



# RISKS OF ANTIMICROBIAL USE

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## **Antimicrobial Stewardship Program**

**TO OPTIMIZE CLINICAL OUTCOMES WHILE MINIMIZING ADVERSE CONSEQUENCES OF ANTIMICROBIAL USE, INCLUDING TOXICITY, SELECTION OF PATHOGENIC ORGANISMS, THE EMERGENCE OF RESISTANCE, AND TO REDUCE HEALTH CARE COSTS WITHOUT ADVERSELY IMPACTING QUALITY OF CARE**



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# BENEFITS OF ANTIBIOTICS

- MRS. ANNE MILLER HOSPITALIZED IN 1942 WITH SEPSIS FOLLOWING A MISCARRIAGE
  - FEVER OF 103F FOR SEVERAL WEEKS
  - FIRST AMERICAN TREATED WITH PENICILLIN.
  - PASSED IN 1999 AT 90 YEARS OF AGE
- SEPSIS
- SURGERY
- ORGAN TRANSPLANTATION
- CANCER
- DIALYSIS PATIENTS
- COMORBIDITIES

**Antibiotic resistance** is when germs (bacteria, fungi) develop the ability to defeat the antibiotics designed to kill them. It does not mean your body is resistant to antibiotics.

### New National Estimate\*

Each year, antibiotic-resistant bacteria and fungi cause at least an estimated:



**2,868,700**  
infections



**35,900** deaths



*Clostridioides difficile*\*\* is related to antibiotic use and antibiotic resistance:



**223,900**  
cases



**12,800** deaths

# REDUCING ANTIMICROBIAL RESISTANCE

- NOT STARTING OR STOPPING ANTIBIOTICS IN PATIENTS WHO DO NOT NEED THEM
  - VIRAL RESPIRATORY TRACT INFECTIONS
  - TREATMENT OF ASYMPTOMATIC BACTERIURIA
- STOPPING ANTIBIOTICS IN PATIENTS WHO NO LONGER NEED THEM
  - SHORTER DURATIONS FOR MANY INFECTIONS
- USING APPROPRIATE SPECTRUM
  - SELECTING ANTIBIOTICS THAT ARE NOT ACTIVE AGAINST MORE PATHOGENS THAN NEEDED
  - DE-ESCALATING SPECTRUM ONCE PATHOGEN IDENTIFIED OR LACK OF PATHOGENS IDENTIFIED
- INFECTION PREVENTION & CONTROL
  - STOP SPREAD
  - PREVENTION INFECTIONS NEEDING ANTIMICROBIALS



# CDC's 2019 AR Threats Report: **PREVENTION WORKS.**

**↓ 18%** fewer deaths from antibiotic resistance overall since 2013 report

**↓ 28%** fewer deaths from antibiotic resistance in hospitals since 2013 report

## AND DECREASES IN INFECTIONS CAUSED BY:

**↓ 41%** Vancomycin-resistant *Enterococcus*

**↓ 33%** Carbapenem-resistant *Acinetobacter*

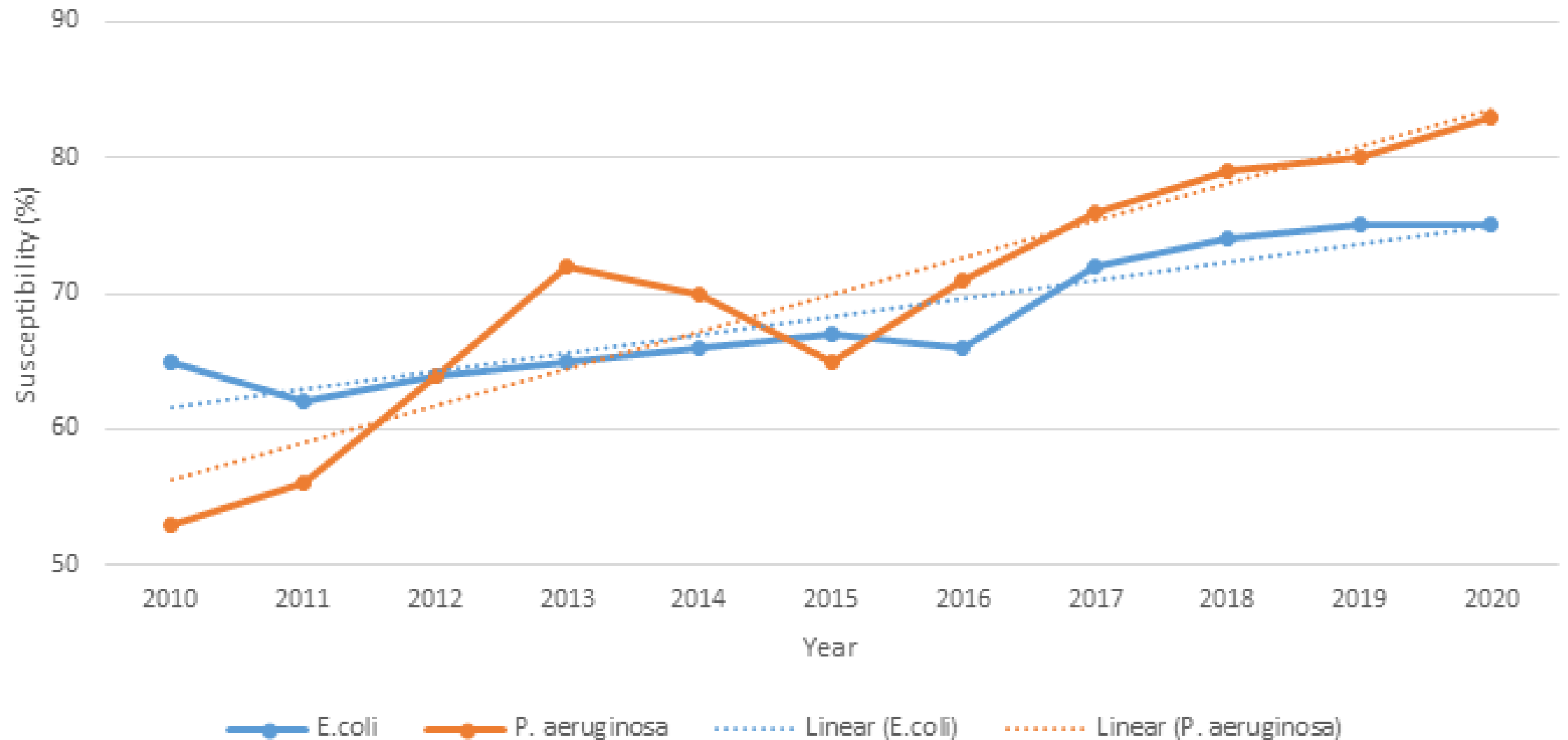
**↓ 29%** Multidrug-resistant *Pseudomonas aeruginosa*

**↓ 25%** Drug-resistant *Candida*

**↓ 21%** Methicillin-resistant *Staphylococcus aureus* (MRSA)

**STABLE** Carbapenem-resistant Enterobacteriaceae (CRE) & drug-resistant tuberculosis (TB disease cases)

## Adult Hospital Levofloxacin Susceptibilities 2010 - 2020



The image features a light gray background with a subtle gradient. In the top-left and bottom-right corners, there are several realistic-looking water droplets of various sizes, rendered with soft shadows and highlights to give them a three-dimensional appearance. The text 'ANTIMICROBIAL TOXICITY' is centered in the middle of the page.

# ANTIMICROBIAL TOXICITY

# TOP 5 ANTIBIOTICS AT NORTON ADULT HOSPITALS IN 2021

Antibiotic	Days Of Therapy
Vancomycin (VANCOCIN)	31,917
Ceftriaxone (ROCEPHIN)	22,643
Cefazolin (KEFZOL/ANCEF)	21,755
Cefepime (MAXIPIME)	19,615
Piperacillin-tazobactam (ZOSYN)	16,791

# ADVERSE EVENTS

## Vancomycin & Beta-lactams

- Allergic reactions
- Drug fever
- Hemolytic anemia
- Thrombocytopenia/pancytopenia
- Elevated liver enzymes
- Injection site/line complications

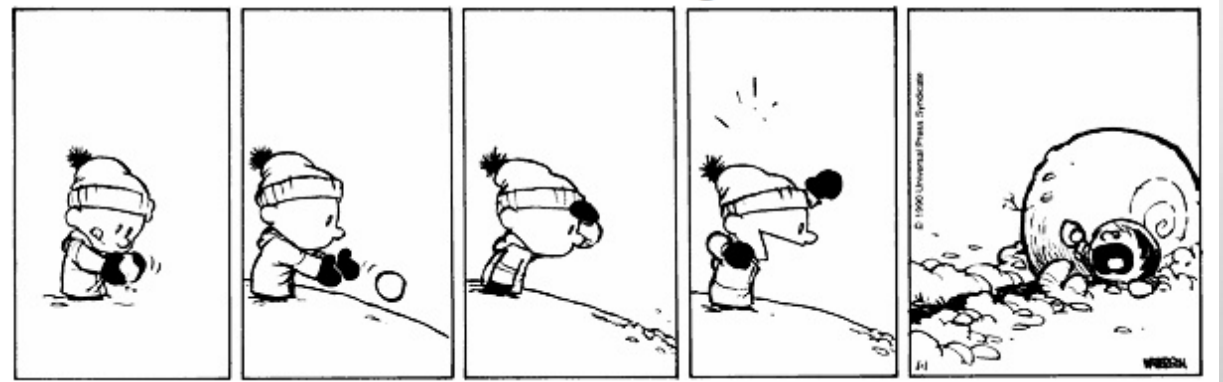
Vancomycin	Ceftriaxone	Cefazolin	Cefepime	Piperacillin-tazobactam
<ul style="list-style-type: none"><li>• Infusion reaction</li><li>• Nephrotoxicity</li><li>• Ototoxicity</li></ul>	<ul style="list-style-type: none"><li>• Kidney stones, gall stones, gall bladder sludge, pancreatitis</li></ul>		<ul style="list-style-type: none"><li>• Neurotoxicity</li></ul>	<ul style="list-style-type: none"><li>• Nephrotoxicity</li></ul>

# INPATIENT ADVERSE DRUG EVENTS RATES DUE TO ANTIBIOTICS

- 20% OF PATIENTS WHO RECEIVED  $\geq$  24 HOURS OF PARENTERAL ANTIBIOTICS DEVELOPED AN ADVERSE DRUG EVENT
  - 73% DURING HOSPITALIZATION
  - 27% AFTER DISCHARGE
- 57% OF ALL ADVERSE DRUG EVENTS OCCURRED WITHIN 30 DAYS
- 43% OF ALL ADVERSE EVENTS OCCURRED WITHIN 90 DAYS
- 20% OF ADVERSE DRUG EVENTS WHEN ANTIBIOTICS **NOT INDICATED**

# IMPACT OF INPATIENT ADVERSE DRUG EVENTS

- 3% - NEW HOSPITALIZATION
- 9% - CLINIC OR EMERGENCY DEPARTMENT
- 61% - ADDITIONAL LAB, ELECTROCARDIOGRAM, OR IMAGING
- 24% - PROLONGED HOSPITALIZATION



# OUTPATIENT ANTIMICROBIAL USE – 2013 - 2014

- KENTUCKY 2<sup>ND</sup> HIGHEST OUTPATIENT PRESCRIBING IN 2013 & 2014
- TOP 5 ORAL ANTIBIOTICS PRESCRIBED NATIONALLY

## 2013

1. AMOXICILLIN
2. AZITHROMYCIN
3. AMOXICILLIN-CLAVULANATE
4. TMP-SMX (BACTRIM)
5. **CIPROFLOXACIN**

## 2014

1. AMOXICILLIN
2. AZITHROMYCIN
3. AMOXICILLIN-CLAVULANATE
4. CEPHALEXIN
5. **CIPROFLOXACIN**



# EMERGENCY DEPARTMENT VISITS DUE TO ADVERSE DRUG EVENTS 2013- 2014

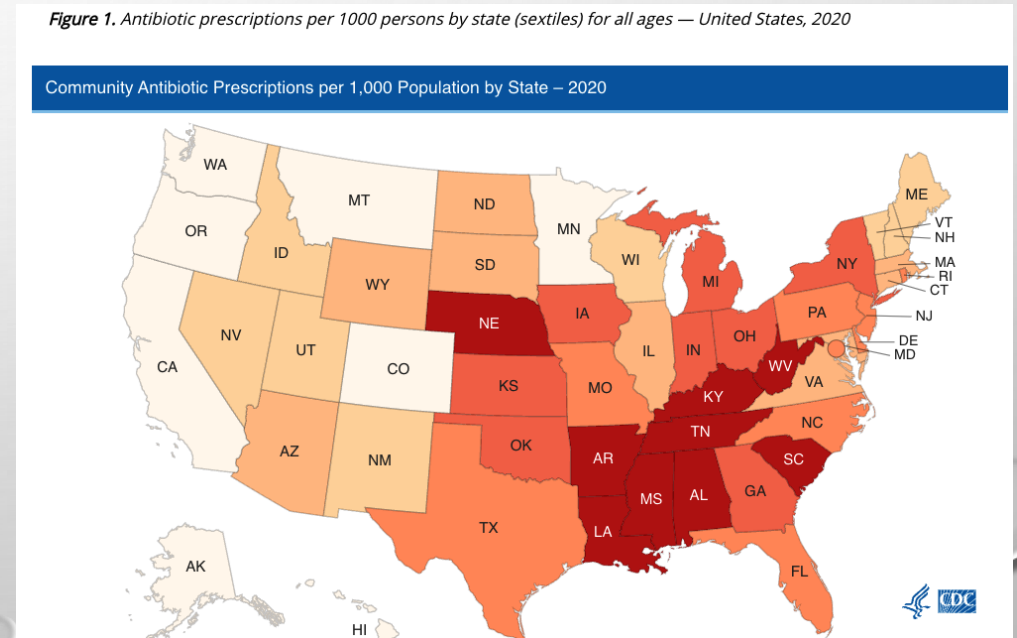
- TOP ANTIBIOTICS ASSOCIATED WITH ED VISITS
  1. ANTICOAGULANTS
  2. **ANTIBIOTICS**
  3. DIABETIC AGENTS
  4. OPIOIDS
- ANTIBIOTICS MOST COMMON IMPLICATED DRUG
  - AGED  $\leq$  5 YEARS
  - AGED 6 – 19 YEARS
- HOSPITALIZATION FOR ED VISITS DUE TO QUINOLONES HIGHER THAN ALL OTHER ANTIBIOTIC CLASSES

# REDUCING ANTIMICROBIAL TOXICITY

- NOT STARTING OR STOPPING ANTIBIOTICS IN PATIENTS WHO DO NOT NEED THEM
  - VIRAL RESPIRATORY TRACT INFECTIONS
  - TREATMENT OF ASYMPTOMATIC BACTERIURIA
- STOPPING ANTIBIOTICS IN PATIENTS WHO NO LONGER NEED THEM
  - SHORTER DURATIONS FOR MANY INFECTIONS
- SELECTING LESS TOXIC ANTIBIOTICS WHEN ABLE
  - E.G. USING AMOXICILLIN-CLAVULANATE OVER LEVOFLOXACIN FOR PNEUMONIA
- INFECTION PREVENTION & CONTROL
  - PREVENT INFECTIONS NEEDING ANTIMICROBIALS

# OUTPATIENT ANTIMICROBIAL USE - 2020

- KENTUCKY 5<sup>TH</sup> HIGHEST OUTPATIENT PRESCRIBING IN 2020
- TOP 5 ORAL ANTIBIOTICS PRESCRIBED NATIONALLY
  1. AMOXICILLIN
  2. AZITHROMYCIN
  3. AMOXICILLIN-CLAVULANATE
  4. CEPHALEXIN
  5. DOXYCYCLINE



The background features a light gray gradient with several realistic water droplets of varying sizes scattered across the top and bottom edges. In the center, there is a faint, circular, textured pattern that resembles a microscopic view of a cell or a biological structure.

# SELECTION OF PATHOGENIC ORGANISMS

# C. DIFFICILE



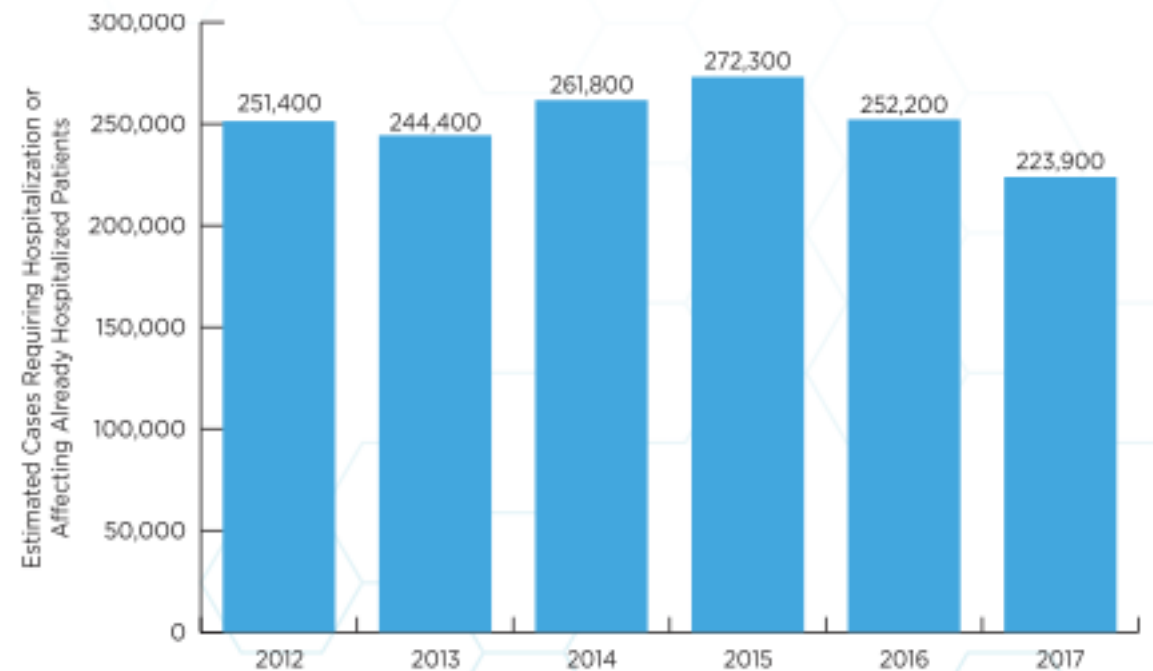
# *C DIFFICILE* AND QUALITY OF LIFE

- SURVEY OF ADULTS HOSPITALIZED WITH *C DIFFICILE* BETWEEN JULY 2019 – MARCH 2020
  - COMPLETED TWO SEPARATE QUALITY OF LIFE SURVEYS
  - COMPARED TO THE GENERAL POPULATION, *C DIFFICILE* PATIENTS SCORED SIGNIFICANTLY LOWER ON:
    - PHYSICAL HEALTH
    - MENTAL HEALTH
  - LOWER SCORES ASSOCIATED WITH
    - RECURRENT ILLNESS
    - SEVERE ILLNESS
    - ADDITIONAL STOOL EPISODES/DAY

# REDUCING *C. DIFFICILE* INFECTION

- USING ANTIBIOTICS ONLY WHEN NEEDED
- USE APPROPRIATE ANTIBIOTIC DURATIONS
- SELECT LOWER RISK ANTIBIOTICS WHEN ABLE
- INFECTION PREVENTION

Continued appropriate infection control, antibiotic use, and diagnostic testing are important to maintain decreases in *C. difficile* cases.



# SUMMARY

- RISKS OF ANTIMICROBIAL USE
  - ANTIMICROBIAL RESISTANCE
  - DRUG TOXICITY
  - SELECTION OF PATHOGENIC ORGANISMS (*C. DIFFICILE*)
- REDUCING RISK OF ANTIMICROBIALS
  - NOT STARTING OR STOPPING ANTIBIOTICS IN THOSE WHO DO NOT NEED THEM
  - STOPPING ANTIBIOTICS IN THOSE WHO NO LONGER NEED THEM
  - SELECTING LEAST TOXIC AGENTS AND AGENTS WITH THE LEAST RISK FOR *C. DIFFICILE* INFECTION WHEN ABLE
  - INFECTION PREVENTION TO STOP SPREAD OF RESISTANT ORGANISMS AND PREVENTING INFECTIONS