

GET SMART



FOR HEALTHCARE

**Know
When
Antibiotics
Work**

National Center for Emerging and Zoonotic Infectious Diseases

Division of Healthcare Quality Promotion



Why we need to improve in-patient antibiotic use

- **Antibiotics are misused in hospitals**
- **Antibiotic misuse adversely impacts patients and society**
- **Improving antibiotic use improves patient outcomes and saves money**
- **Improving antibiotic use is a public health imperative**



Antibiotics are misused in hospitals

- **“It has been recognized for several decades that up to 50% of antimicrobial use is inappropriate”**
- **IDSA/SHEA Guidelines for Antimicrobial Stewardship Programs**
- **<http://www.journals.uchicago.edu/doi/pdf/10.1086/510393>**



Antibiotic are misuse in a variety of ways

- **Given when they are not needed**
- **Continued when they are no longer necessary**
- **Given at the wrong dose**
- **Broad spectrum agents are used to treat very susceptible bacteria**
- **The wrong antibiotic is given to treat an infection**

Antibiotic misuse adversely impacts patients- *C. difficile*

- **Antibiotic exposure is the single most important risk factor for the development of *Clostridium difficile* associated disease (CDAD).**
 - Up to 85% of patients with CDAD have antibiotic exposure in the 28 days before infection¹

1. Chang HT et al. *Infect Control Hosp Epidemiol* 2007; 28:926–931.



Antibiotic misuse adversely impacts patients- *C. difficile*

- Emergence of the NAP-1/BI or “epidemic” strain of *C. difficile* has intensified the risks associated with antibiotic exposure.

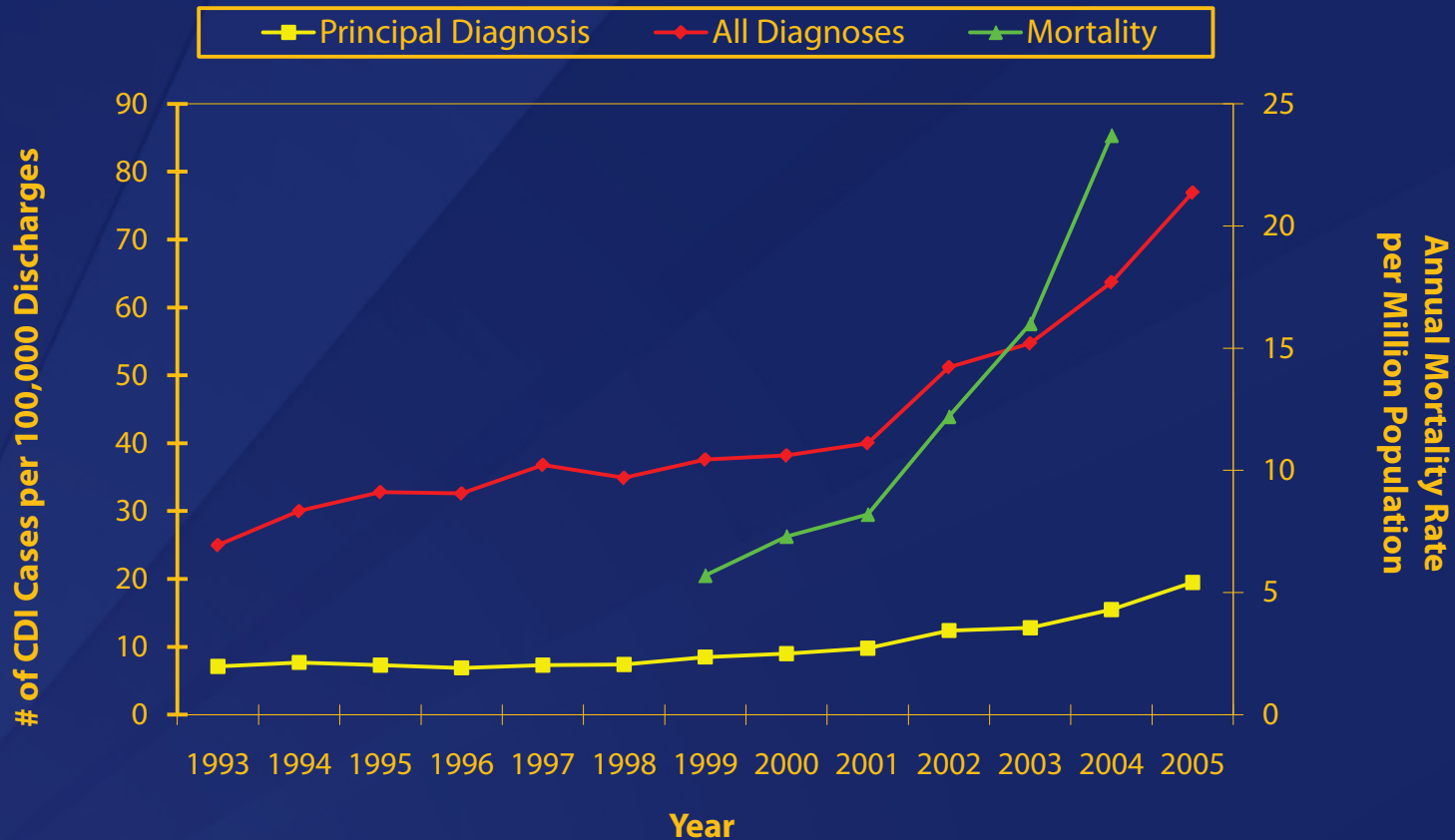


Antibiotic misuse adversely impacts patients- *C. difficile*

- Epidemic strain of *C. difficile* is associated with increased risk of morbidity and mortality.



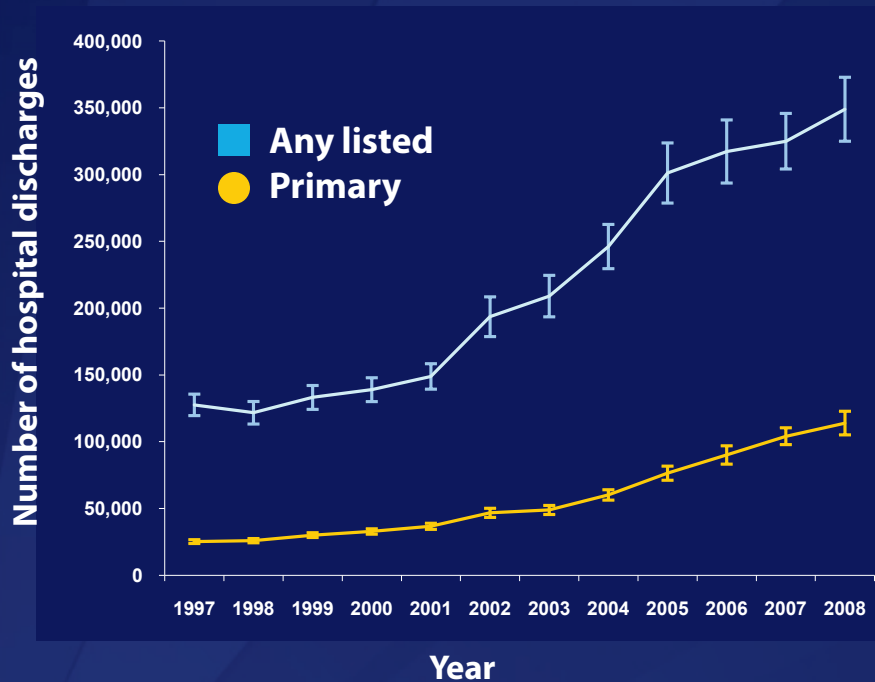
Incidence and mortality are increasing in US



Elixhauser A, et al. Healthcare Cost and Utilization Project: Statistical Brief #50. April 2008. Available at: <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb50.pdf>. Accessed March 10, 2010.
Redelings MD, et al. Emerg Infect Dis. 2007;13:1417-1419.



Estimated burden of healthcare-associated CDI



- Hospital-acquired, hospital-onset: 165,000 cases, \$1.3 billion in excess costs, and 9,000 deaths annually
- Hospital-acquired, post-discharge (up to 4 weeks): 50,000 cases, \$0.3 billion in excess costs, and 3,000 deaths annually
- Nursing home-onset: 263,000 cases, \$2.2 billion in excess costs, and 16,500 deaths annually

Elixhauser, A. (AHRQ), and Jhung, MA. (Centers for Disease Control and Prevention). *Clostridium Difficile-Associated Disease in U.S. Hospitals, 1993–2005*. HCUP Statistical Brief #50. April 2008. Agency for Healthcare Research and Quality, Rockville, MD. And unpublished data
<http://www.hcup-us.ahrq.gov/reports/statbriefs/sb50.pdf>

Campbell et al. *Infect Control Hosp Epidemiol*. 2009;30:523-33.
Dubberke et al. *Emerg Infect Dis*. 2008;14:1031-8.
Dubberke et al. *Clin Infect Dis*. 2008;46:497-504.



Antibiotic misuse adversely impacts patients- *C. difficile*

- Epidemic strain is resistant to fluoroquinolone antibiotics, which confers a selective advantage.

Antibiotic misuse adversely impacts patients - resistance

- **Getting an antibiotic increases a patient's chance of becoming colonized or infected with a resistant organism.**



Antibiotic exposure increases the risks of resistance

Pathogen and Antibiotic Exposure	Increased Risk
Carbapenem Resistant Enterobacteriaceae and Carbapenems	15 fold 1
ESBL producing organisms and Cephalosopriins	6- 29 fold 3,4

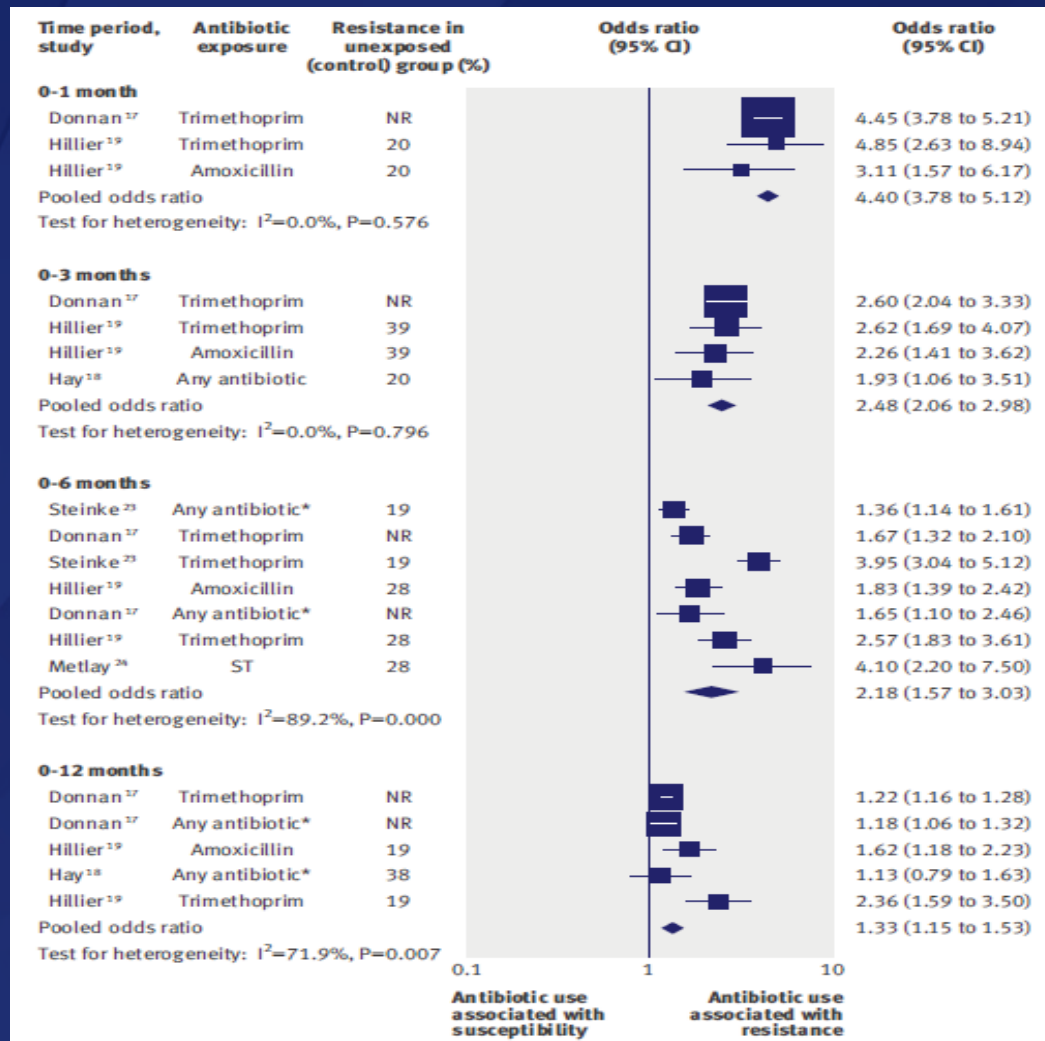
Patel G et al. *Infect Control Hosp Epidemiol* 2008;29:1099-1106

Zaoutis TE et al. *Pediatrics* 2005;114:942-9

Talon D et al. *Clin Microbiol Infect* 2000;6:376-84



Effect of antibiotic prescribing in primary care on antimicrobial resistance in individual patients: systematic review and meta-analysis



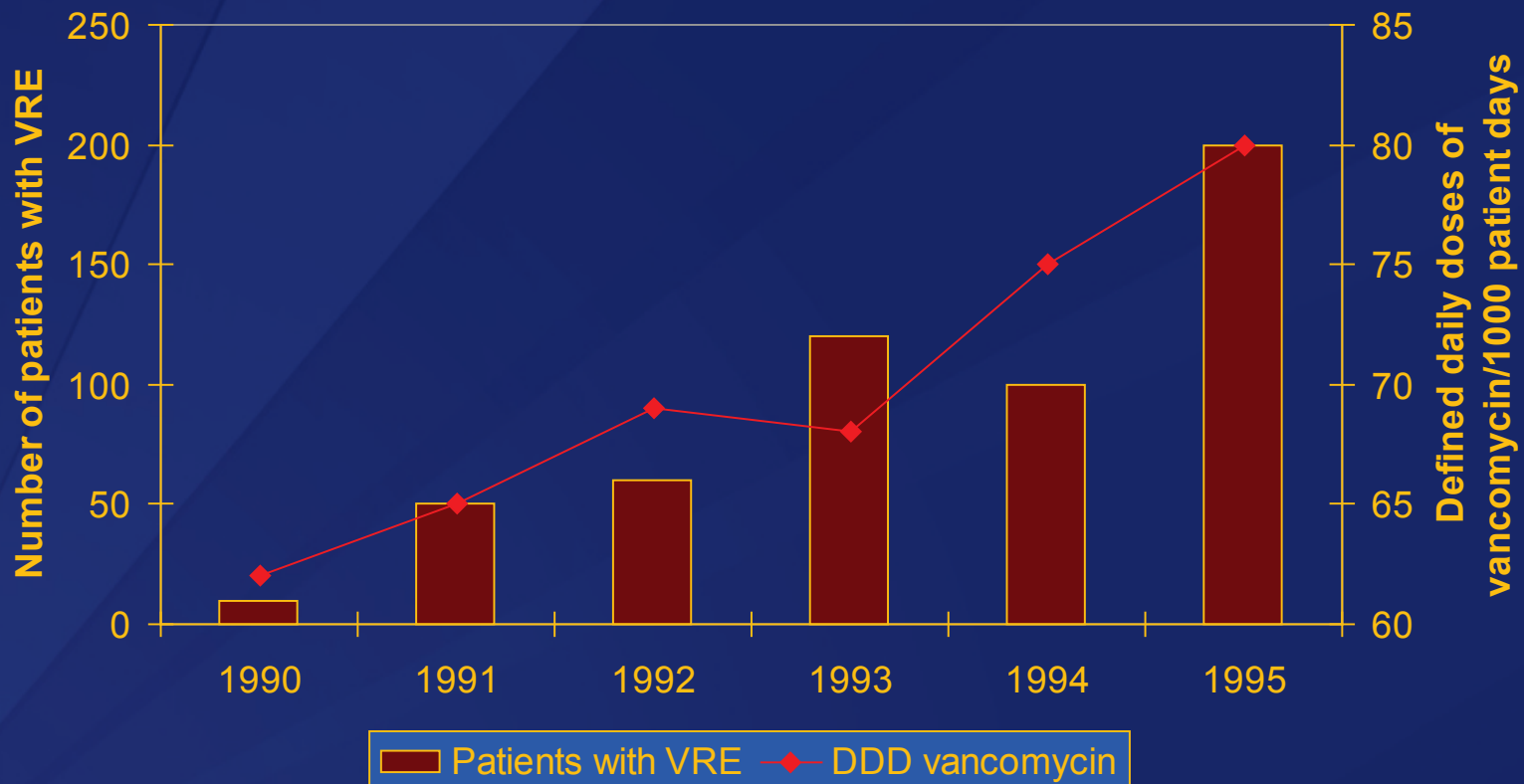
Antibiotic misuse adversely impacts patients- resistance

- Increasing use of antibiotics increases the prevalence of resistant bacteria in hospitals.

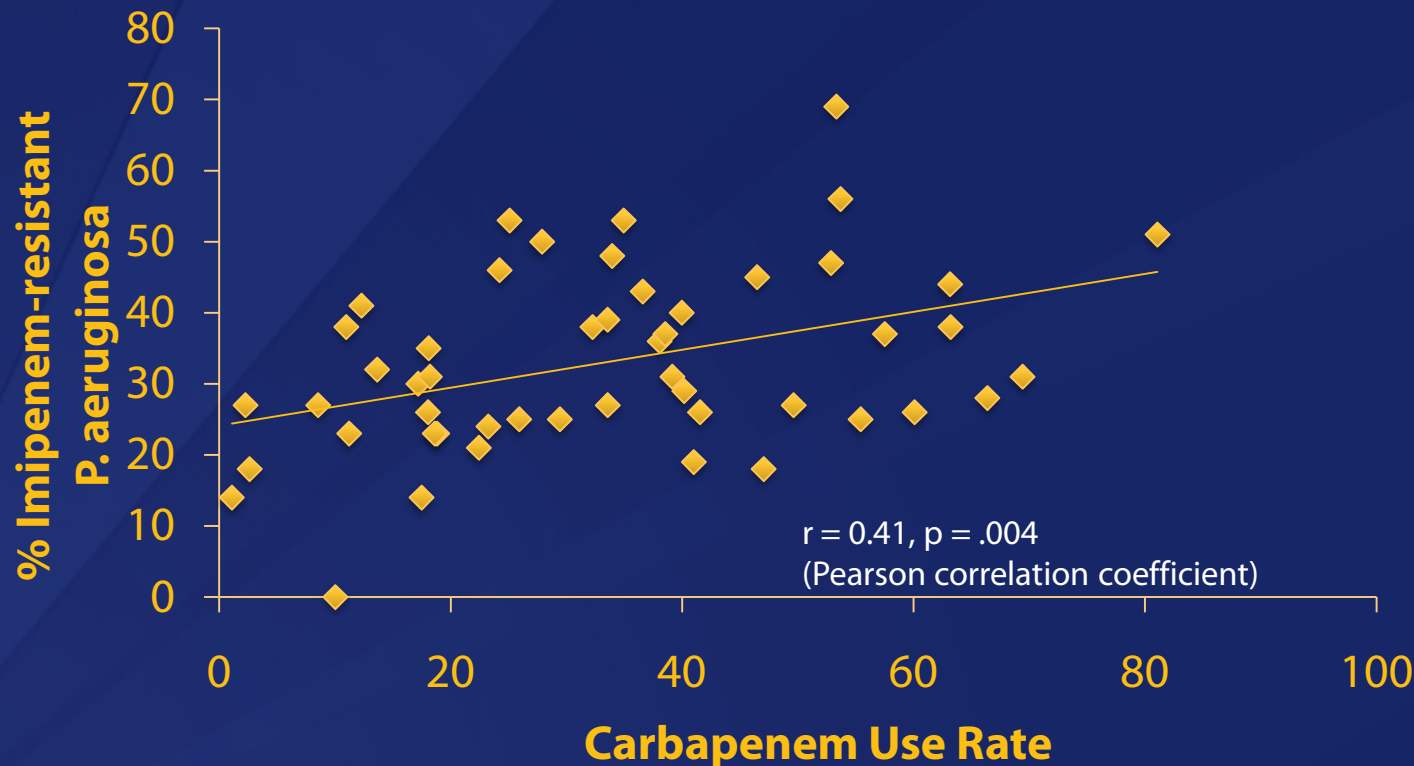


Association of vancomycin use with resistance

(JID 1999;179:163)



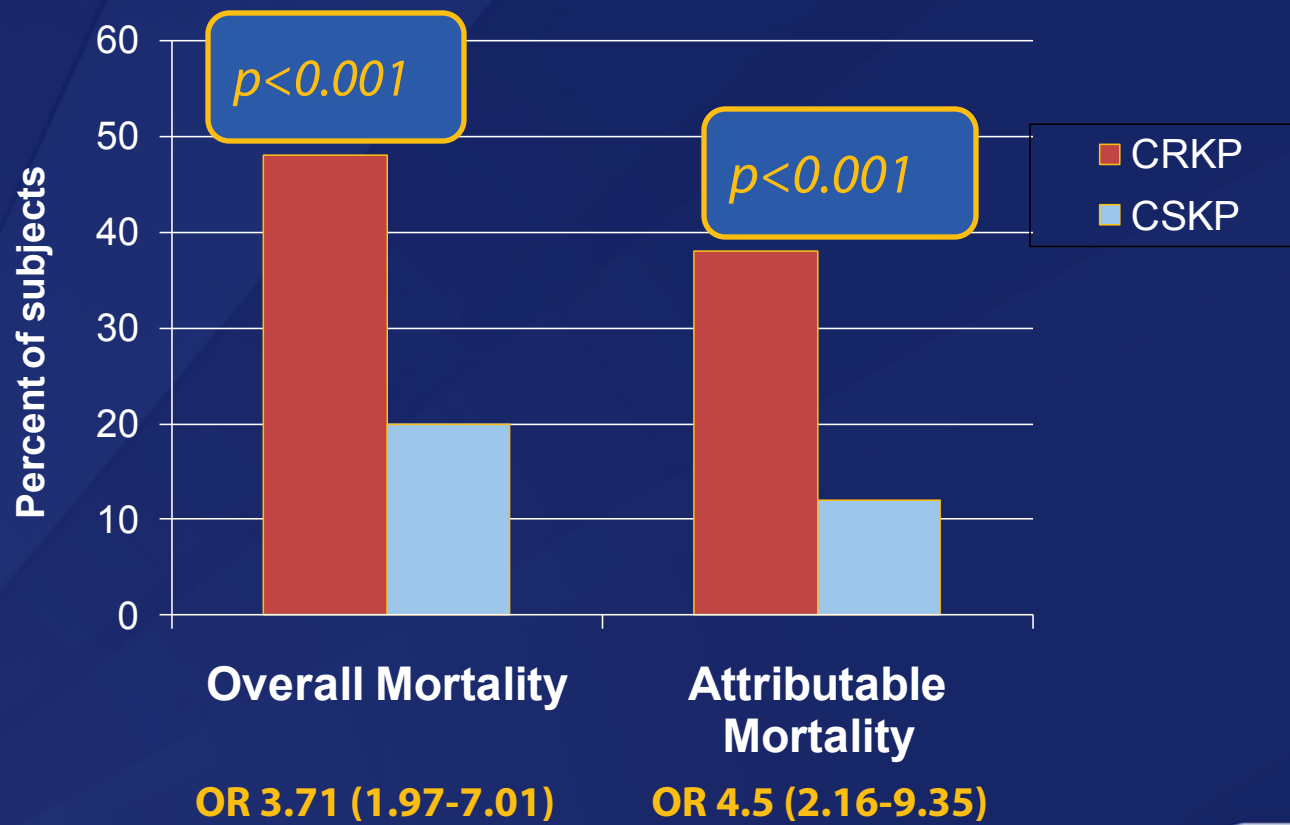
Annual prevalence of imipenem resistance in *P. aeruginosa* vs. carbapenem use rate



Antibiotic resistance increases mortality



Mortality associated with carbapenem resistant (CR) vs susceptible (CS) *Klebsiella pneumoniae* (KP)



Mortality of resistant (MRSA) vs. susceptible (MSSA) *S. aureus*

- **Mortality risk associated with MRSA bacteremia, relative to MSSA bacteremia: OR: 1.93; $p < 0.001$.¹**
- **Mortality of MRSA infections was higher than MSSA: relative risk [RR]: 1.7; 95% confidence interval: 1.3–2.4).²**

1. *Clin. Infect. Dis.*36(1),53–59 (2003).

2. *Infect. Control Hosp. Epidemiol.*28(3),273–279 (2007).



Antibiotic misuse adversely impacts patients - adverse events

- In 2008, there were 142,000 visits to emergency departments for adverse events attributed to antibiotics.¹



Antibiotic misuse adversely impacts patients - adverse events

- National estimates for in-patient adverse events are not available, but there are many reports of serious adverse events (aside from *C. difficile* infection) from in-patient antibiotic use.



Improving antibiotic use reduces *C. difficile* infections



Impact of fluoroquinolone restriction on rates of *C. difficile* infection

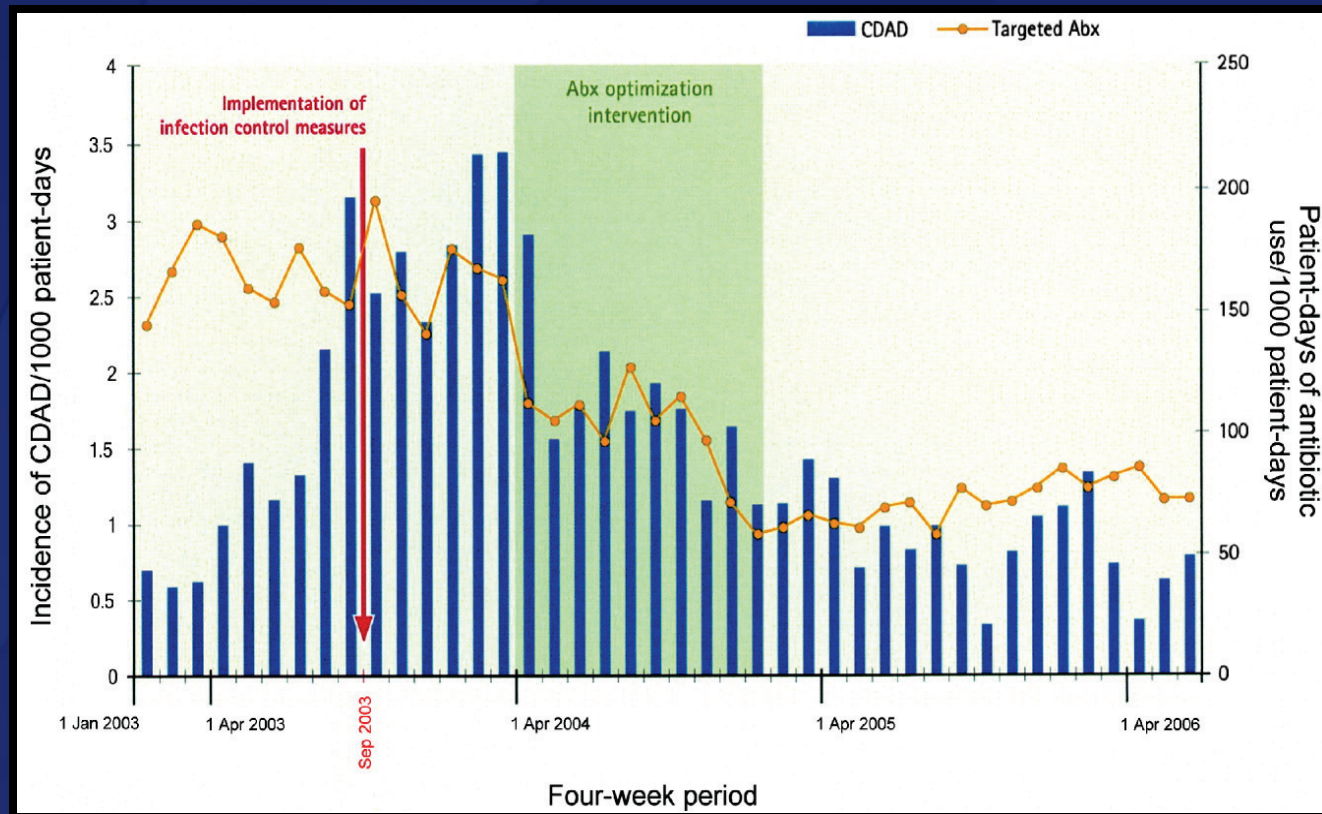


Infect Control Hosp Epidemiol. 2009 Mar;30(3):264-72.

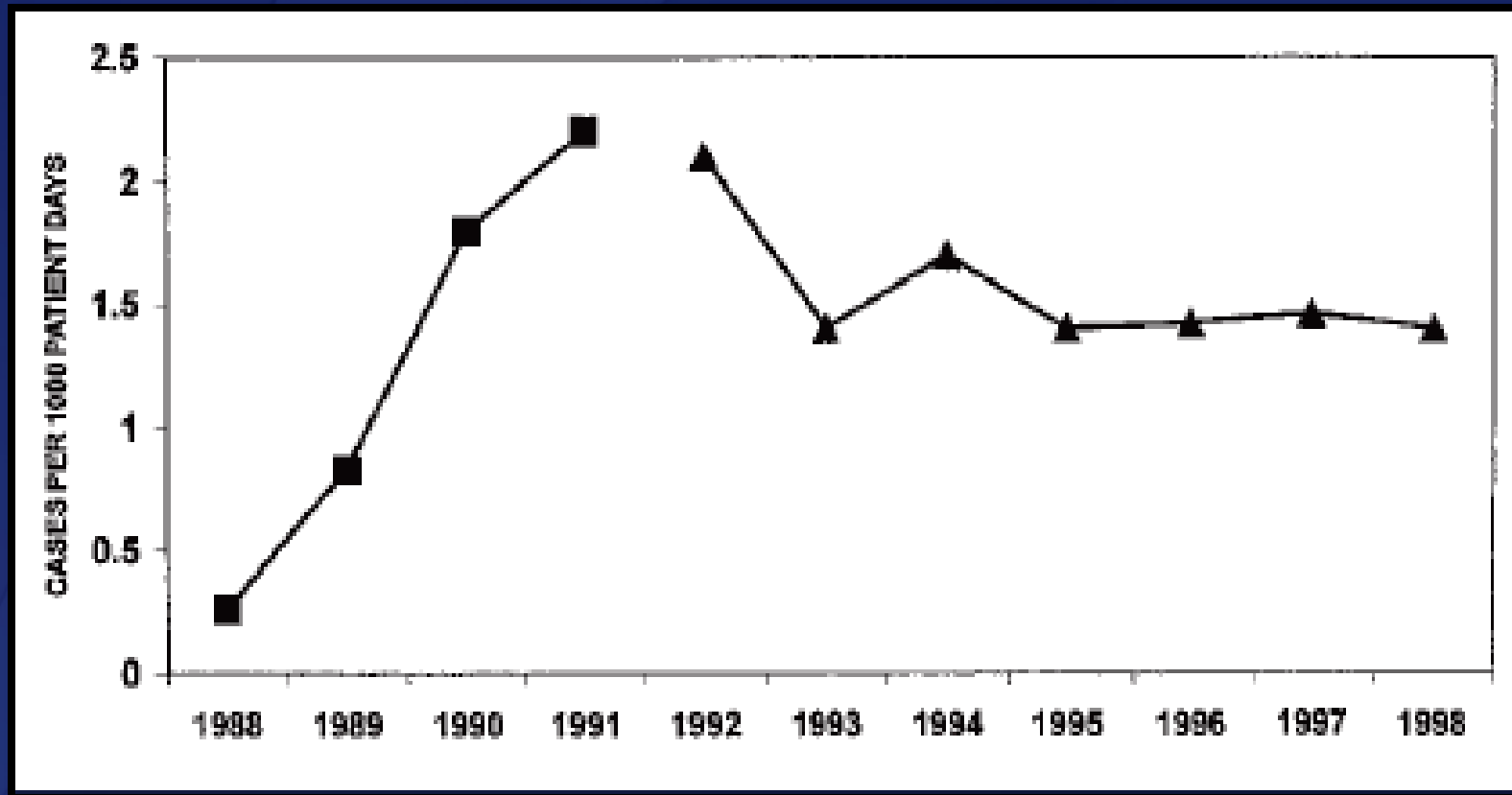


Targeted antibiotic consumption and nosocomial *C. difficile* disease

Tertiary care hospital; Quebec, 2003-2006



Impact of improving antibiotic use on rates of *C. difficile*



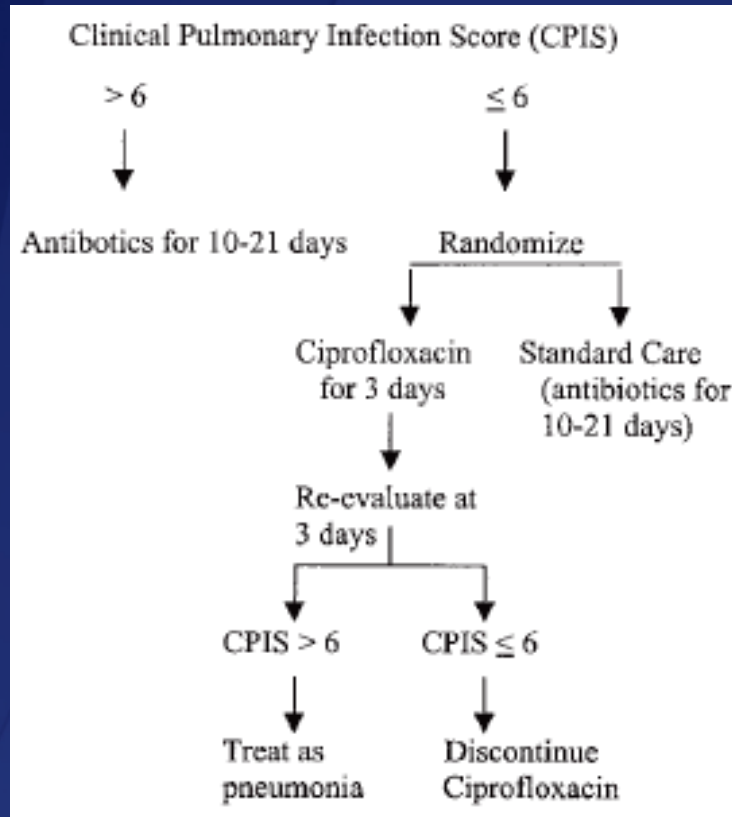
Carling P et al. *Infect Control Hosp Epidemiol.* 2003;24(9):699-706.



Improving antibiotic use reduces resistance



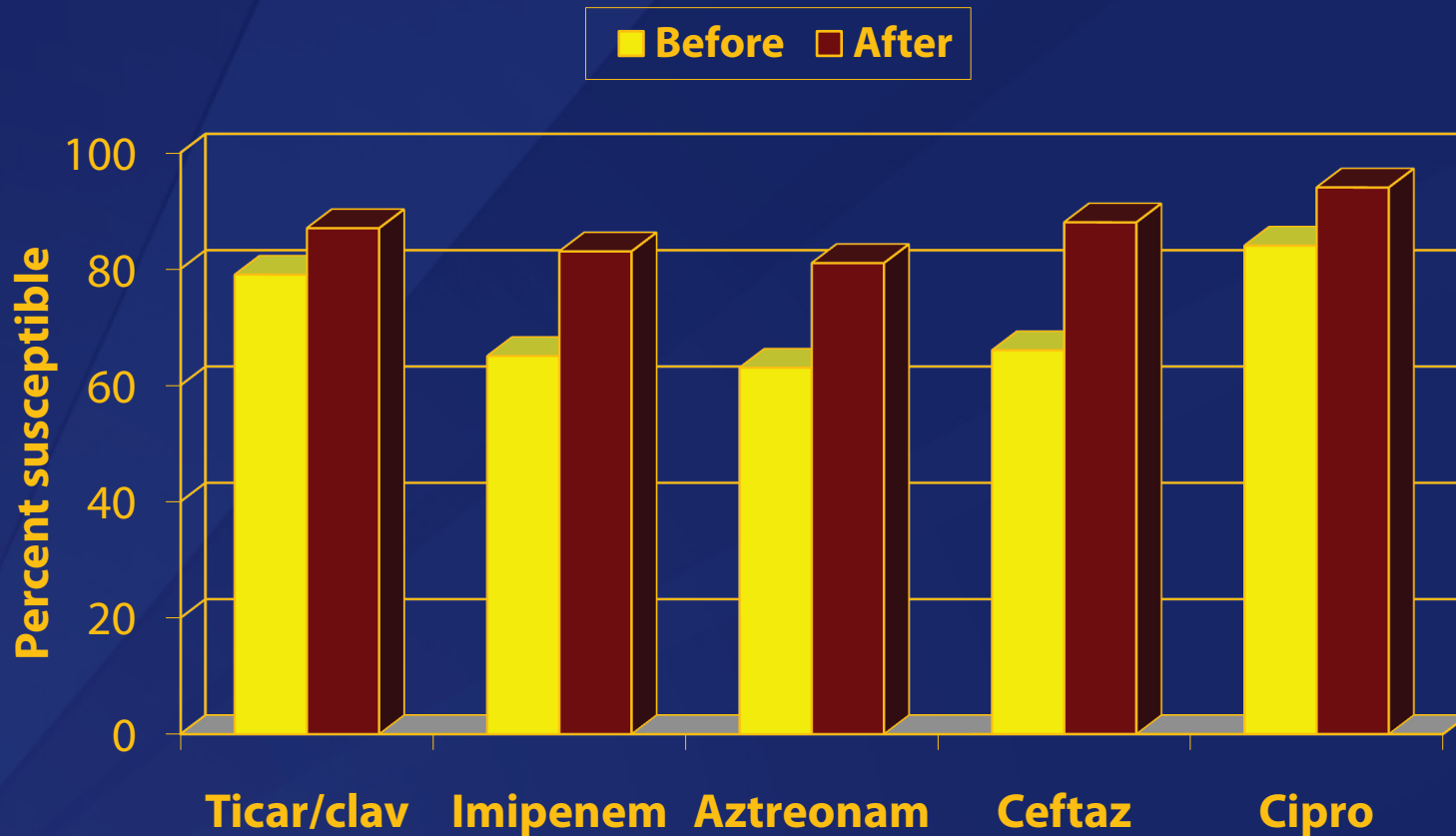
Stewardship optimizes patient safety: decreased patient-level resistance



	Cipro	Standard
Antibiotic duration	3 days	10 days
LOS ICU	9 days	15 days
Antibiotic resistance/ superinfection	14%	38%

Study terminated early because attending physicians began to treat standard care group with 3 days of therapy

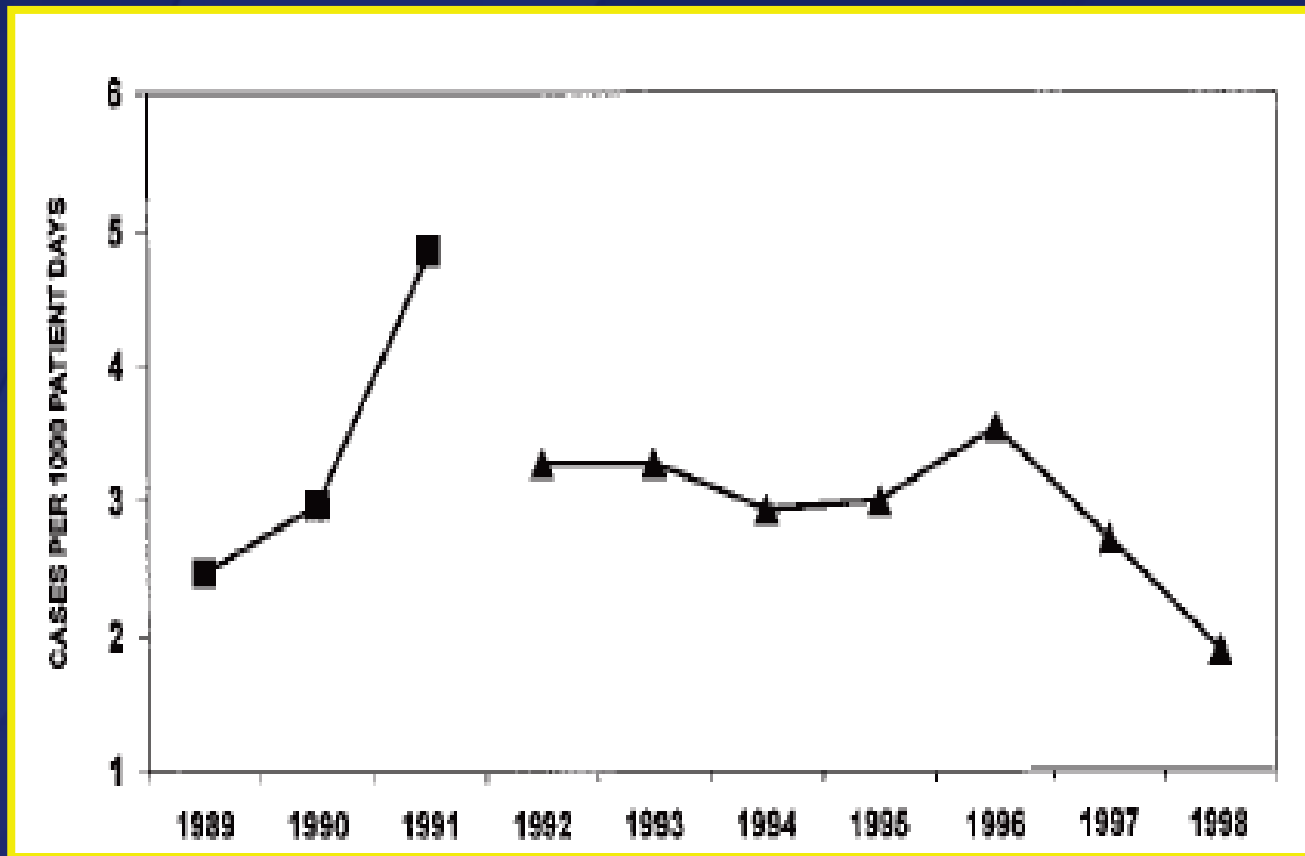
P. aeruginosa susceptibilities before and after implementation of antibiotic restrictions (CID 1997;25:230)



P < 0.01 for all increases



Impact of Improving Antibiotic Use on Rates of Resistant Enterobacteriaceae



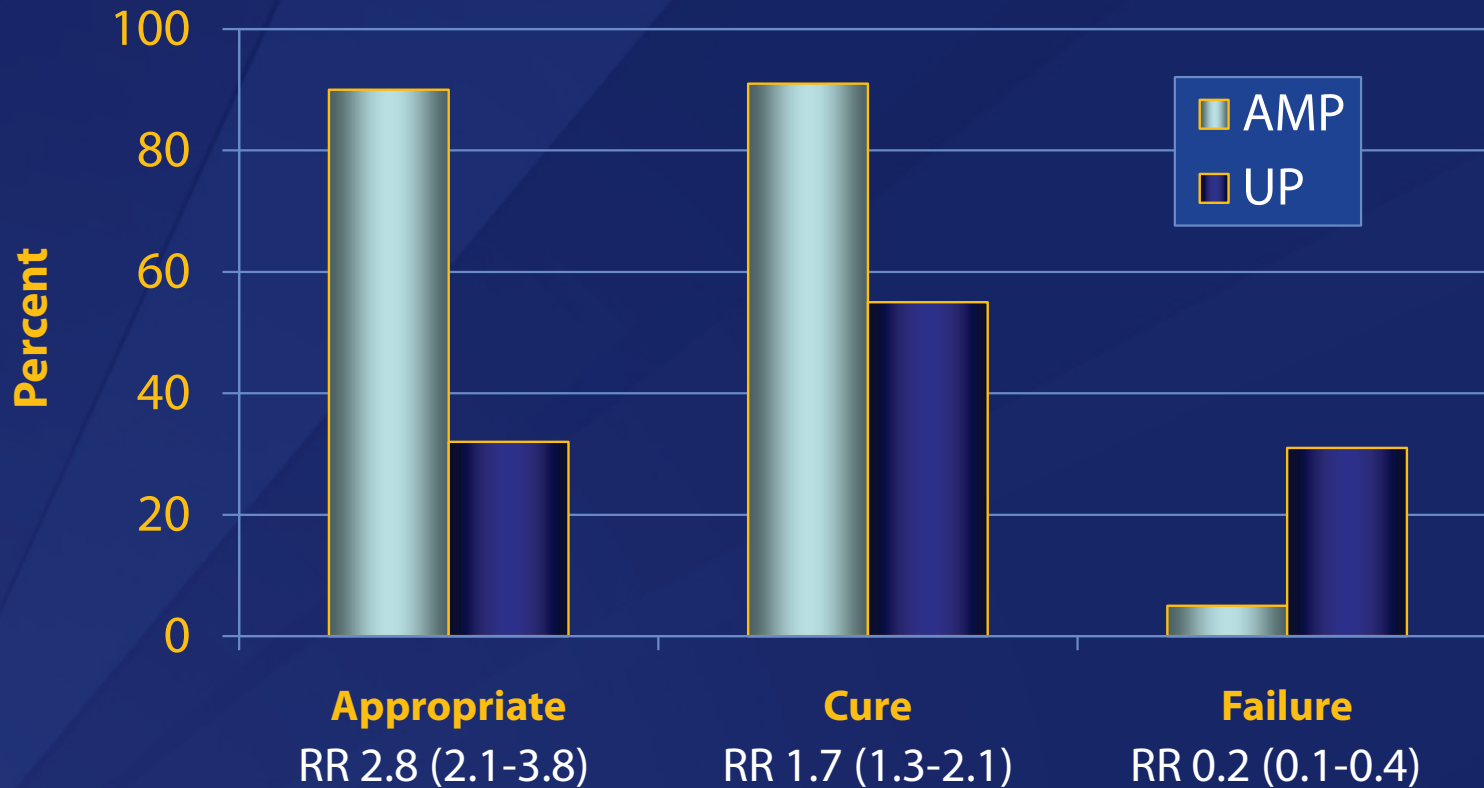
Carling P et al. *Infect Control Hosp Epidemiol.* 2003;24(9):699-706.



Improving antibiotic use improves infection cure rates



Clinical outcomes better with antimicrobial management program



Fishman N. *Am J Med.* 2006;119:S53.

AMP = Antibiotic Management Program
UP = Usual Practice

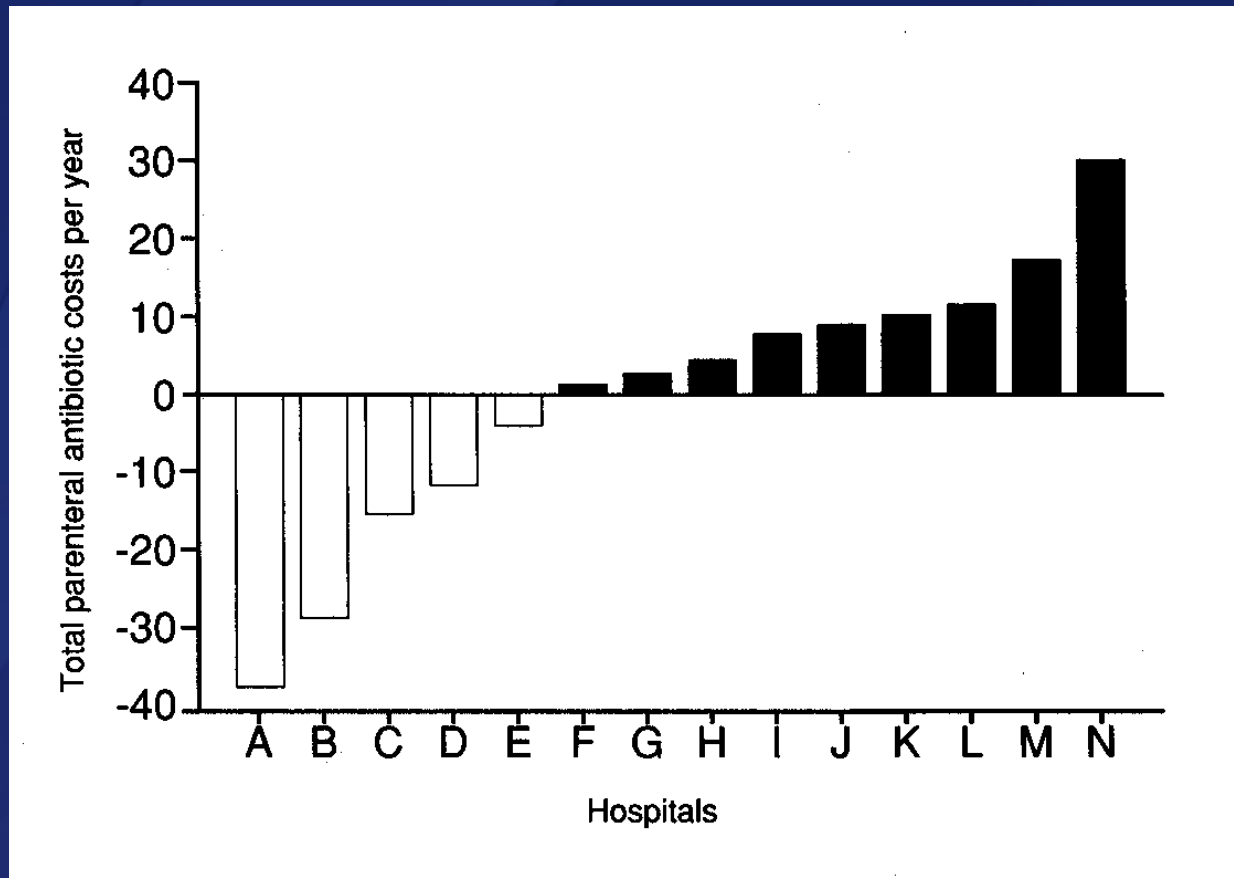


Improving antibiotic use saves money

- **“Comprehensive programs have consistently demonstrated a decrease in antimicrobial use with annual savings of \$200,000 - \$900,000”**
- **IDSA/SHEA Guidelines for Antimicrobial Stewardship Programs**
- **<http://www.journals.uchicago.edu/doi/pdf/10.1086/510393>**



Total costs of parenteral antibiotics at 14 hospitals



Improving antibiotic use is a public health imperative

- **Antibiotics are the only drug where use in one patient can impact the effectiveness in another.**
- **If everyone does not use antibiotics well, we will all suffer the consequences.**



Improving antibiotic use is a public health imperative

- **Antibiotics are a shared resource, (and becoming a scarce resource).**
- **Using antibiotics properly is analogous to developing and maintaining good roads.**



Improving antibiotic use is a public health imperative

- **Available data demonstrate that we are not doing a good job of using antibiotics in in-patient settings.**
 - Several studies show that a substantial percentage (up to 50%) of in-patient antibiotic use is either unnecessary or inappropriate.



Improving antibiotic use is a public health imperative

- **Bringing new antibiotics into our current environment is akin to buying a new car because you hit a pot hole, but doing nothing to fix the road.**
- **Fixing the “antibiotic use road” is part of the mission of public health.**



GET SMART



FOR HEALTHCARE

**Know
When
Antibiotics
Work**

FOR HEALTHCARE

MOCK

Get Smart for Healthcare

- **This program is a logical extension of CDC's "Get Smart: Know When Antibiotics Work" campaign, which is focused on improving antibiotic use in out-patient settings.**



Mission- Get Smart for Healthcare

- To optimize the use of antimicrobial agents in in-patient healthcare settings.



Goals- Get Smart for Healthcare

- **Improve patient safety through better treatment of infections.**
- **Reduce the emergence of anti-microbial resistant pathogens and *Clostridium difficile*.**
- **Heighten awareness of the challenges posed by antimicrobial resistance in healthcare and encourage better use of antimicrobials as one solution.**





For more information please contact Centers for Disease Control and Prevention

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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