Antibiotic Stewardship
Why We Must
How We Can

CAPT Arjun Srinivasan, MD
Associate Director for Healthcare Associated Infection Prevention Programs
Division of Healthcare Quality Promotion
beu8@cdc.gov

Nothing to Disclose

Why We Have to Improve Antibiotic Use

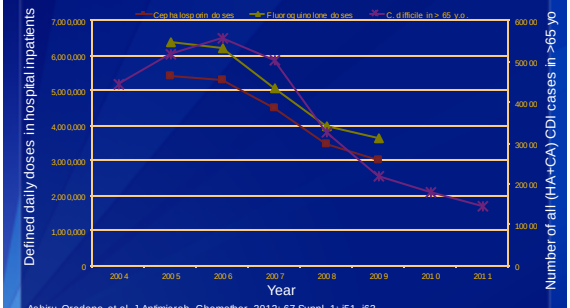
- Antibiotics are unlike any other drug, in that the use of the agent in one patient can compromise its efficacy in another.
- A lot of in-patient antibiotic prescriptions are unnecessary or sub-optimal.
- We are running out of antibiotics.
- We won't get new ones soon.
- Improving antibiotic has many benefits for patients and society.

Antibiotic Stewardship to Combat *C. difficile*

- 2014 meta-analysis on the impact of stewardship on *C. difficile* included 16 studies.
- Stewardship programs were significantly protective against *C. difficile*
  - Pooled risk ratio 0.48; 95% CI: 0.38, 0.62
- Restrictive interventions were most effective.
- Protection especially strong in geriatric settings.

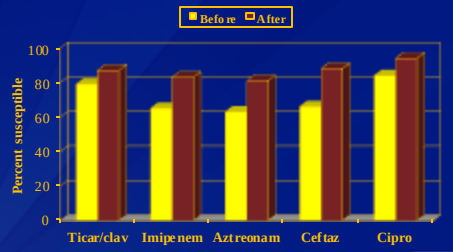
Feazel LM et al. J Antimicrob Chemother, March 2014

Impact of Reductions in Antibiotic Prescribing on *C. difficile* in England



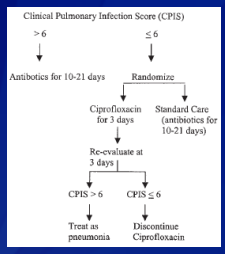
Ashiru-Oredope et al. J Antimicrob Chemother 2012; 67 Suppl 1: i51–i63
Wilcox MH et al. Clinical Infectious Diseases 2012;55(8):1056–63
http://www.hpa.org.uk/web/HPAweb &Page &HPAwebAutoListName/Page/1179745282388

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



P<0.01 for all increases

Stewardship optimizes patient safety: decreased patient-level resistance

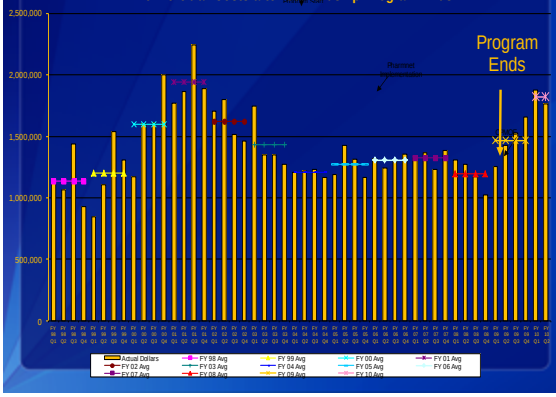


	Cipro	Standard
Antibiotic duration	3 days	10 days
LOS ICU	9 days	15 days
Antibiotic resistance/ superinfection	14%	38%

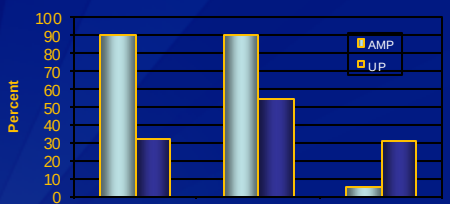
Study terminated early because attending physicians began to treat standard care group with 3 days of therapy

Singh N et al. *Am J Respir Crit Care Med*. 2000;162:505-11.

Antimicrobial Costs after Stewardship Program Ends



Clinical outcomes better with antimicrobial management program



RR 2.8 (2.1-3.8) RR 1.7 (1.3-2.1) RR 0.2 (0.1-0.4)

Fishman N. *Am J Med*. 2006;119:553.

AMP = Antibiotic Management Program
UP = Usual Practice

What is "Antibiotic Stewardship"

- Ensuring that every patient gets:
- An antibiotic only when one is needed
- The right agent
- At the right dose
- For the right duration

Goals of Stewardship

- The primary goal of antibiotic stewardship is improving patient safety.
- Reducing antibiotic use and saving money are NOT the primary goals of antibiotic stewardship.
- They simply happen to be desirable side effects.

Where Do We Want to Be?

- Every hospitalized patient gets optimal antibiotic treatment.
- Every hospital in America has an active antibiotic stewardship program to accomplish that goal.
- Every stewardship program uses proven best practices.

What Is The Current Status of Antibiotic Stewardship Programs?

- To get a better picture of stewardship programs, CDC added questions to the 2015 annual facility survey of the National Healthcare Safety Network (covers hospital activities in 2014).
- Questions based on items outlined in CDC "Core Elements for Hospital Antibiotic Stewardship Programs."

Core Elements for Antibiotic Stewardship Programs

- Leadership commitment from administration
- Single leader responsible for outcomes
- Single pharmacy leader
- Antibiotic use tracking
- Regular reporting on antibiotic use and resistance
- Educating providers on use and resistance
- Specific improvement interventions
- http://www.cdc.gov/getsmart/healthcare/implementation/core-elements.html

NHSN Annual Facility Survey- Antibiotic Stewardship

Element	N	%
Leadership	2508	59.9
Accountability	3016	72.1
Drug Expertise	3648	87.2
Act	3962	93.8
Track	3266	78.1
Report	2822	67.5
Educate	2589	61.9

Preliminary Information

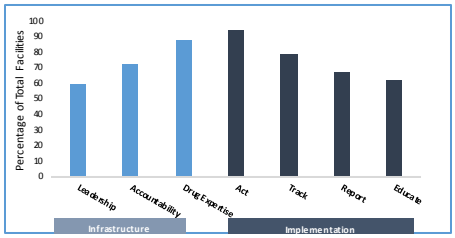
NHSN Annual Facility Survey- Antibiotic Stewardship

Count of Elements	N	%
0	107	2.6
1	169	4.0
2	288	6.9
3	349	8.3
4	403	9.6
5	465	11.1
6	775	18.5
7	1628	38.9

Preliminary Information

Percentage of Facilities Acute Care Hospitals Reporting Implementation of Core Elements of Hospital Antibiotic Stewardship Programs

Preliminary Results from 2014 NHSN Annual Facility Survey of Acute Care Facilities (N=4,184)



Some Interesting Findings

- Implementation of all elements by bed-size:
  - 0-50 beds: 22%
  - 51-200 beds: 39%
  - >201 beds: 56%
- Percent of hospitals with all elements based on salary support:
  - Hospitals with salary support: 76%
  - Hospitals without salary support: 27%

Preliminary Information

How Do We Get to 100%?

- Lessons learned from CLABSI prevention- what made that work?
- Well defined interventions with education on implementing them.
- A strong, national measurement system.
- A national emphasis on solving the problem- including national goals.
- New policies to spur action.
- Research

Turning This Into A National Program for Antibiotic Stewardship

- Education- on interventions and implementation
- Measurement
  - Total antibiotic use and appropriate use
  - Prevalence of stewardship programs
- National goals
- National policies
- Research to expand implementation and develop new interventions.

Education

Changing the Way We Think About Antibiotic Stewardship

- A lesson learned from experience with infection control.
- Infection prevention works best when it's viewed as everyone's responsibility with healthcare epidemiology and infection control as a resource to help.
- Stewardship should be the same- it's not something someone does "to you" or "for you."

Measuring In-patient Antibiotic Use- Current CDC Approach

- Broad (ideally national) assessments of aggregate use.
  - Emerging Infections Program point prevalence survey
  - Proprietary data from drug distributors.
- Facility specific assessments of antibiotic administration data
  - National Healthcare Safety Network Antibiotic Use option
- Detailed assessments of appropriate antibiotic use.
  - Emerging Infections Program antibiotic use assessment

National Healthcare Safety Network Antibiotic Use Option

- Captures electronic data on antibiotics administered, along with admission/discharge/transfer data.
- Calculates rates of administration for use:
  - By facilities to monitor interventions on single units or facility wide
  - To collect aggregate information on antibiotic use at a regional and national level
  - Eventually, to create antibiotic use benchmarks.

Example Use of Data for a Hospital (AU Analysis Output Options): Line List Rate Tables, by Location

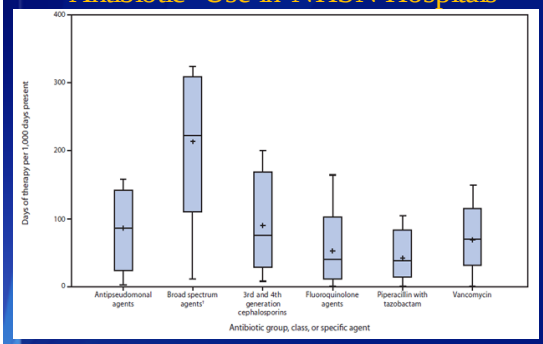
National Healthcare Safety Network
Rate Table - All Submitted AU Data - Antimicrobial Utilization Rates by Location
Rate per 1,000 Days Present
As of: February 3, 2012 at 3:52 PM
Date Range: All AU_RATESLOCATION

Org ID=10846 CDC Location=IN:ACUTE:CC:M Location=INMEDCC

Summary Yr/Mon	Antimicrobial Category	Antimicrobial Class	Antimicrobial Days	Days Present	Rate per 1000 Days Present
2011M01	Antibacterial	-- All --	90165	10000	9,016.500
2011M01	Antibacterial	Aminoglycosides	438	10000	43.800
2011M01	Antibacterial	Carbapenems	12	10000	1.200
2011M01	Antibacterial	Cephalosporins	57	10000	5.700
2011M01	Antibacterial	Fluoroquinolones	12	10000	1.200
2011M01	Antibacterial	Folate pathway inhibitors	6	10000	0.600

*Data is for example only

Antibiotic Use in NHSN Hospitals



MMWR March 7, 2014 / 63(09);194-200

An Update on the Antibiotic Use Option of NHSN

- 116 facilities have submitted at least 1 month of data
  - Facility types include general acute care facilities, Veterans Affairs hospitals, critical access hospitals, children's hospitals, and an oncology hospital
  - From 25 states: AZ, CA, CO, FL, IA, ID, IL, IN, KS, KY, MA, MI, MN, MO, NE, NM, NY, OH, OK, OR, RI, SD, TX, UT, WI
  - Using 4 vendors & 'homegrown' systems

Challenges With A Quality Measure on Antibiotic Use

- Will require good benchmarking to help facilities know if they are outliers.
- The goal is not 100% or zero.
- Being an "outlier" does not necessarily mean there is a problem.
  - The measure would suggest areas where further review is warranted.
- Always have to be alert for unintended consequences.

Standardized Antibiotic Administration Ratio (SAAR)

- CDC's 1st attempt at developing a quality improvement measure for antibiotic use.
- Similar in principle to the Standardized Infection Ration (SIR).
- SAAR expresses observed antibiotic use compared to predicted use.
- CDC worked with many partners to develop the SAAR measure to try and make it most useful for stewardship.

Standardized Antibiotic Administration Ratio (SAAR)

- Experts in stewardship suggested that a variety of different SAARs would be useful.
- SAARs for a variety of different patient populations.
- SAARs for a variety of different groups of antibiotics.

Standardized Antibiotic Administration Ratio (SAAR): Patient Location Groupings

- Adult:
  - Medical and Surgical ICUs
  - Medical and Surgical wards
  - All medical and surgical locations combined
- Pediatric
  - Medical and Surgical ICUs
  - Medical and Surgical wards
  - All medical and surgical locations combined

Standardized Antibiotic Administration Ratio (SAAR): Antibiotic Groupings

- Broad spectrum agents predominantly used for hospital-onset/multi-drug resistant bacteria.
- Broad spectrum agents predominantly used for community-acquired infection.
- Anti-MRSA agents.
- Agents predominantly used for surgical site infection prophylaxis.
- All antibacterial agents.

An Update on the Antibiotic Use Option of NHSN

- The Standardized Antibiotic Administration Ratio was approved for endorsement by the Patient Safety Committee of the National Quality Forum in June.
  - Requested approval was for public health surveillance and quality improvement only.
- Measure is now out for public comment before a vote of the full NQF membership in the fall.

Key Points About the SAAR

- The SAAR is risk adjusted based only on facility characteristics (e.g. presence of ICUs, hospital size).
- The SAAR only helps directs stewardship efforts to locations and antibiotics where use appears to deviate from expected.
  - High use might be perfectly justified, low use might be harming patients.

Next Steps for the SAAR

- Working with experts to examine the impact of adding patient level characteristics to the risk adjustment model (e.g. infectious disease diagnoses).
- Working with experts to develop tools to help stewardship programs explore abnormal SAARs and then take steps to improve antibiotic use (where indicated).

Assessment of Vancomycin Use in 36 Hospitals

Patients treated with intravenous vancomycin	**185**	—
No diagnostic culture obtained around antibiotic initiation, although standard practice with most infections	17	(9.2)
Diagnostic culture showed no Gram-positive bacterial growth, but patient still treated for long duration (>3 days) (excludes presumed SSTI, which often can be culture negative)	40	(21.6)
Diagnostic culture grew only oxacillin-susceptible *Staphylococcus aureus*, but patient still treated for long duration (>3 days) (likely missed opportunity to switch antibiotic based on culture result)	9	(4.9)
No. of patients with potential for improvement in prescribing	66	(35.7)

MMWR March 7, 2014 / 63(09);194-200

Key Moments for Antibiotic Stewardship

- Patients with *C. difficile*
- Patients with positive blood cultures
- Patients being given IV antibiotics at discharge
- Patients on unnecessarily duplicative therapy.
- Patients being treated for:
  - Community acquired pneumonia (CAP)
  - Urinary tract infection (UTI)
  - Skin and soft tissue infections
- Patients who have gotten 3 days of therapy.

Inappropriate Antibiotics in Patients with *C. difficile*

- Study of 141 patients who got antibiotics following a new C. difficile infection.
  - C difficile treatment guidelines urge providers to stop unnecessary antibiotics.
- Of 2147 total antibiotic days:
- 45% of the days included at least one unnecessary antibiotic
- 36% of the days included only unnecessary antibiotics.

Infect Control Hosp Epidemiol 2013;34:109

Patients With Positive Blood Cultures

- An excellent target for stewardship interventions
  - Easy to find
  - Not too many (hopefully)
- Ensures patients with serious infections get proper therapy.
- Can reduce treatment of blood culture contaminants.

"Kicking CAUTI"

- Quality improvement effort in two VA hospitals in Texas.
- Developed a simple algorithm to improve sending of urine cultures.
  - Defined specific criteria when urine cultures were indicated.
- ~70% drop in rate of sending urine cultures with similar drop in unnecessary treatment of asymptomatic bacteruria.

Traunter, B et al.

Stewardship After Day Three

- Audit and Feedback to Reduce Broad Spectrum Antibiotic Use in an ICU.
- Gave providers feedback on antibiotics on days 3 and 10 of antibiotics.
- Mean monthly antibiotic use decreased from 644 DOT/1000 pt days to 503 (P<0.001).
- *C. difficile* decreased (11 cases to 4)
- Meropenem susceptibility increased.

ICHE 2012;33:354

Take an "Antibiotic Time Out"

- Antibiotics are almost started with limited clinical information.
- We should have a deliberate "time out" to critically re-assess antibiotic therapy.
- Does the patient actually need antibiotics?
- What's the best antibiotic for the infection?
- How long do they need it for?

National Goals and Policies- In-patient

- Before September 18, 2014.
- No national in-patient stewardship goals or policies.
  - Stewardship questions included as "non-citation" questions on Center for Medicare Services (CMS) in-patient infection control worksheet.

Why Are National Goals and Policies Important?

- Strong stewardship programs are not universal and not a high priority in many facilities.
- Not too different from where infection control was in the past.
- Certainly not the case for infection control now.

What Made the Difference in Infection Control?

- Infection control is a Center for Medicare and Medicaid Services (CMS) "Condition of Participation" for acute care hospitals.
  - All hospitals must have an infection control program that meets CMS criteria in order to get paid by CMS.
- Created a requirement for infection control infrastructure, including trained staff, in all hospitals.

What Made the Difference in Infection Control?

- Prevention of healthcare associated infections was included in Value Based Purchasing requirements of the Affordable Care Act.
- Hospitals must publicly reported infection data to get full CMS payment.
- Over time, infection data will factor into hospital payments.
- "C-suites" are now very aware of and interested in preventing infections.

September 18, 2014

- White House announced a national effort to combat antibiotic resistance in bacteria.
- Three key items released on that day:
  - Report from the President's Council of Advisors on Science at Technology (PCAST)
  - National Strategy for Combatting Antibiotic Resistant Bacteria
  - Executive Order
- Stewardship prominent in all three.

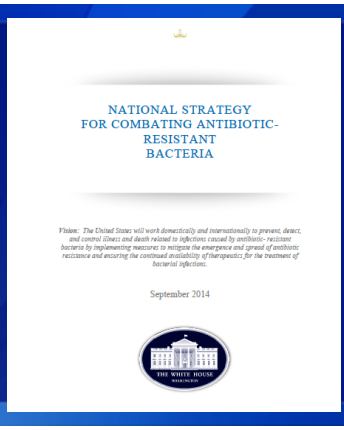

REPORT TO THE PRESIDENT ON
COMBATING ANTIBIOTIC RESISTANCE

Executive Office of the President
President's Council of Advisors on
Science and Technology

September 2014

PCAST Recommendations on Stewardship

- Improve capacity of state and local health departments to support stewardship programs.
- CMS should make antibiotic stewardship programs a Condition of Participation for hospitals and nursing homes.
- CMS should explore regulatory mechanisms for improving stewardship in other settings.
- CMS should add antibiotic use reporting to the Inpatient Quality Reporting Program.


NATIONAL STRATEGY
FOR COMBATING ANTIBIOTIC-
RESISTANT
BACTERIA

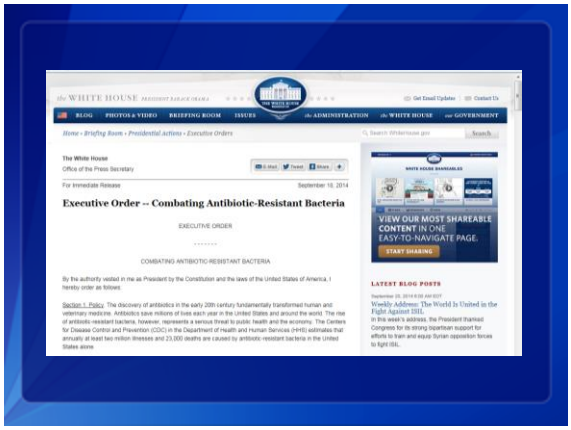
Vision: The United States will work domestically and internationally to prevent, detect, and control illness and death related to infections caused by antibiotic- resistant bacteria by implementing measures to mitigate the emergence and spread of antibiotic resistance and ensuring the continued availability of therapeutics for the treatment of bacterial infections.

September 2014

THE WHITE HOUSE
WASHINGTON

National Strategy for Combating Antibiotic Resistant Bacteria

- All states will implement stewardship activities in healthcare settings.
- All federal facilities will have robust stewardship programs.
- 95% of hospitals will report antibiotic use data to NHSN.
- Reduce inappropriate use for monitored conditions/agents by 20% in-patient and 50% outpatient.
- CDC and AHRQ will expand research.



Executive Order on Combating Antibiotic Resistant Bacteria

- HHS will propose regulations to ensure all inpatient settings have robust antibiotic stewardship programs.
- Explore ways to improve antibiotic use in other healthcare settings.
- All federal facilities will have robust stewardship programs by 2016.
- Government will monitor improvements in use through NHSN.

Call to Action for Human Health Stewardship

FORUM ON ANTIBIOTIC STEWARDSHIP

JUNE 2, 2015

White House Forum on Antibiotic Stewardship

- Brought together more than 100 leading organizations representing interests in both human and animal health.
- Human health partners included:
  - Healthcare facilities
  - Healthcare providers
  - Insurance providers
  - Consumer and patient advocates
  - Industry- pharmaceutical, diagnostic, information technology

White House Forum on Antibiotic Stewardship

- All organizations were asked what they were currently doing and planned to do to improve antibiotic use.
- Discussions revolved around how the groups could better work together to improve antibiotic use.

An Update on Conditions of Participation for Stewardship

- CMS posted proposed revisions to the long term care Conditions of Participation in July which included new proposed requirements for antibiotic stewardship in long term care.

Antibiotic Stewardship and Infection Control

- Are logical partners and already closely linked in most hospitals.
- We need to advance this partnership.
- APIC and SHEA have identified several key opportunities for collaboration.

Opportunities for Partnership

- Identifying MDROs and monitoring trends.
- Supporting efforts to prevent the spread of MDROs and C. difficile (hand hygiene).
- Analyzing and reporting surveillance data.
- Education
- Developing treatment algorithms and other protocols to improve antibiotic use.

But How? And Is That All?

- I think there's more we can do to enhance the partnership between infection control and antibiotic stewardship.
- We need to work to develop more concrete actions and ones that are strongly synergistic.

Conclusions

- This is an unprecedented time for antibiotic stewardship.
- There is now a national strategy for advancing stewardship as a key part of combating resistance.
- Now comes the hard part of putting reports and strategies into action.
- We want to partner with you- tell me how!