

Antimicrobial Stewardship

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Keck Medicine of USC

Date: November 4th, 2019

Agenda

- Background
- Current Status -How did we get here?
- Efforts to Optimize use- What can we do about it?
- Antimicrobial Stewardship Program
- Future directions

Attack of the superbugs: July 2041

Emma Jones beams a weak smile at her newborn son, cradled in her husband's arms at a hospital in New York. She is recovering from a severe bacterial infection that she contracted during her Caesarean section. The infection had begun to shut down her organs; doctors put her in a coma and hooked her up to a breathing machine. Ms. Jones is lucky. She is one of a handful of people to have been treated with parvomycin, the first new antibiotic to become available since 2024.

Attack of the superbugs: July 2041

In Western countries the rise in deadly infections has been primarily in hospitals. Back when antibiotics still worked, they were used preventively in almost all operations.

In 2015 surgical-wound infections occurred in less than 5% of cases; by 2040 the rate had leapt to nearly 30% for some operations. Caesarean sections, which at their peak made up one-third of births in America in 2019, are now carried out only when there is no other option.

Attack of the superbugs: July 2041

Some hospitals no longer perform elective surgeries, such as hip and knee replacements, because so few patients are willing to take the risk of post-operative infection. But surgeons are busier with amputations. The lack of effective antibiotics means that amputating a limb is sometimes the only way to treat an infected skin ulcer in a diabetic patient.

At a New York Hospital, most heartbreaking are the paediatric wards. They are full of children recovering from amputations, many as a result of sepsis. “It often starts with just a scrape, a bug bite or a strep throat,” says Dr Velasquez, “things that take-home antibiotics easily cleared up 20 years ago.”

Our antibiotics are no match for superbugs, and it's a 'global crisis,' UN report says

Antimicrobial Resistance is where bacteria pick up a resistance to readily available antibiotics

BBC NEWS HEALTH

Home World UK England N.Ireland Scotland Wales Business Politics

24 January 2013 Last updated at 13:18

Antibiotic 'apocalypse' warning

By James Gallagher
Health and science reporter, BBC News

The rise in drug resistant infections is comparable to the threat of global warming, according to the chief medical officer for England.



OPINION

Prof Dame Sally Davies said bacteria were everywhere

Antibiotic apocalypse approaches

In India, there is now a strain of 'totally drug-resistant' TB. We're doomed if that spreads.

It will take us back to the dark days when there was a real risk of a global antibiotic apocalypse. It is a warning that we must take seriously. It is a warning that we must take seriously. It is a warning that we must take seriously.

These are the words of Prof Dame Sally Davies, the UK's chief medical officer, as she warned of a global antibiotic apocalypse. She said that the rise in drug-resistant infections is comparable to the threat of global warming. She said that we are in a 'race' against time to develop new antibiotics. She said that we need to do more to reduce the use of antibiotics. She said that we need to do more to reduce the use of antibiotics.

Drug resistance is for a due to needed much more attention

WE HAVE NO CURE

superbugs are coming

The rise of super-bugs. The end of antibiotics.

The future. What can you do?

In 2014, MRSA resistance rates exceeded 80% in several parts of the world. In 2017, an estimated 750,000 people are expected to die from antibiotic-resistant bacteria. The World Bank predicts that by 2050, 10 million people will die from antibiotic-resistant bacteria.

THE YORKSHIRE POST

18/10/14 | 13°C to 19°C Light showers

Main Topics: Debate, Traffic Cams, Rural, Features, Tour de France, The Great W...

General news, Politics, Education, Local stories, National Showbiz, Northern Digest

Antibiotic resistance 'could be far worse than ebola'

Superbug Shuts Down Entire School District

23 schools disinfected after single case of drug-resistant staph



Oct 28, 2007 6:31 AM CDT

A longstanding problem

Newsweek March 28, 1994

ANTIBIOTICS

THE END OF MIRACLES?

The End of Antibiotics? BY SHARON BOGLE

I just went, at the annual meeting of the American Association for the Advancement of Science in San Francisco, to a conference on antibiotic resistance. The speakers were warning that there are more and more antibiotics, as a result, we are facing the prospect of a medical disaster. He said.

THE END OF ANTIBIOTICS?

'Miracle' Era of Antibiotics Is Ending

Modern medicine can't fight off superbugs for long

Aug 12, 2010 1:14 PM CDT



Four areas where dairy farmers can cut antibiotics use in herds

Antibiotic resistance is a growing problem for dairy farmers. It is a growing problem for dairy farmers. It is a growing problem for dairy farmers.

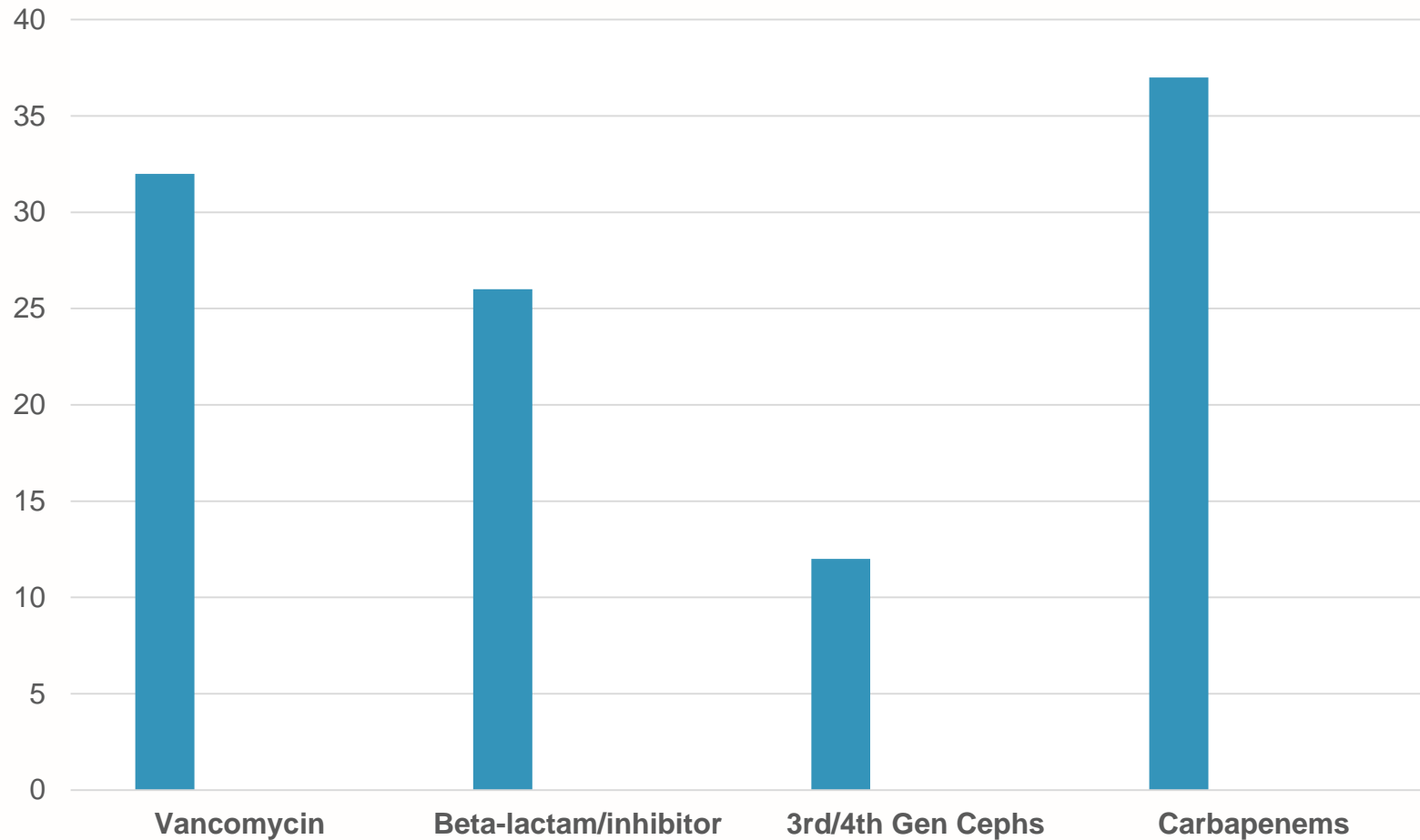
1. Reduce the use of antibiotics in feed. 2. Use antibiotics only when necessary. 3. Use antibiotics only when necessary. 4. Use antibiotics only when necessary.

HOW DID WE GET HERE?

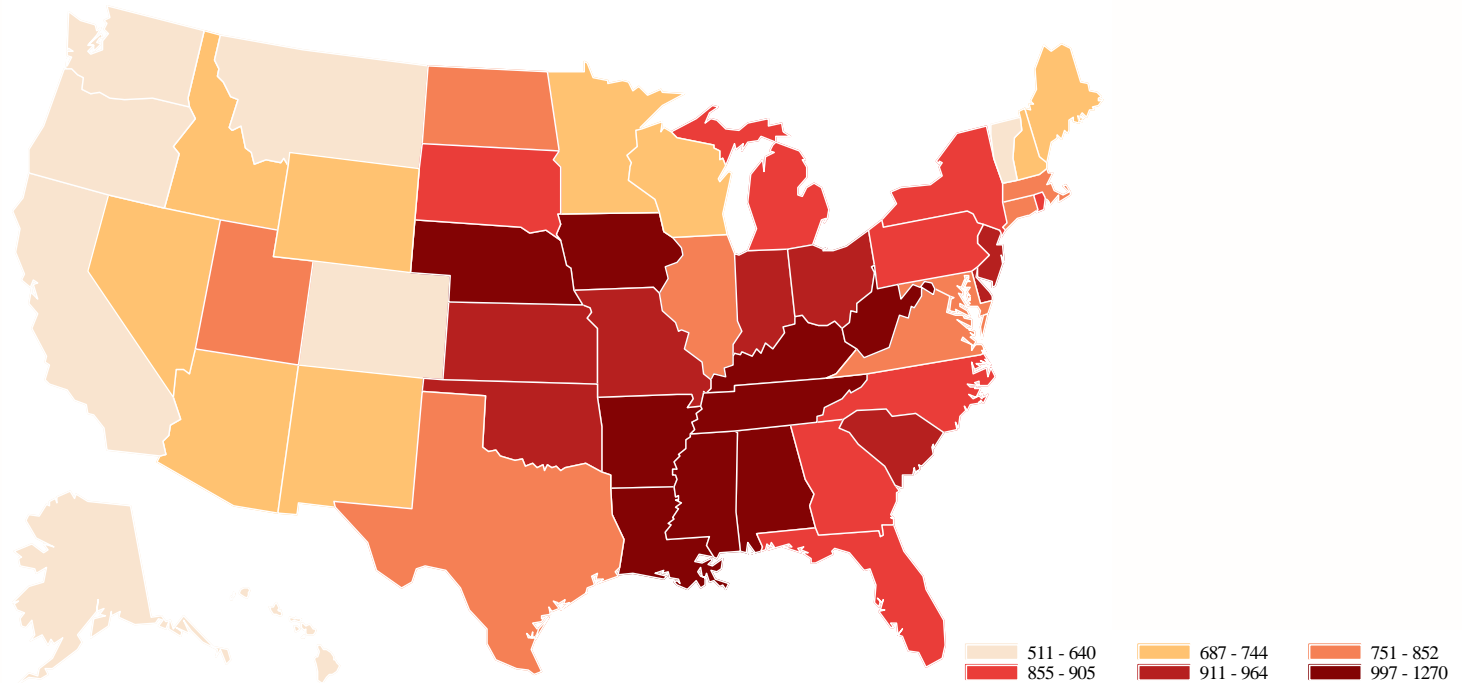
Acute care hospitals

- >50% of patients received antibiotics during hospital stay
- One third of antibiotic prescriptions were inappropriate
- Increasing use of broad spectrum antibiotics

Antimicrobials with Largest Increase in Use 2006-2012



Outpatient Antimicrobial Prescriptions

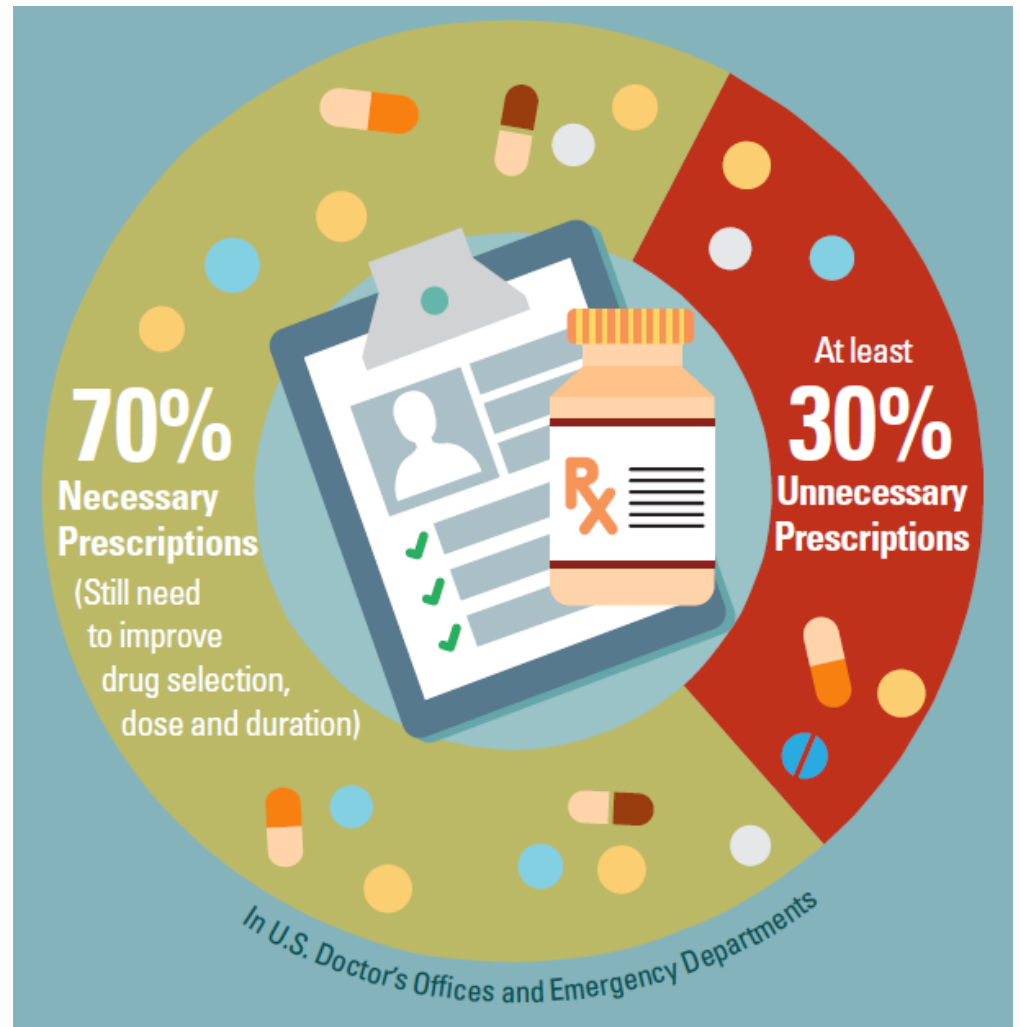


In 2016, 270 million antibiotic prescriptions were dispensed in the outpatient areas, i.e., 836 per 1,000 population

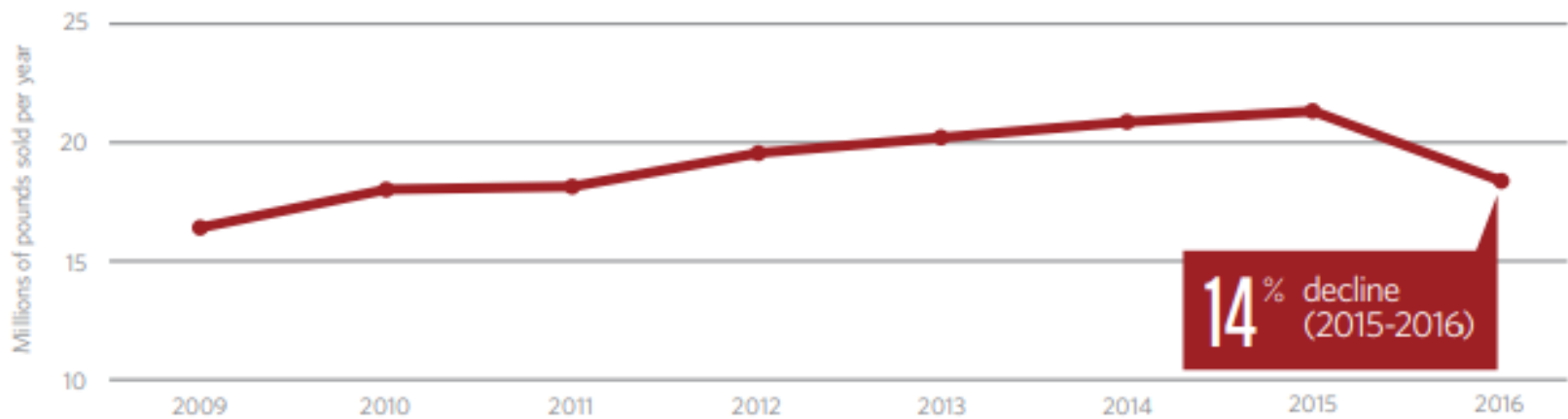
King et al. Clin Infect Dis. 2019 Mar 16.

Antibiotic Use in Outpatient Areas

At least 30% of antibiotic prescriptions written in offices and emergency departments are unnecessary.



After Steady Increases, Sales of Medically Important Antibiotics for Use in U.S. Food-Producing Animals Fell for the First Time in 2016

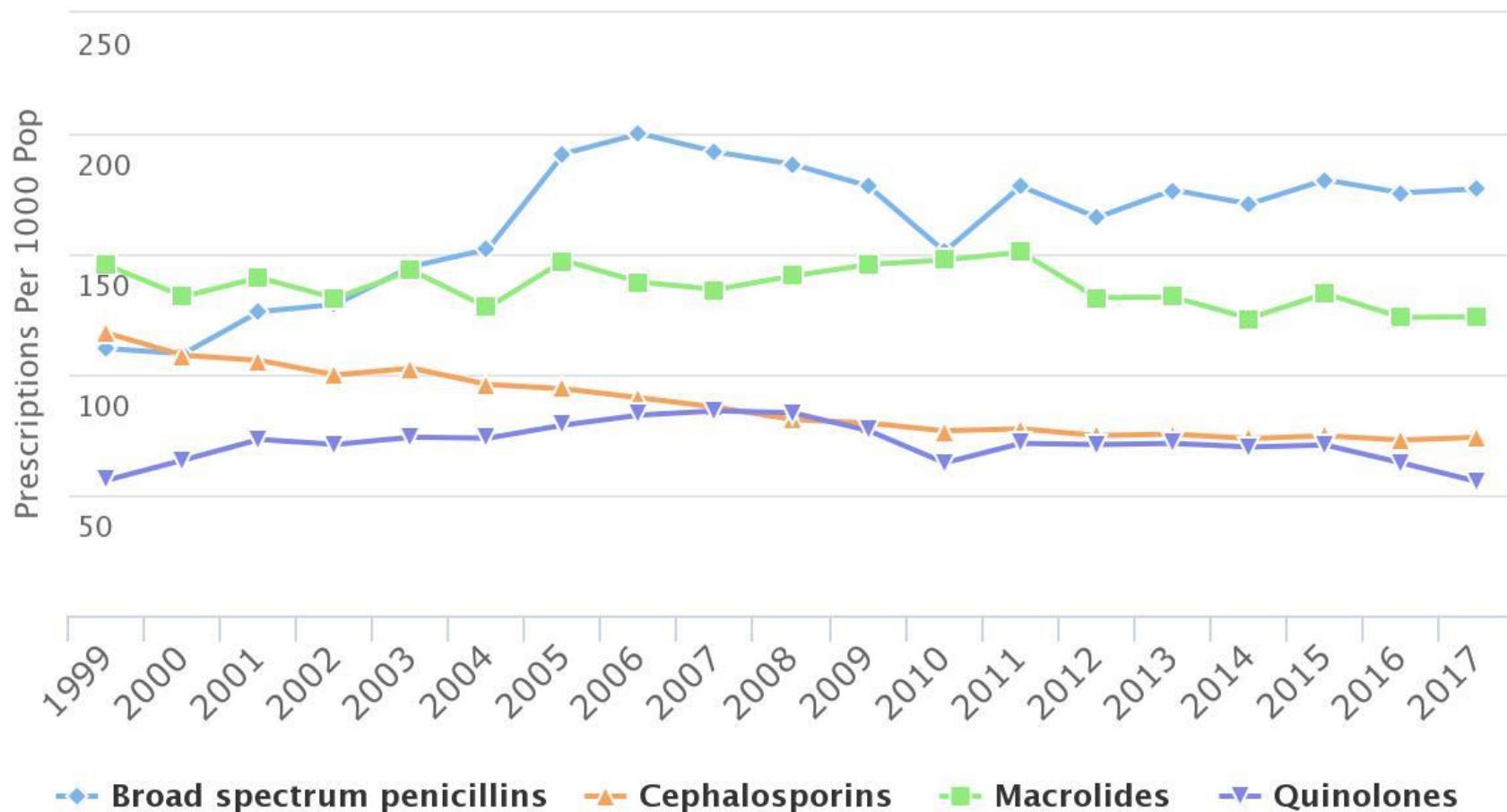


Source: Food and Drug Administration, "2016 Summary Report on Antimicrobials Sold or Distributed for Use in Food-Producing Animals" (2017), <https://www.fda.gov/downloads/ForIndustry/UserFees/AnimalDrugUserFeeActADUFA/UCM588085.pdf>

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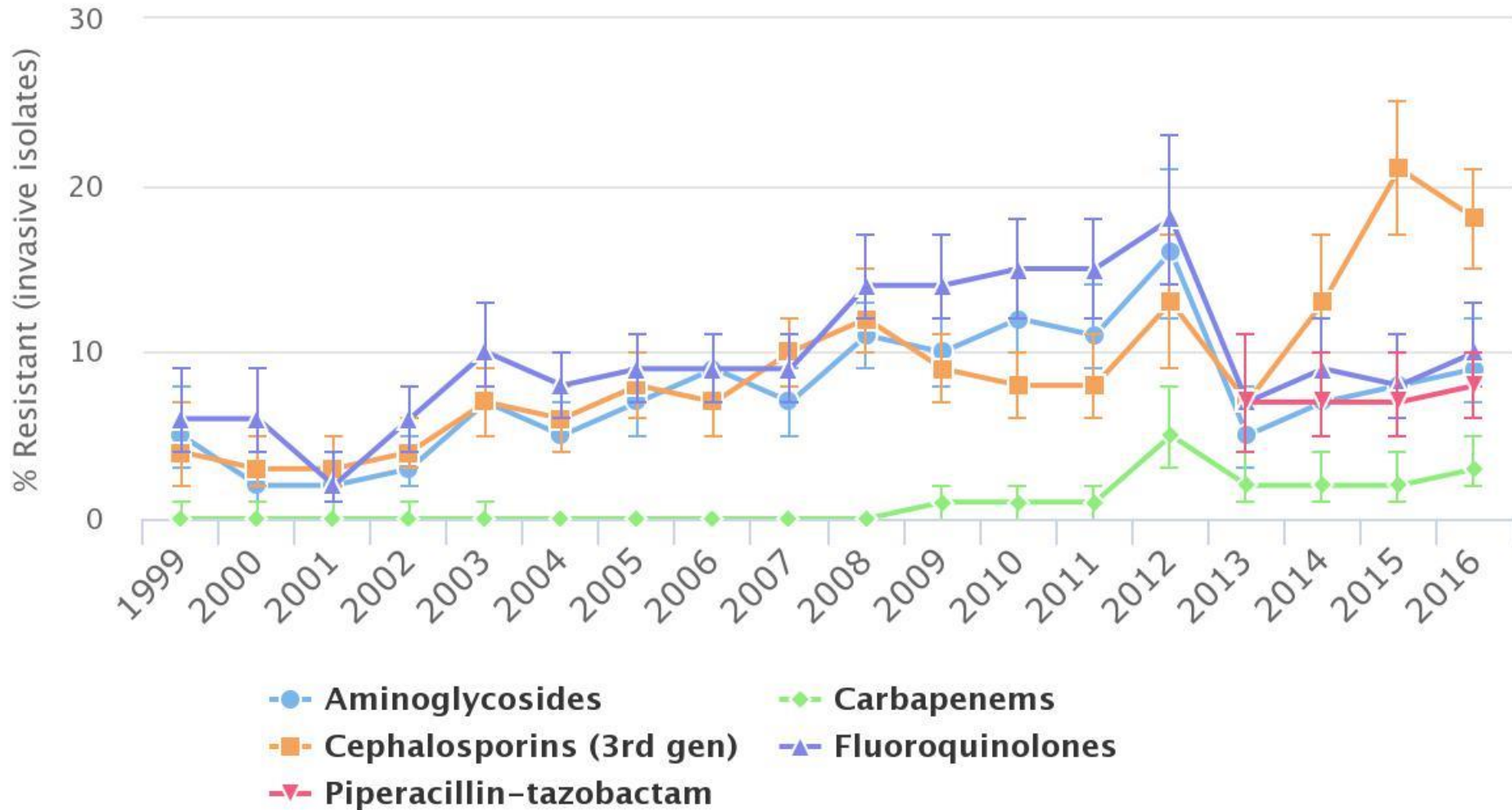
Antibiotic Use in California

Source: IQVIA



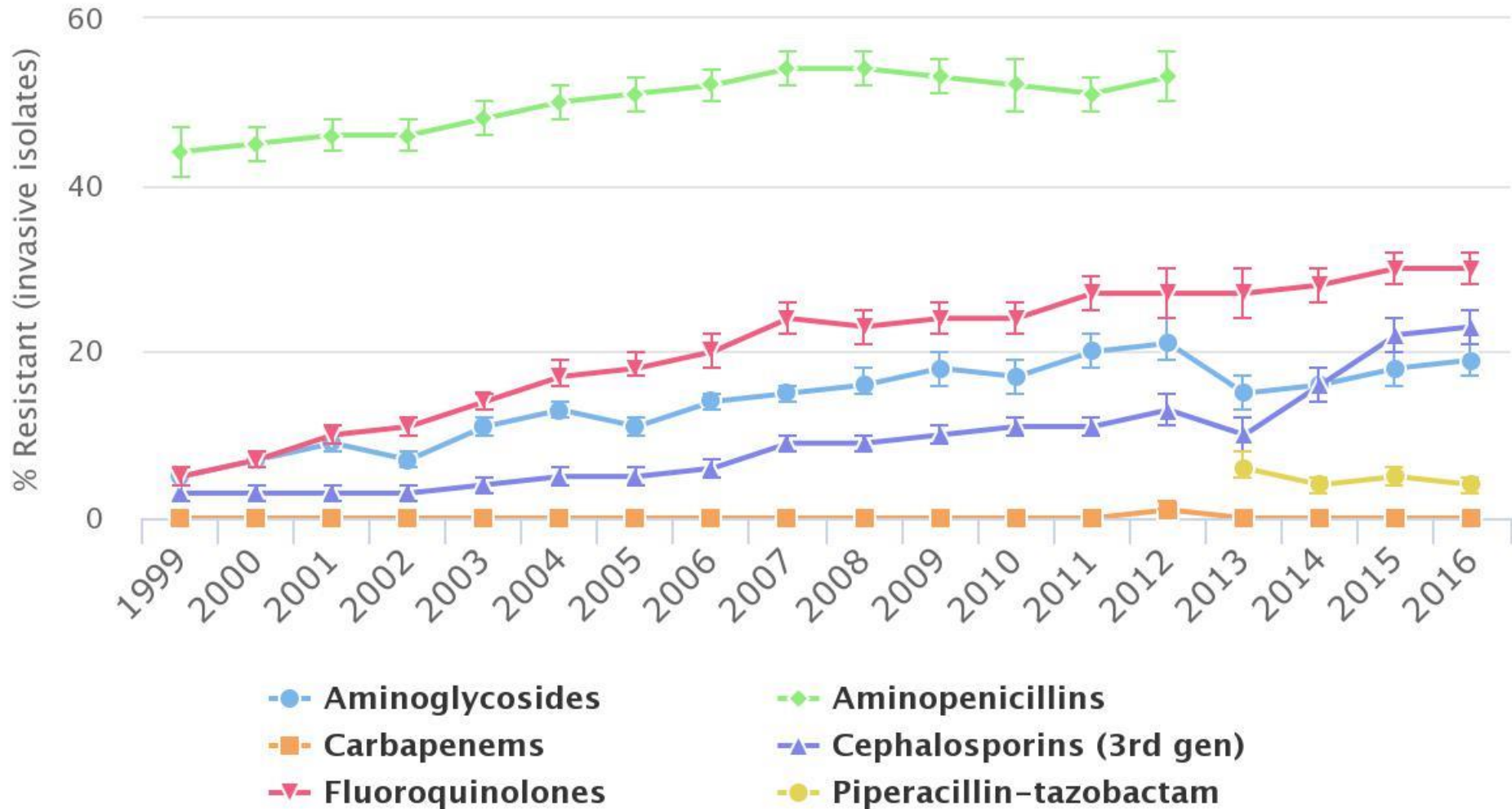
Center for Disease Dynamics, Economics & Policy (cddep.org)

Antibiotic Resistance of *Klebsiella pneumoniae* in Pacific



Center for Disease Dynamics, Economics & Policy (cddep.org)

Antibiotic Resistance of *Escherichia coli* in Pacific



Center for Disease Dynamics, Economics & Policy (cddep.org)

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WHAT CAN WE DO ABOUT IT?

A) MANUFACTURE NEW ANTIBIOTICS

Number of new antibiotics



Figure 1. Timeline of antibiotic production.

B) ALTERNATIVE WAYS TO KILL BACTERIA

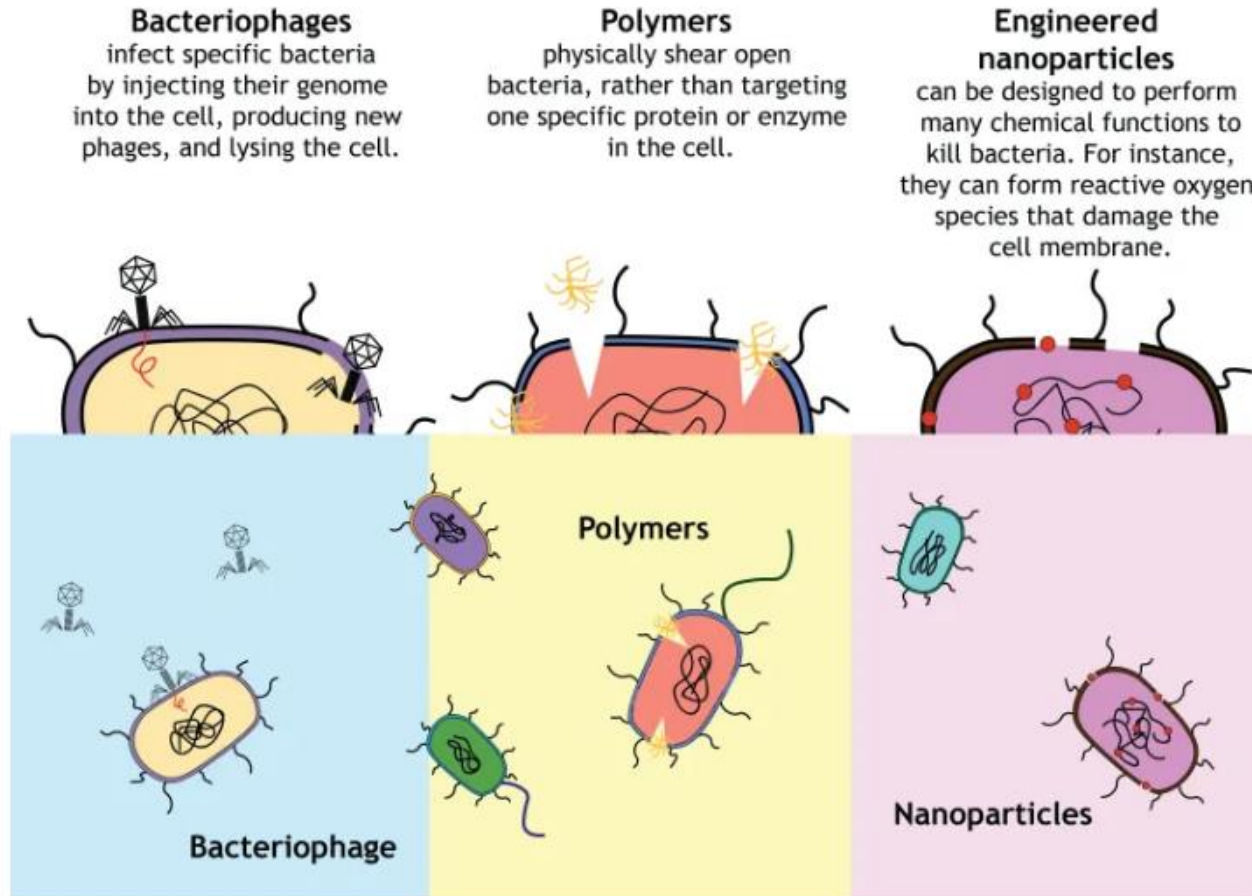


Figure 2: New ways to kill bacteria. Scientists have been developing alternative ways to kill bacteria, such as the use of bacteriophages, polymers, and other kinds of engineered nanoparticles.

C) STEWARDSHIP OF CURRENT RESOURCES (ANTIMICROBIALS)

- World Health Organization (WHO) launched the Global Action Plan (2015) aimed at reducing antimicrobial resistance
- United Nations (2016) committed to address root causes of antimicrobial resistance across multiple sectors- human health, animal health and agriculture
- This was the fourth time a health issue has been taken up by UN General Assembly (HIV, non-communicable disease and Ebola)
- Centre of Disease Control and Prevention (CDC) recommended all hospitals should have an Antimicrobial Stewardship Program

ANTIMICROBIAL STEWARDSHIP CONT.

- The Joint Commission required all acute care hospitals to have an Antimicrobial Stewardship Program by Jan 1st, 2017
- All acute care hospitals were expected to meet the 7 Elements of Performance (EPs)

ELEMENTS OF PERFORMANCE FOR ASP

- Leadership commitment from administration
- Single leader responsible for outcomes (ID Physician)
- Single pharmacy leader (ID Pharmacist)
- Antibiotic use tracking
- Regular reporting on antibiotic use and resistance
- Educating providers on use and resistance
- Specific improvement interventions

ASP Interventions

- Prospective audit with intervention and feedback
- Formulary restriction
- Preauthorization requirements

Antimicrobial Stewardship Operations (ASP team and Pharmacists)

- **Daily audit with Intervention and Feedback -**
 - Performed by ASP Pharmacist and ID Attending Physicians (M - F) in the form of daily clinical rounds
 - Select drugs reviewed at 72 hours (Meropenem, Vancomycin, Micafungin, Linezolid and Zosyn)
 - Daily Rounds with ASP Pharmacist & ID attending

Antimicrobial Stewardship Operations contd.

- **Antimicrobial Restriction – (restricted to approval by Infectious Diseases Consult)**
 - Daptomycin - Tigecycline - Ceftaroline - Ceftolozane/tazo
 - Isavuconazole - Fidaxomicin - Quinupristin/Dalfopristin
 - Ceftazidime/Avibactam

- Pharmacy will dispense up to 24 hour supply – after hours, weekends

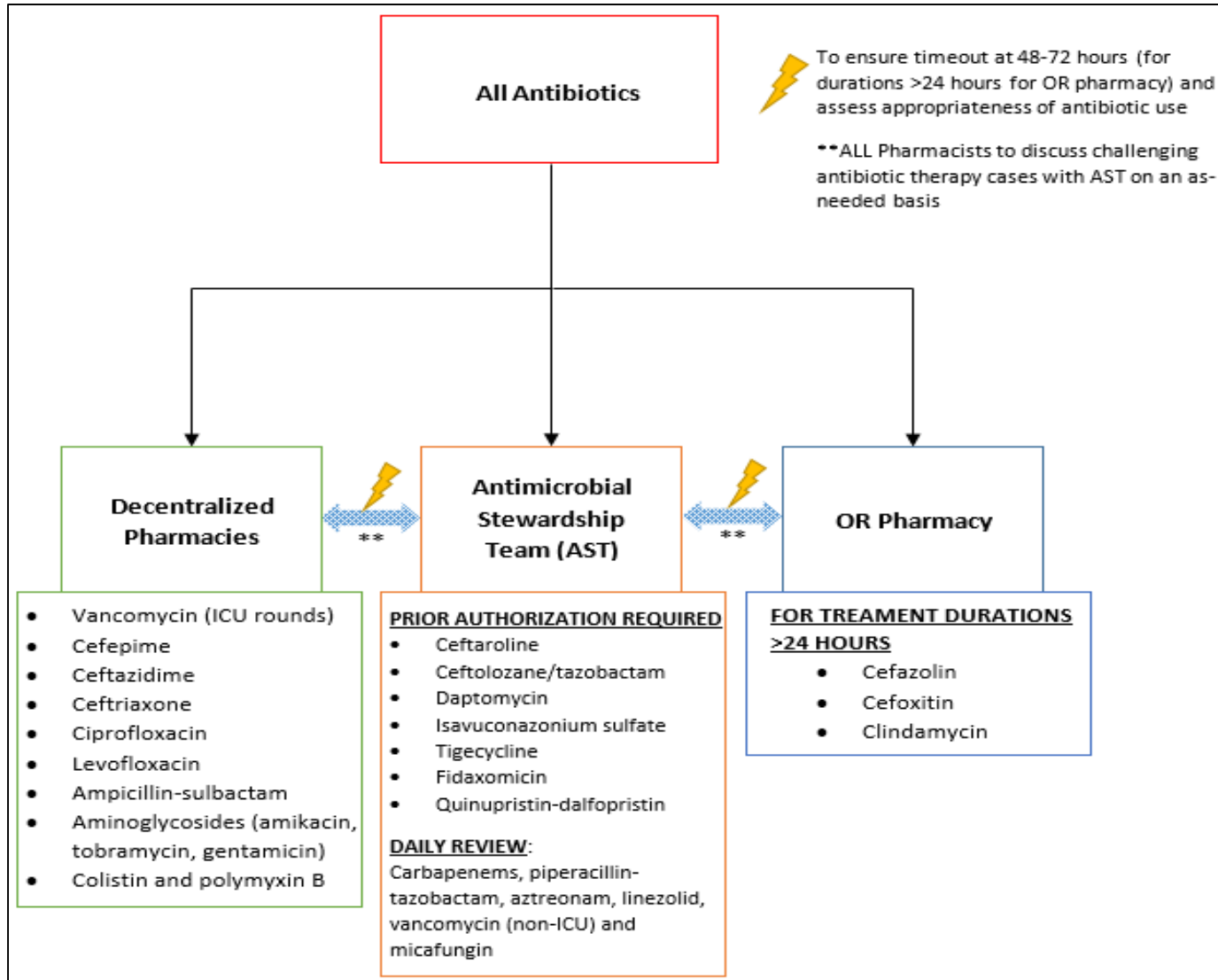
- Unit Pharmacist will inform ID consult of formal consultation

Antimicrobial Stewardship Operations contd.

- **Review of other antimicrobials**

- Other antimicrobials include Cephalosporins, Quinolones, Aminoglycosides, Colistin, Polymixin B and Unasyn
- Reviewed at 48-72 hours by unit pharmacists
- Challenging cases reviewed by ID Pharmacist

ASP Overview at Keck Medical Center of USC



Social Determinants of Antibiotic Prescribing

- Medical sociologists and anthropologists believe – prescribing a drug is a highly social as well as a clinical act
- Social factors
 - a) Relationship between Clinicians
 - b) Emotional response (fear, anxiety)
 - c) Environmental factors
 - d) Perception of the problem

Bosk 1979 Forgive and Remember, Freidson 1970 The Profession of Medicine, Van der Geest et al Ann Rev Anthropology 1996

Social Determinants of Antibiotic Prescribing contd.

- Social factors need to be considered in implementing stewardship interventions
- Appreciation of environmental and emotional factors
- Relationship between clinicians will be best addressed in collaboration with respective professional societies
- Adoption of Culture of Safety in antimicrobial stewardship

Antimicrobial Stewardship Initiatives at Keck

- Aim: Modification of behavior with positive reinforcement
- Collaboration and Leadership in Antimicrobial Stewardship-**CLASS** Initiative at Keck and Norris
- Antimicrobial orders are reviewed daily
- Antimicrobial Stewardship team identify providers who are top prescribers, i.e., choose their antibiotics wisely and ensure a drug-bug match

Appreciating efforts for appropriate antibiotic usage

- Monthly communication is sent to providers
- As a part of CLASS initiative, we have recognized and rewarded 26 providers thus far

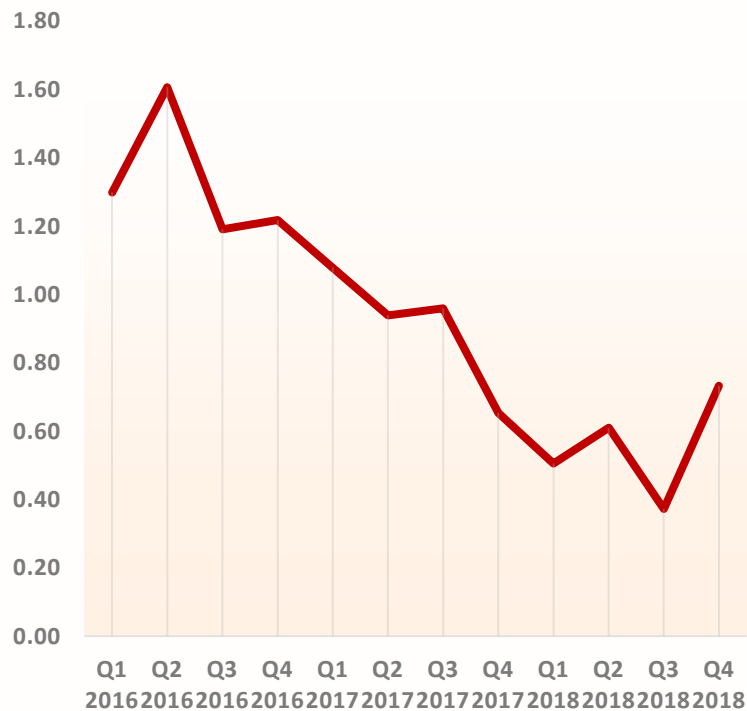


Appropriate Usage of Antimicrobials

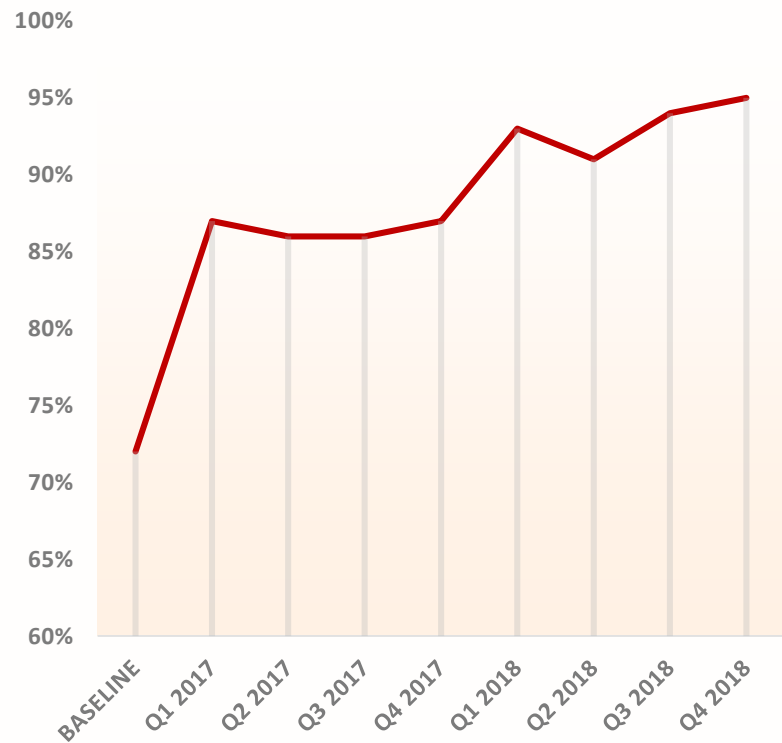
- Carbapenems 84%(baseline)→96% ↑
- Vancomycin 72% (baseline)→ 92% ↑
- Zosyn 74% (baseline)→ 83% ↑

Current Status at Keck Medical Center

VRE Rate per 1000 patient days



Appropriate Vancomycin Use

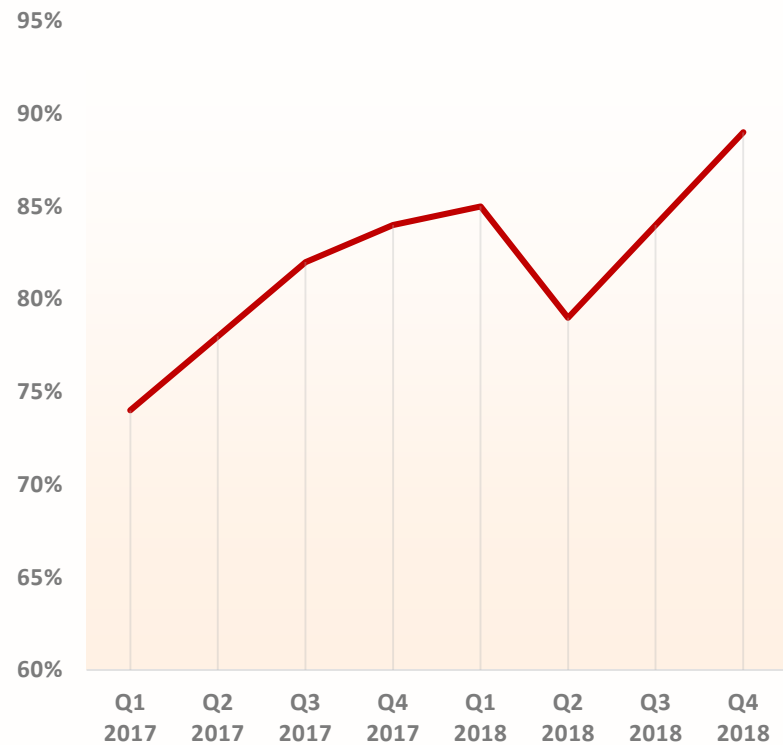


Extended Spectrum beta-lactamase producers

ESBL rate per 1000 patient days



Appropriate Zosyn Use

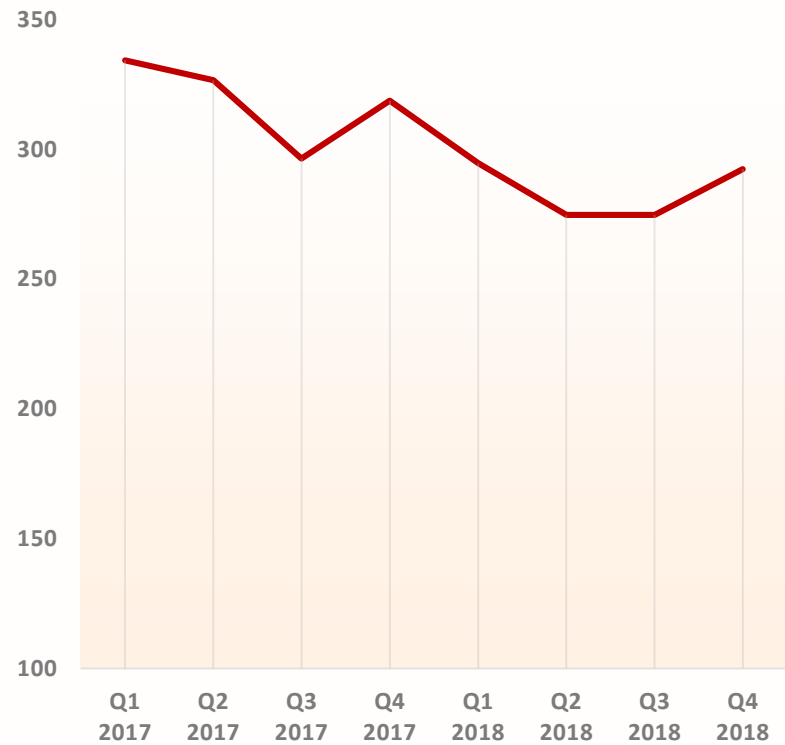


C.Difficile and Gram Negative Utilization

CDI rate per 1000 patient days



Gram Negative Utilization (DOT per 1000 patient days)



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FUTURE OF ANTIMICROBIAL STEWARDSHIP

- Expansion of ASP in non-hospital settings
- Curtailing use of antimicrobials in food producing animals
- Increasing emphasis on diagnostics
- Incentivizing pharmaceutical companies to manufacture new antimicrobials

“IF WE FAIL TO ACT, WE ARE LOOKING AT AN ALMOST UNTHINKABLE SCENARIO, WHERE ANTIBIOTICS NO LONGER WORK AND WE ARE CAST BACK INTO THE DARK AGES OF MEDICINE”

David Cameron, former UK Prime Minister

THANK YOU

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