

# Antimicrobial Resistance and Introduction to UAMS Antimicrobial Stewardship

UAMS Antimicrobial Stewardship Program

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# UAMS - Antimicrobial Stewardship Program (ASP)

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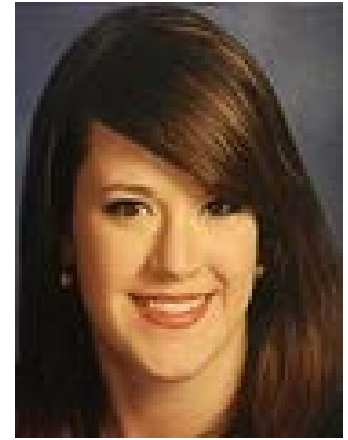
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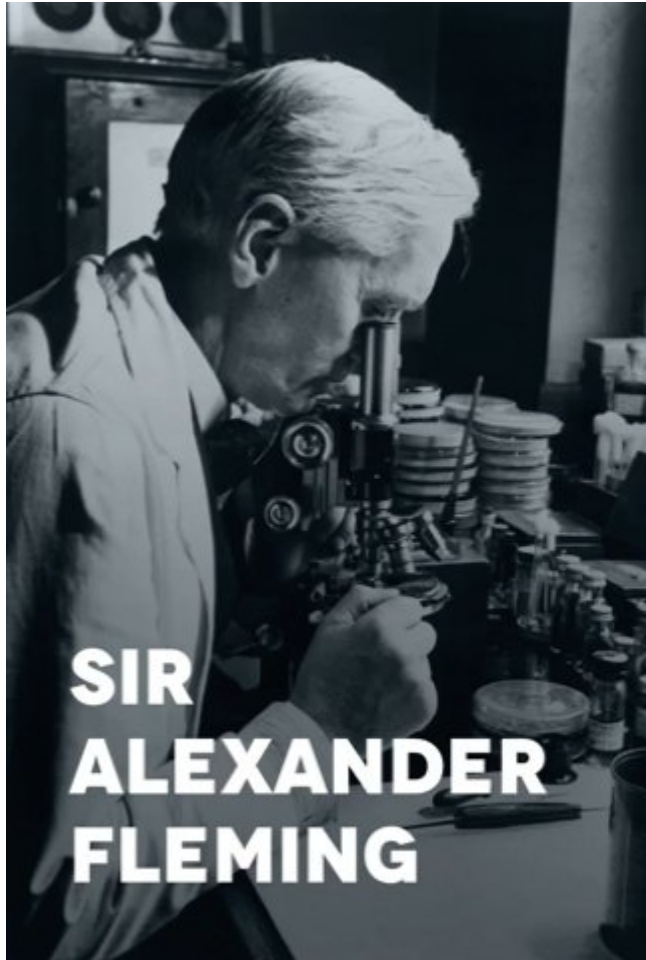


- Ryan Dare, MD



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The thoughtless person playing with penicillin treatment is morally responsible for the death of the man who succumbs to infection with the penicillin-resistant organism.

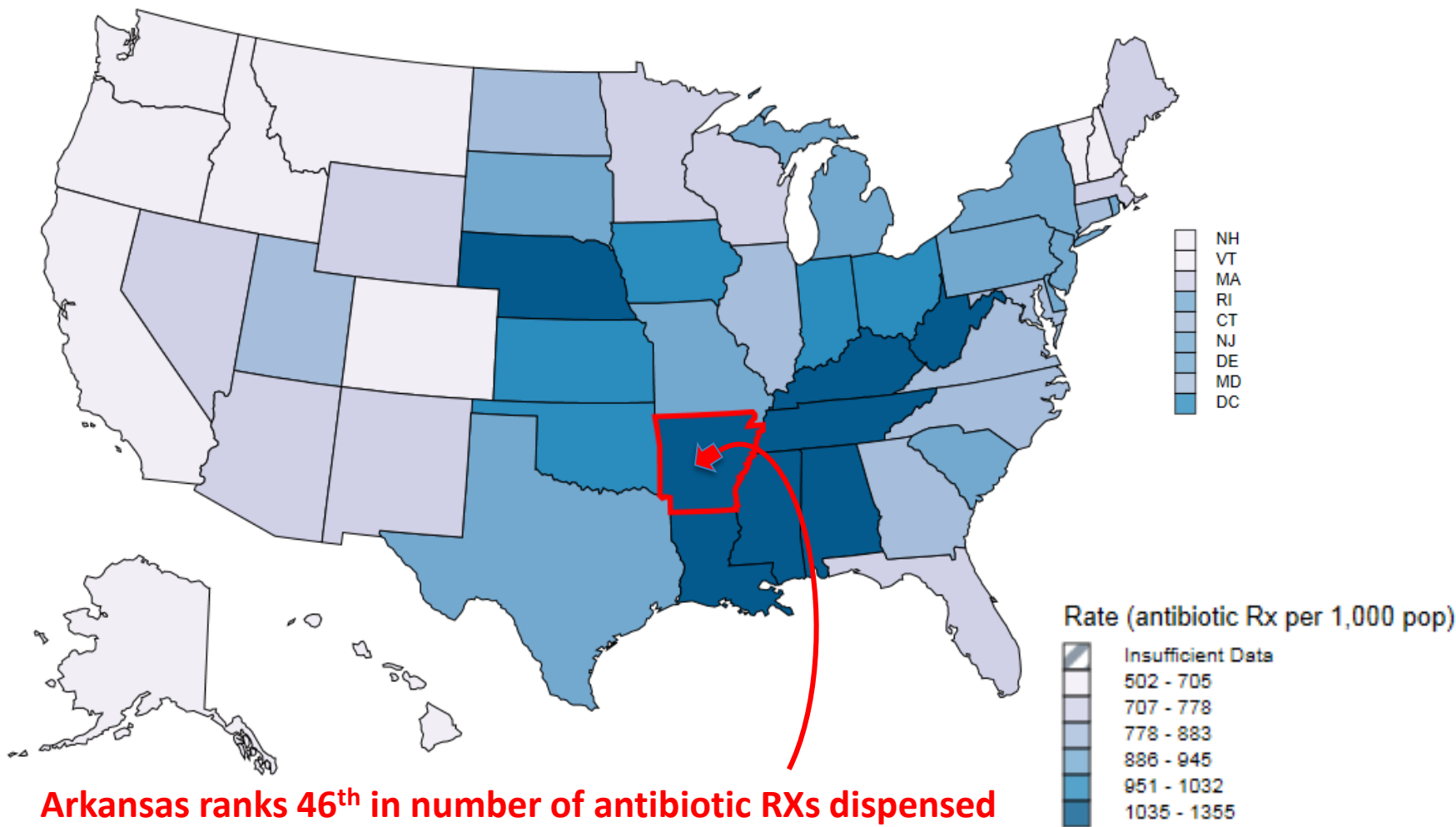
# Antibiotic Usage



- CDC reports 50% of antibiotics prescribed in US are inappropriate
- Increased usage -> antibiotic resistance
  - Local impact: in-hospital resistance is driven by in-hospital usage
  - Multidrug Resistant Organisms: Over 2 million infections and 23 thousand deaths per year
  - Rates of multi-drug resistant organisms are increasing
    - MRSA, VISA, VRE, ESBL, CRE, MDR-pseudomonas
- Antibiotic overuse increases risk of *C. difficile*
  - Fluoroquinolones, Cephalosporins, Clindamycin
  - 250,000 infections and 14,000 deaths per year in the US
- Antimicrobial Associated Adverse Events:
  - Approximately 5% of hospitalized patients on antibiotics have a drug related event
  - Antibiotic associated ER visits: 140,000 per year

# 2015 Oral Outpatient Antibiotic Prescriptions Dispensed in U.S. Community Pharmacies Per 1000 Population

269.4 Million Antibiotic Rx per year. 838 per 1000 persons (4 of 5)

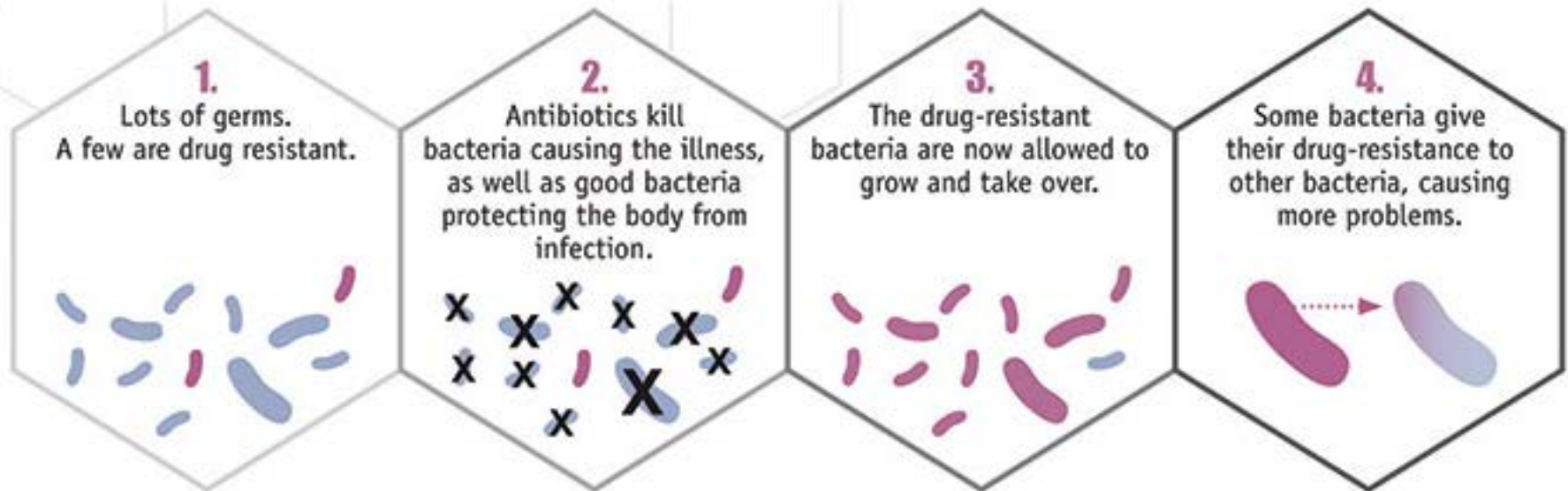


**Arkansas ranks 46<sup>th</sup> in number of antibiotic RXs dispensed  
1,154 RX per 1,000 persons (>1 per person)**

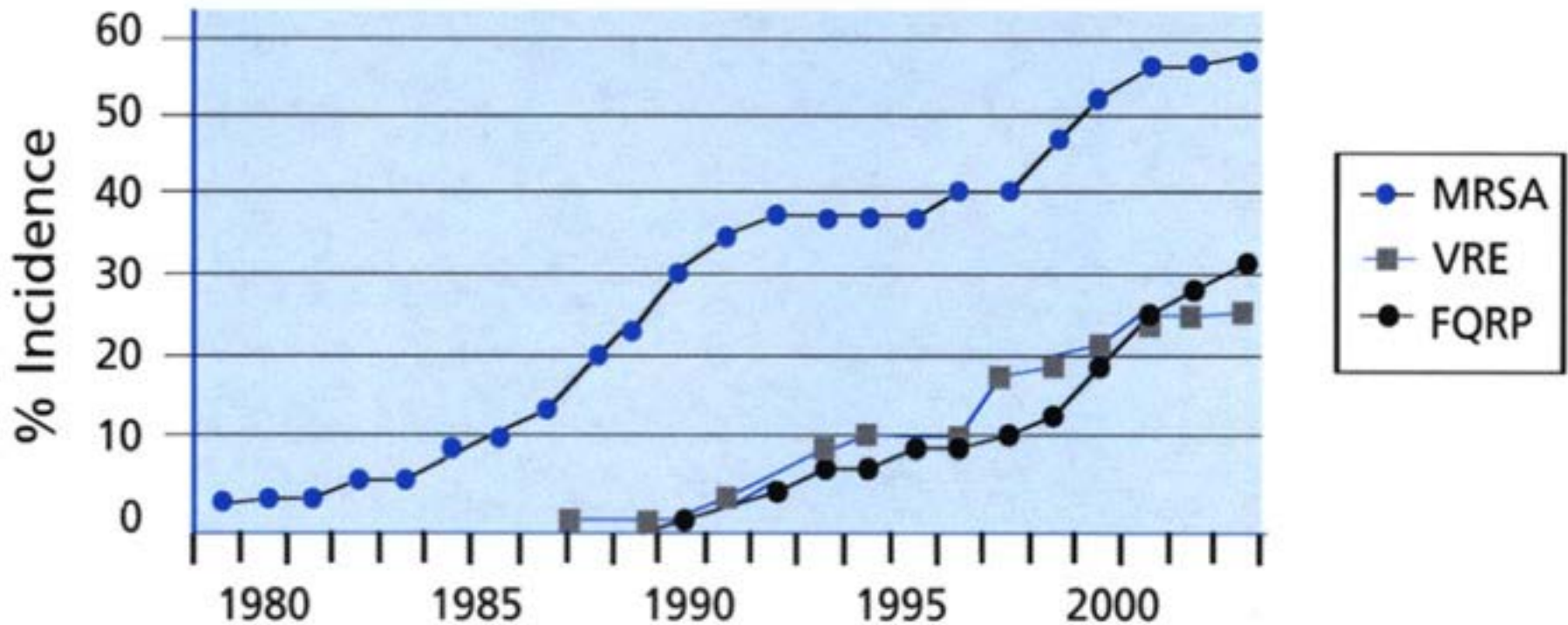
# Antibiotic Overuse Leads to Resistance



## How Antibiotic Resistance Happens



# Rise of Antibiotic Resistance

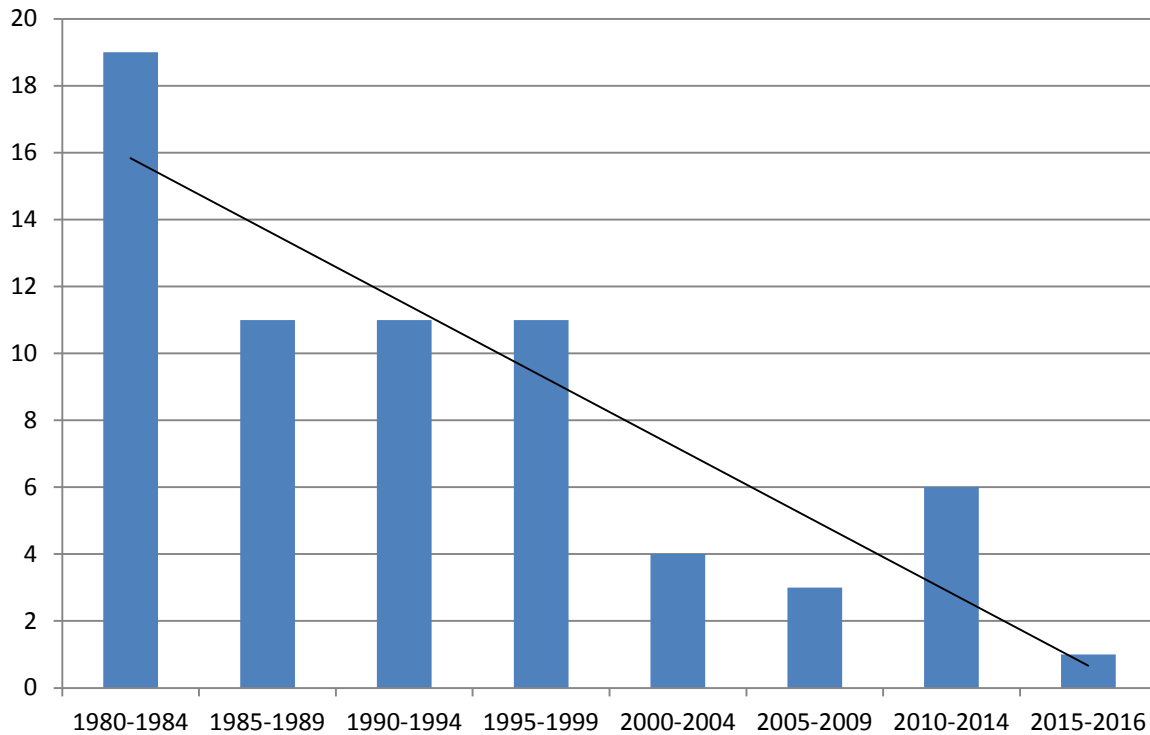


MRSA = methicillin-resistant *Staphylococcus aureus*; VRE = Vancomycin-resistant *enterococci*  
FQRP = Fluoroquinolone-resistant *Pseudomonas aeruginosa*



# Need for New Antimicrobials

**Number of Antibacterial Drugs  
Approved by the FDA per Year**



The rate of multi-drug resistant organisms is increasing, however, the development of new antibiotics on the market is decreasing

Multi-drug resistant organisms exist without treatment options

# *Clostridium difficile*

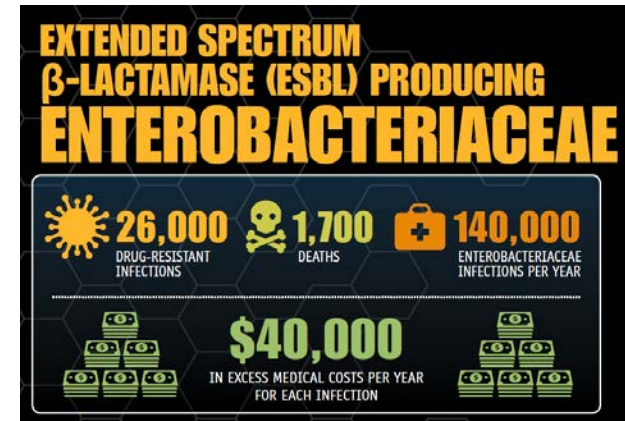
## “C diff”

- Life-threatening diarrhea
- Iatrogenic: Due to antibiotic exposure
- More virulent strain emerged in 2000 with 400% increase in deaths
- 90% of deaths occur in patients > 65 years old
- Think twice before starting antibiotics unless needed
- Fluoroquinolones, Cephalosporins, Clindamycin have highest risk



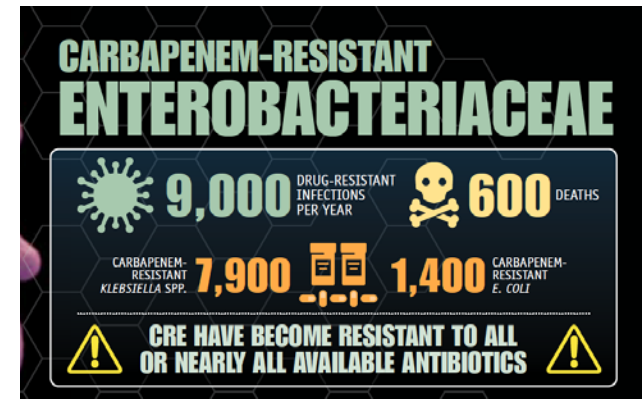
# Extended Spectrum Beta-lactamase “ESBL”

- Enzyme produced by some enterobacteriaceae
- Causes resistance to wide variety of penicillins and cephalosporins
- Bloodstream infections due to ESBL producing organisms have a 57% higher risk of death compared to non-ESBL strains
- \$40,000 increase in cost per ESBL bloodstream infection
- Typically require broad spectrum carbapenems for treatment

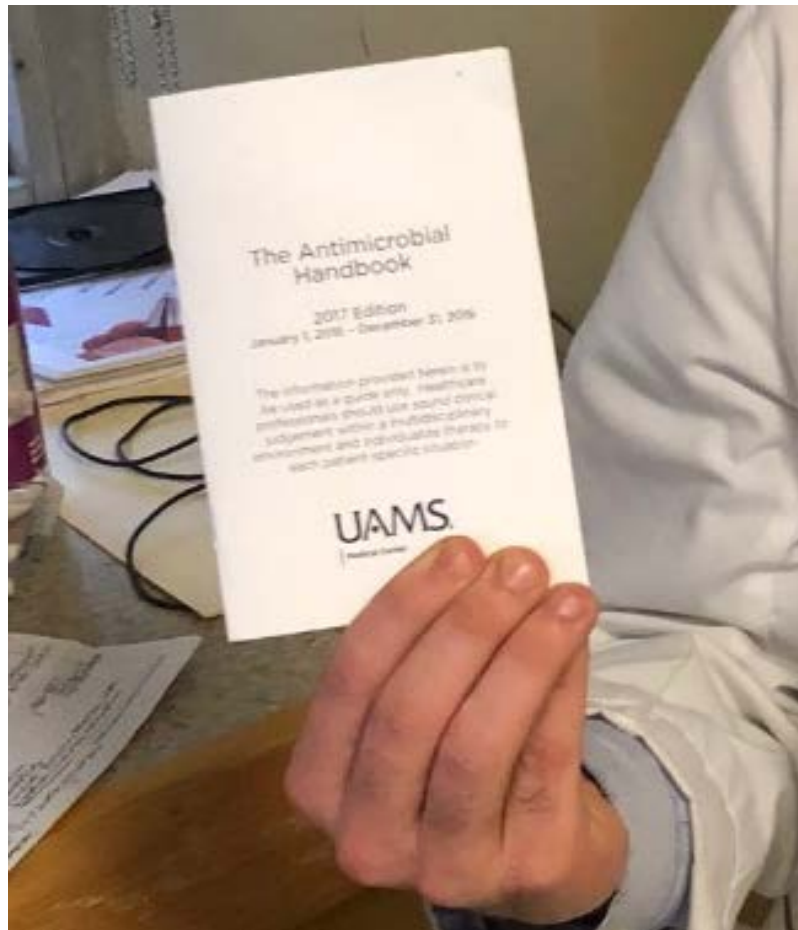


# Carbapenem-Resistant Enterobacteriaceae “CRE”

- Typically hospital acquired
- Resistant to nearly all antibiotics available
- 50% of patients with CRE bloodstream infection die
- Rate increasing



# UAMS Antimicrobial Handbook



All Inpatient, non-ICU, Percent susceptible, Gram-negative bacilli 1/2015-12/31/2015

	Body Site	Total Isolates	Aminic	Ampicillin	Ampicillin-Sulbactam	Cefazolin	Cefepime	Ceftazidime	Ceftazidime	Ceftiofame	Genamycin	Imipenem	Levofloxacin**	Nitrofurantoin	Piperacillin-Tazobactam	Tobramycin	Trimethoprim-Sulfamethoxazole
<b>All inpatient, non-ICU</b>																	
<i>Acinetobacter baumannii</i>	All sites	22	91	—	90	—	74	75	—	79	91	79	—	—	—	—	88
<i>Burkholderia cepacia</i>	All sites	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Citrobacter spp.</i>	All sites	40	100	—	—	18	100	95	95	92	100	90	84	94	94	97	73
<i>Enterobacter spp.</i>	All sites	77	100	—	—	0	97	73	73	97	87	95	—	72	97	92	—
<i>Escherichia coli</i>	Urine	263	100	86	83	82	80	80	87	99	85	93	84	89	83	89	83
	Non-Urine	113	100	82	41	70	89	85	85	84	98	65	—	82	88	65	—
<i>Klebsiella oxytoca</i>	All sites	20	100	—	35	53	95	95	95	95	100	90	57	95	95	100	—
<i>Klebsiella pneumoniae</i>	Urine	82	100	—	77	89	95	95	95	97	100	84	24	91	93	90	—
	Non-Urine	87	100	—	77	88	91	91	91	93	100	89	—	91	95	93	—
<i>Proteus mirabilis</i>	Urine	28	100	82	86	89	95	95	95	89	—	77	0	100	89	86	—
	Non-Urine	20	100	75	85	55	95	95	95	85	—	60	—	100	85	70	—
<i>Pseudomonas aeruginosa</i>	Urine	28	95	—	—	77*	67	—	—	91	81	63	—	61	99	—	—
	Non-Urine	59	98	—	—	—	97*	88	—	78	61	—	79	93	—	—	—
	CF Sputum**	59	54	—	—	—	59*	73	—	58	—	53	—	66	80	—	—
<i>Serratia marcescens</i>	All sites	27	96	—	—	0	100	93	96	92	—	96	—	—	—	—	81
<i>Stenotrophomonas maltophilia</i>	All sites	33	—	—	—	—	—	42	—	—	—	—	79	—	—	—	85

- Produced Annually
- Specific Antibiogram for Wards, ER, ICU
- IV->PO Conversion Recommendations
- Daily Costs of Antibiotics
- Antimicrobial Restrictions and Reservations
- Automatic Stop Dates for Certain Antibiotics
- Antimicrobials in Pregnancy and Lactation
- Vancomycin Dosing
- Pneumonia Treatment Guidelines
- Role of MRSA Nares for Vanc De-escalation
- Navigating antibiotic allergies
- Alternatives to fluoroquinolones
- Use of procalcitonin

# Antimicrobial Stewardship

Coordinated interventions to *improve* and *measure* the appropriate use of antimicrobials by promoting the selection of the **optimal antimicrobial drug regimen, dose, duration of therapy, and route of administration**

# Antimicrobial Stewardship

- Aim is to decrease selective pressure for multidrug-resistant organisms in order to preserve the utility of antibacterial agents.
- Goal is to ensure that there are systems and support to help providers use antibiotics optimally.
- Leads to improved patient outcomes, increased patient safety, decreased risk of *C. diff*, decreased facility costs.
- For this to work, every provider has to play a role in stewardship.

Antibiotics are a limited resource. The more that antibiotics are used today, the less likely they will still be effective in the future.



# Does Your Patient Need Antibiotics??

- Signs and symptoms of infection
  - Are you treating colonization?
- Appropriate collection of cultures
  - Collect prior to initiation of antibiotics
- Appropriate Duration
  - Less is more

# UAMS Antibiotic Stewardship

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