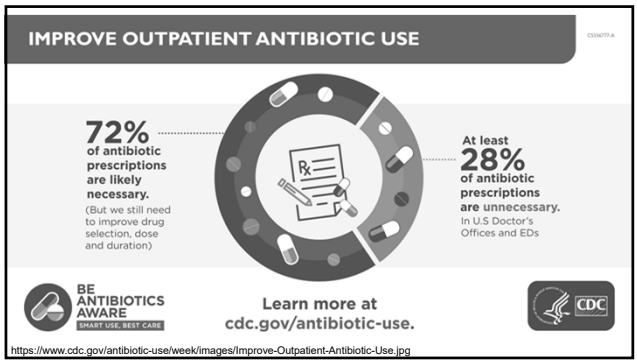
- Required at all hospitals by Joint Commission
- Encountering these efforts daily while rounding
  - Restricted antimicrobials
  - Prospective audits with intervention & feedback
  - IV to oral conversion of antimicrobials
  - Education
  - Guidelines & clinical pathways

OUTPATIENT



https://www.cdc.gov/antibiotic-use/images/2021-Report-Map.jpg

U.S. average 211.1 million antibiotic prescriptions



https://www.cdc.gov/antibiotic-use/week/images/Improve-Outpatient-Antibiotic-Use.jpg

Total inappropriate antibiotic use

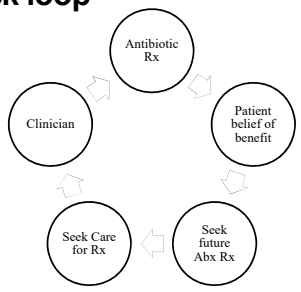
50%

- STOP **Unnecessary use**
- **Inappropriate Selection**
- **Inappropriate Dosing**
- **Inappropriate Duration**

Reasons behind inappropriate Rx

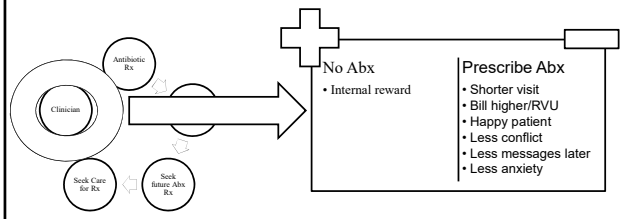
- Primarily psychologically & socially rooted
  - Rx is a **BEHAVIOR**, not a scientific decision
- Lack of awareness
  - Clinicians do not perceive they are prescribing inappropriately
- Misaligned incentives
- Inadequate knowledge regarding guidelines
- Fear from complications of infections
- All complicated by a feedback loop

Feedback loop



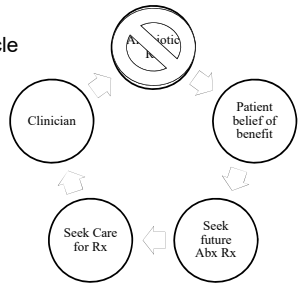
Shi Z, Barnett ML, Jena AB, Ray KN, Fox KP, Mehrotra A. Association of a Clinician's Antibiotic-Prescribing Rate With Patients' Future Likelihood of Seeking Care and Receipt of Antibiotics. Clin Infect Dis. 2021 Oct 5;73(7):e1672-e1679. doi: 10.1093/cid/ciaa1173.

Feedback loop



Feedback loop

- We are part of the cycle
- We **can** change
- Our patients behavior WILL change



CDC Core Elements of Outpatient Antimicrobial Stewardship

https://www.cdc.gov/antibiotic-use/core-elements/outpatient.html

CDC Core Elements of Outpatient ASP

- **Commitment**
  - Dedication to appropriate antibiotic prescription & patient safety
- Action for policy & practice
- Tracking & reporting
- Education & expertise

Commitment

- Display **public commitments** in support of ASP
- Identify a **leader** to direct activities within a facility
- Communicate with **all clinic staff** members to set patient expectations
  - This includes front desk, medical assistants, nurses, administrative staff

Commitment Poster

- In 2014 study by Meeker et al, evaluated use of poster in exam rooms effect on antibiotic prescriptions in acute URI
- Result: 19.7% absolute percentage reduction of inappropriate antibiotic prescribing rate relative to control
  - Results did not diminish over time

Commitment Poster

Soure: cdc.gov

Commitment Poster

Commitment Poster - Minnesota

Commitment Poster - DIY

https://www.health.mn.gov/diseases/antibioticresistance/hcp/commitkit

CDC Core Elements of Outpatient ASP

- Commitment
- **Action for policy & practice**
  - Implement at least one policy or practice to improve, assess if it works & modify as needed
- Tracking & reporting
- Education & expertise

Action for Policy & Practice

- Use **evidence-based diagnostic criteria** & **treatment** recommendations
- Use delayed prescribing practices or watchful waiting, when appropriate
  - Acute otitis media, sinusitis, etc

CDC treatment guidelines
https://www.cdc.gov/antibiotic-use/clinicians/adult-treatment-rec.html

Action for Policy & Practice

- Support for clinical decisions
- Utilizing call centers or RN hotlines as triage to prevent unnecessary visits

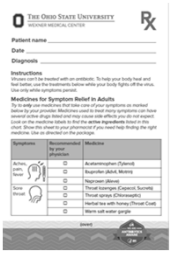
Action - Over the Counter "Prescription Pad"

- Education for patients on how to manage symptom control in acute respiratory illness
- Improves efficiency for clinician, decreases errors & allows for transaction to occur
  - ALL improve patient satisfaction

Over the Counter "Prescription Pad"

Soure: cdc.gov

Over the Counter "Prescription Pad"



CDC Core Elements of Outpatient ASP

- Commitment
- Action for policy & practice
- **Tracking & reporting**
  - Monitor antibiotic prescribing practices & offer regular feedback to clinicians or have them monitor themselves
- Education & expertise

Tracking & Reporting

- Self-evaluate antibiotic prescription practices
- Participate in CME & QI activities

- Implement at least one antibiotic prescription tracking & reporting system
- Assess & share performance on quality measures & established reduction goals
  - HEDIS measures

Tracking & Reporting – CDC

Technical Assistance Tool | 2023

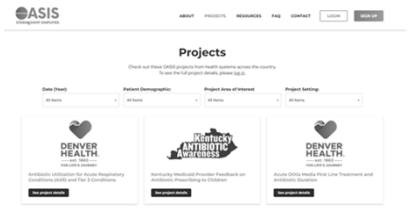
Measurement and Evaluation Approaches to Improve Outpatient Antibiotic Prescribing in Health Systems

Contents

https://www.cdc.gov/antibiotic-use/pdfs/Measurement-Evaluation-Improve-Outpatient-508.pdf

Tracking & Reporting

- **OASIS Stewardship Simplified**



https://oasisstewardship.org/

CDC Core Elements of Outpatient ASP

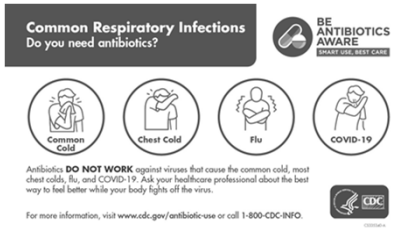
- Commitment
- Action for policy & practice
- Tracking & reporting
- **Education & expertise**
  - Provide educational resources to clinicians & patients on antibiotic prescribing
  - Ensure access to needed expertise on optimizing antibiotic prescribing

Education & Expertise

- Educate patients about
  - when antibiotics are needed & not needed
  - potential harms of antibiotics treatments
  - risks of antimicrobial resistance
- Discussing antibiotic allergy versus intolerance
  - Penicillin allergies…

Education & Expertise

- Educate patients – CDC infographics



Education & Expertise

- Communication skills training for clinicians
  - Providers poorly predict when patients want antibiotics
  - **DART – Dialogue Around Respiratory Illness Treatment modules**
    - Free online (directed towards parents of children)
    - https://www.uwimtr.org/dart/

ASP→ in practice

- Patient with pharyngitis

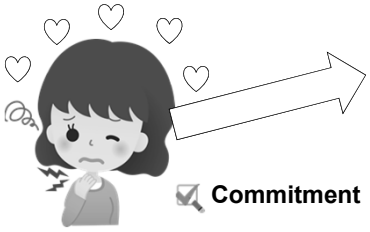
ASP → in practice

- Patient calls with complaint of sore throat
- **Triage line:** recommends patient present to clinic for further evaluation

☑ **Commitment & Policy**

ASP→ in practice

- Patient sees poster in exam room

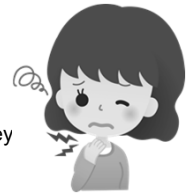


☑ **Commitment**

ASP→ in practice

MA sets expectations

- Does NOT promise antibiotics
- Reassure patient they will get great care



☑ **Commitment & Policy**

Policy & Practice – pharyngitis

Evidence based diagnostic criteria

Centor criteria (>2)

- Fever
- Tonsillar exudates
- Tender cervical lymphadenopathy
- Absence of cough

Rapid antigen detection test

No antibiotics

Antibiotics recommended

https://www.cdc.gov/antibiotic-use/clinicians/adult-treatment-rec.html

Policy & Practice – pharyngitis

Evidence based treatment

- + Centor → **+** RADT → Antibiotics for GAS
- Pick the correct antibiotic for the correct duration
- You appropriately select amoxicillin for 10 days… until patient **declares PCN allergy**

Education – pharyngitis

- Discuss allergy further

- Recall GAS antibiotic resistance to azithromycin & clindamycin are increasingly common

Source: cdc.gov

Education – pharyngitis

- Discuss allergy further
- Decide amoxicillin is safe to use, educate patient AND adjust flag in the chart / EMR

ASP – pharyngitis

- + Centor → **-** RADT → **No** Antibiotics

☑ **Evidence based diagnostic criteria**

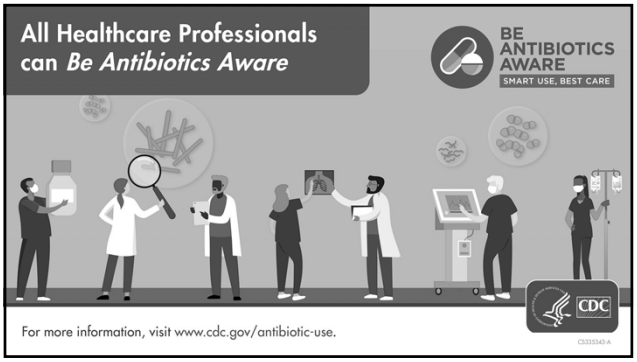
ASP– pharyngitis

- + Centor → **-** RADT → **No** Antibiotics
- Astute clinician you suspect it is likely viral
  - Educate patient

    ☑ **Effective Education**
  - Provide supportive care recommendations

    ☑ **Policy & practice**

Tracking – pharyngitis

- Depending on size of practice this can vary
- **Example:**
  - **Review rapid test results & antimicrobial use**
    - Even small chart review can be beneficial
  - **HEDIS measure for pharyngitis**
  - **OASIS project**

☑ **Tracking**