The Importance of Implementing Antimicrobial Stewardship Programs

Presenter:
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With Added Qualifications in Infectious Diseases
National Clinical Pharmacist Specialist – Infectious Diseases

Objectives

- Use current recommendations for eradicating the correlation between antimicrobial misuse and the emergence of antimicrobial resistant pathogens
- Incorporate information from the current antimicrobial stewardship programs to national practice
- Understand current and upcoming antimicrobial stewardship program requirements

WHY DO WE NEED ANTIMICROBIAL STEWARDSHIP?

Antimicrobial Resistance

- June 26, 1945 – "…the microbes are educated to resist penicillin and a host of penicillin-fast organisms is bread out….In such cases the thoughtless person playing with penicillin is morally responsible for the death of the man who finally succumbs to infection with the penicillin-resistant organisms. I hope this evil can be averted."
  - Sir Alexander Fleming

New York Times, June 26, 1945: 21

Antimicrobial Resistance (cont.)

- ESKAPE (*E. faecium, S. aureus, K. pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, Enterobacter sp*.)
- MRSA/VISA aka GISA, hVISA, VRSA
- VRE
- Multidrug-resistant *S. pneumoniae*
- XDR-TB – resistant to INH & RIF + FQ & at least 1 of 3 second line drugs (capreomycin, kanamycin, or amikacin)

Antimicrobial Resistance (cont.)

- MRSA
- hVISA
  - MIC 2-4 mcg/mL
  - Questionable use of Vancomycin in MIC ≥2
  - Winnebago has increasing numbers of hVISA (89%)
- VISA aka GISA
  - MIC 8-16 mcg/mL (some consider 4-8 mcg/mL)
- VRSA
  - >16 mcg/mL (some suggest >32 mcg/mL)

Ref: http://cooper.imb.uq.edu.au/community_background.html

Antimicrobial Resistance (cont.)

- Extended-spectrum β-lactamase-producing and carbapenemase-producing Enterobacteriaceae
- Carbapenem Resistant Enterobacteriaceae (CRE)
  - New Delhi metallo-β-lactamase (NDM)
  - Verona intergron-encoded metallo-β-lactamase (VIM)
  - Imipenemase (IMP) metallo-β-lactamase
- *Clostridum difficile* NAP1 strain (resistant to fluoroquinolones – noted to produce several-fold more toxin in vitro)

Warny et al., Lancet 2005; 366:1079-84
Gupta, N. et al. Clin Infect Dis 2011; 53(1):60-67.

Pan-Resistant *K. pneumoniae*

- New York City Isolates reported in CID in 2009
- Two pan-resistant *K. pneumoniae*
  - Patient 1 - asymptomatic bacteruria
  - Patient 2 - died

Table 1. Antimicrobial susceptibility patterns for *Klebsiella pneumoniae* isolates.

Antimicrobial	MIC value, μg/mL	
	Patient 1: urine specimen	Patient 2: blood specimen
Amikacin	≥64	≥64
Ampicillin	≥32	≥32
Aztreonam	≥64	≥64
Cefazolin	>64	>64
Cefepime	32	≥16
Ceftriaxone	>64	>64
Ciprofloxacin	≥4	≥4
Gentamicin	≥16	≥16
Piperacillin-tazobactam	≥128	≥128
Tobramycin	≥16	≥16
Trimethoprim-sulfa	≥320	≥320
Nitrofurantoin	256	NA
Ertapenem	>8	>8
Imipenem	>16	>R[a]
Moxifloxacin	NA	>R[a]
Tigecycline	≥8	≥8
Polymyxin B[b]	4	≥16

NOTE. All susceptibility testing, except for polymyxin B, was done using the Vitek 2 automated system (bioMerieux). MIC, minimum inhibitory concentration; NA, not available.

[a] Antimicrobial agents indicated with "R" instead of an MIC value were read as susceptible by the automated system, but findings were modified on the basis of polymerase chain reaction testing results indicating the presence of *K. pneumoniae* carbapenemase genes.

[b] Tested using Etest.

Elemam A, et al. Clin Infect Dis 2009; 49:271-4.

Winnebago Service Unit
CRE Isolate

- 50 y/o F
- Nursing home patient
- UCx
- Allergy to tetracyclines (doxycyline)
  - Asymptomatic bacteruria

1 Klebsiella pneumoniae

1 **K. pneumoniae**

Drug	MIC	Interps	Origin
Amox/K Clav	>16/8	R	
Amp/Sulbactam	>16/8	R	
Ampicillin	>16	R	
Aztreonam	>16	R	
Cefazolin	>16	R	
Cefepime	>16	R	
Cefotaxime	>32	R	
Cefoxitin	>16	R	
Ceftazidime	>16	R	
Ceftriaxone	>32	R	
Cefuroxime	>16	R	
Cephalothin	>16	R	
Ciprofloxacin	>2	R	
Ertapenem	>4	R	
Gentamicin	8	I	
Imipenem	>8	R	
Levofloxacin	>4	R	
Meropenem	>8	R	
Nitrofurantoin	>64	R	
Pip/Tazo	>64	R	
Tetracycline	<=4	S	
Tobramycin	>8	R	
Trimeth/Sulfa	>2/38	R	

Public Health Problem

- CDI associated with ABX use
- Can be spread via fomites
  - *to other patients not on ABX
- ***<u>Antimicrobials are the only medication that misuse affects multiple people</u>***

Public Health Problem (cont.)

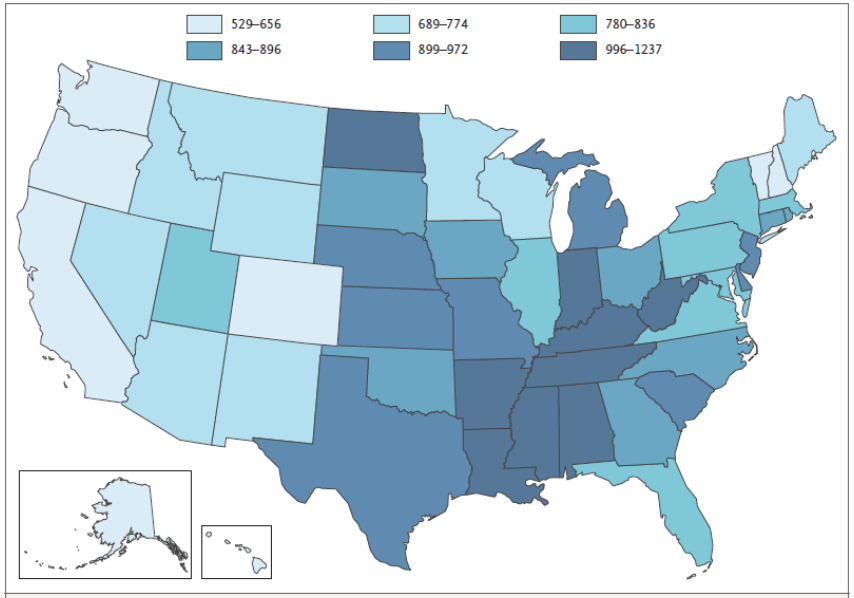


Figure 1. Antibiotic Prescriptions per 1000 Persons of All Ages According to State, 2010.

- 2010 – Health Care Providers Rx 258 million courses of ABX
- 833 Rx per 1000 persons

Hicks and Taylor. N Engl J Med, 2013; 368 (15):1461-2.

Public Health Problem (cont.)

- Decreasing development of new antimicrobials
  - Slow development due to difficult regulatory environment compared w/ more profitable markets
  - Predicted in 2004 w/ est. of IDSA's Antibiotic Availability Task force & the "Bad Bugs, No Drugs" document
  - CDC & European Medicines Agency noted that the last new class of drugs active against gram-negative bacilli was trimethoprim the1970's

Spellburg, et al, . Clin Infect Dis 2008; 46:155-64.
Tabot, et al, Clin Infect Dis 2006; 42:657-68.
ECDC/EMEA report,
Available at: http://www.ecdc.europa.eu/en/publications/Publications/Forms/ECDC_DispForm.aspx?ID=444.
Accessed 5 Apr 2012.

WHAT IS AN ANTIMICROBIAL STEWARDSHIP PROGRAM?

Antimicrobial Stewardship Program (ASP)

- Slow development of microorganism resistance
- Optimize medication selection, dose, and duration
- Reduce adverse events
- Lower rates of morbidity/mortality
- Reduce hospital stay
- Drive down spending/cost

Septimus & Owens, Clinical Infectious Diseases 2011;53(S1):S8-S14.

ASP Key Players

- Physician
  - Best – Infectious Diseases Specialist
  - Physician interested in I.D.
- Pharmacist
  - Best – I.D. training
  - Pharmacist interested in I.D.
- Laboratory
  - Very helpful!
- Infection Control
  - Important to have involved with process
- I. T.
  - Order bundles, templates
- Administration
  - Need I say more?

ASP (cont.)

- Core strategies:
  - Prospective audit with direct intervention and feedback
  - Formulary restriction and preauthorization requirements

Rapp et al, . Available at: http://www.ashpadvantage.com/docs/stewardship-white-paper.pdf. Accessed: 5 April 2012.

ASP (cont.)

- Supplemental Elements:
  - Education
  - Evidence-based guidelines and clinical pathways
  - Antimicrobial order forms
  - Streamlining or de-escalation of therapy
  - Dose optimization
  - Parenteral to oral conversion
- Computer programs are available to help monitor
- Antimicrobial conservation
  - Shortening treatment length (CAP, UTI)

Rapp et al, . Available at: http://www.ashpadvantage.com/docs/stewardship-white-paper.pdf. Accessed: 5 April 2012.
MacDougall & Polk, Clinical Microbiology Review. 2005;18:638-656.

HOW CAN ANTIMICROBIAL STEWARDSHIP BE IMPLEMENTED?

Antimicrobial Stewardship Program (ASP) Implementation

- Find physician and pharmacist champions
- Be assessable for I.D. questions (I.D. Pharmacotherapy Consult)
- Monitoring cultures
  - Able to track trends
  - Notice microbes resistant to empiric choices
  - Uses local resistance patterns for ABX recommendations
- Performing in-services
  - Specific topics aimed at problem prescribing
  - Ex. Ceftriaxone use, Vancomycin use, SSTI, URTI

ASP Implementation (cont.)

- Create guidelines (Ex. Guidebook for Great Plains Area and Winnebago)
  - SSTI guidelines – includes Vancomycin dosing
  - Pneumonia bundle
- Create Annual Antibiograms
  - Helpful to monitor trends at local service unit
- Created ASP Report
  - Highlights trends to medical staff and administration
  - Includes analysis and recommendations
    - Ex: Sulfamethoxazole/Trimethoprim – not good for UTI at Winnebago

Use available resources

- IDSA: Infectious Disease Society of America
- CDC & Get Smart: Know When Antibiotics Work
- Morbidity and Mortality Weekly Report
- The Society for Healthcare Epidemiology of America (SHEA)
- Locally (at your site, local university, IHS)

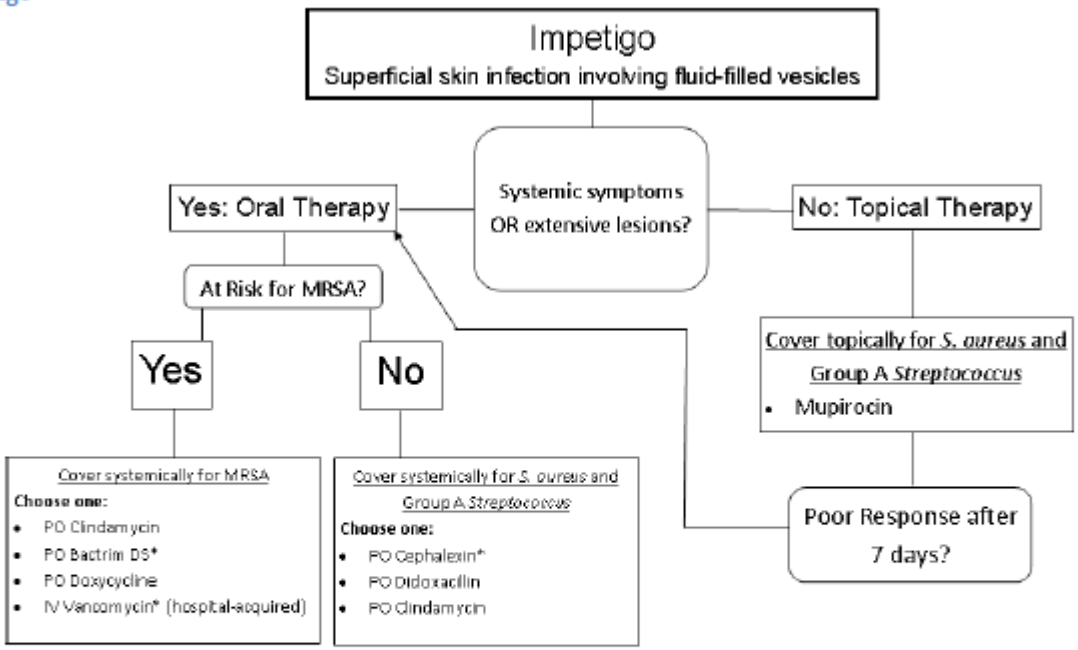
WHAT ARE SOME TOOLS?

Great Plains Area and Winnebago Service Unit Guidebook

- Describes ASP and rational
- Provides a quick reference for commonly seen infections
  - Guidelines for when to treat vs when not to treat
  - Antimicrobial recommendations for when treatment is necessary
- Guidelines are to help guide choices
  - Different regions have different resistance problems
  - Each Service Unit will need to tailor the antimicrobial recommendations

Guideline Examples:

Impetigo



* requires renal dosing

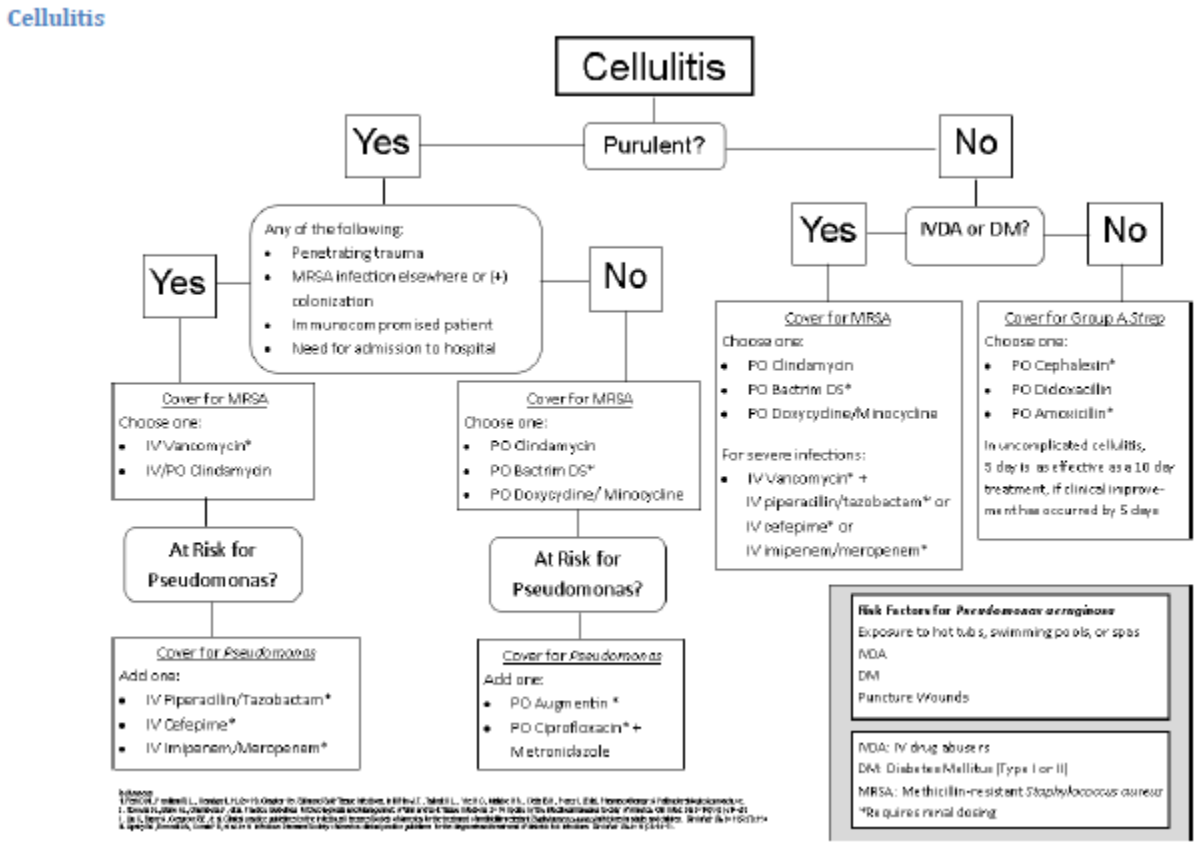
MRSA: Methicillin-resistant *Staphylococcus aureus*

Risk Factors:

IV drug abusers	(+) MRSA nasal swab
Children in daycare	Boil, abscess, or "spider bite"
Homeless	Athletically active adolescents
Jail Patients	Immunocompromised pts.

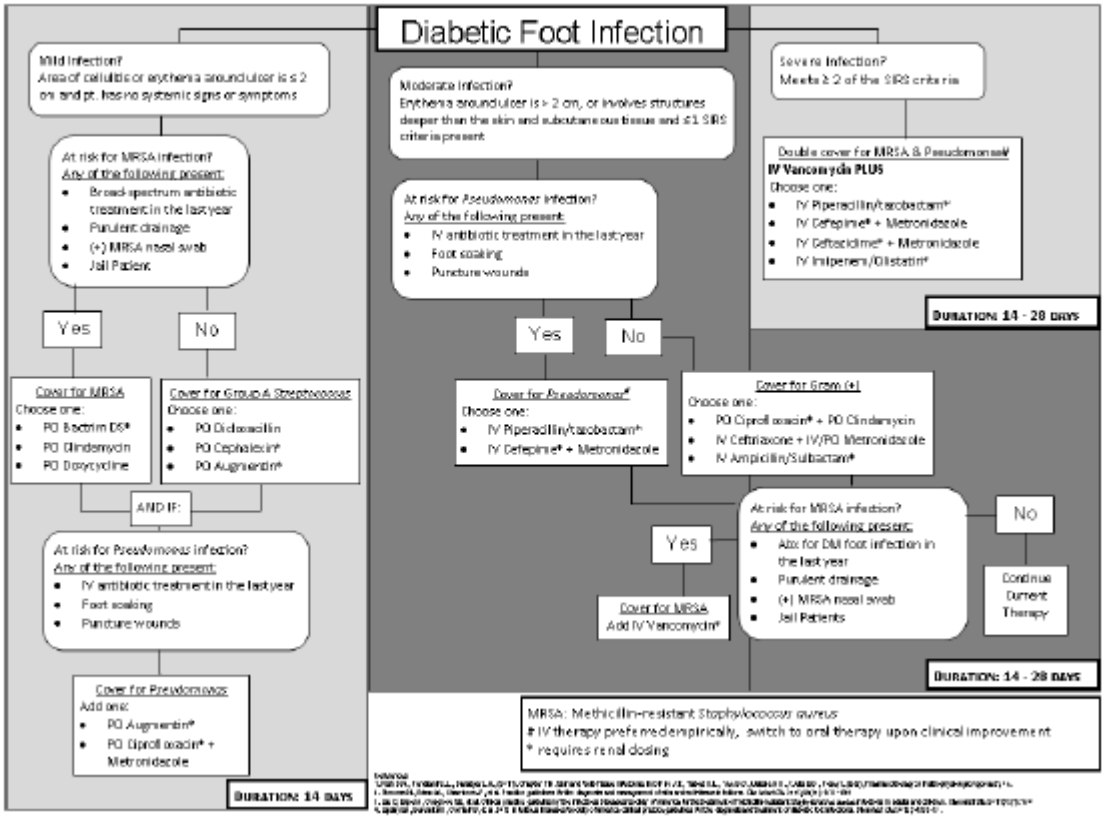
Antibiotic Dosing		
	Adult	Pediatric
Clindamycin	300–450 mg PO QID	20 mg/kg/d in 3 divided doses PO
Bactrim	1 double strength tablet PO BID	8–12 mg/kg (based on trimethoprim component)in either 4 divided doses IV or 2 divided doses PO
Doxycycline	100 mg PO BID	Not recommended for age <8 yd
Cephalexin	500 mg PO QID	25–50 mg/kg/d 4 divided doses po
Dicloxacillin	250 mg PO QID	N/A

Guideline Examples:

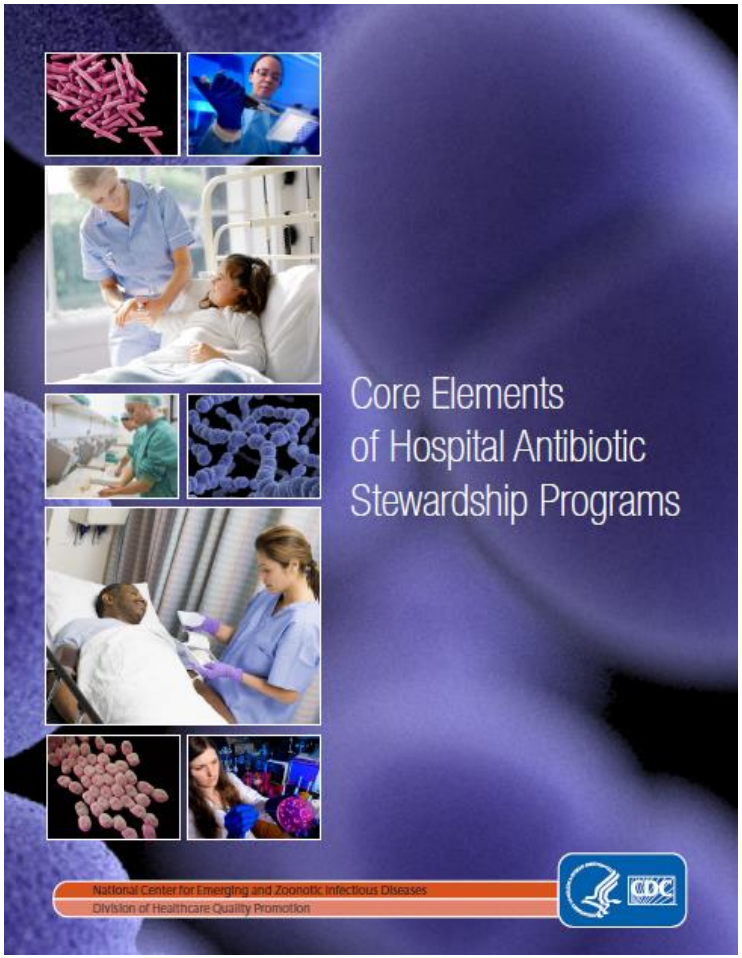


Guideline Examples:

Diabetic Foot Infection



CDC ASP Guidance



CDC ASP Guidance

Checklist for Core Elements of Hospital Antibiotic Stewardship Programs

The following checklist is a companion to *Core Elements of Hospital Antibiotic Stewardship Programs*. This checklist should be used to systematically assess key elements and actions to ensure optimal antibiotic prescribing and limit overuse and misuse of antibiotics in hospitals. CDC recommends that all hospitals implement an Antibiotic Stewardship Program.

Facilities using this checklist should involve one or more knowledgeable staff to determine if the following principles and actions to improve antibiotic use are in place. The elements in this checklist have been shown in previous studies to be helpful in improving antibiotic use though not all of the elements might be feasible in all hospitals.

LEADERSHIP SUPPORT	ESTABLISHED AT FACILITY
A. Does your facility have a formal, written statement of support from leadership that supports efforts to improve antibiotic use (antibiotic stewardship)?	❑ Yes ❑ No
B. Does your facility receive any budgeted financial support for antibiotic stewardship activities (e.g., support for salary, training, or IT support)?	❑ Yes ❑ No
ACCOUNTABILITY	
A. Is there a physician leader responsible for program outcomes of stewardship activities at your facility?	❑ Yes ❑ No
DRUG EXPERTISE	
A. Is there a pharmacist leader responsible for working to improve antibiotic use at your facility?	❑ Yes ❑ No
KEY SUPPORT FOR THE ANTIBIOTIC STEWARDSHIP PROGRAM ***Does any of the staff below work with the stewardship leaders to improve antibiotic use?***	
B. Clinicians	❑ Yes ❑ No
C. Infection Prevention and Healthcare Epidemiology	❑ Yes ❑ No
D. Quality Improvement	❑ Yes ❑ No
E. Microbiology (Laboratory)	❑ Yes ❑ No
F. Information Technology (IT)	❑ Yes ❑ No
G. Nursing	❑ Yes ❑ No

CDC ASP Guidance

ACTIONS TO SUPPORT OPTIMAL ANTIBIOTIC USE	
POLICIES	**POLICY ESTABLISHED**
A. Does your facility have a policy that requires prescribers to document in the medical record or during order entry a dose, duration, and indication for all antibiotic prescriptions?	❑ Yes ❑ No
B. Does your facility have facility-specific treatment recommendations, based on national guidelines and local susceptibility, to assist with antibiotic selection for common clinical conditions?	❑ Yes ❑ No
SPECIFIC INTERVENTIONS TO IMPROVE ANTIBIOTIC USE ***Are the following actions to improve antibiotic prescribing conducted in your facility?***	
BROAD INTERVENTIONS	**ACTION PERFORMED**
C. Is there a formal procedure for all clinicians to review the appropriateness of all antibiotics 48 hours after the initial orders (e.g. antibiotic time out)?	❑ Yes ❑ No
D. Do specified antibiotic agents need to be approved by a physician or pharmacist prior to dispensing (i.e., pre-authorization) at your facility?	❑ Yes ❑ No
E. Does a physician or pharmacist review courses of therapy for specified antibiotic agents (i.e., prospective audit with feedback) at your facility?	❑ Yes ❑ No
PHARMACY-DRIVEN INTERVENTIONS ***Are the following actions implemented in your facility?***	**ACTION PERFORMED**
F. Automatic changes from intravenous to oral antibiotic therapy in appropriate situations?	❑ Yes ❑ No
G. Dose adjustments in cases of organ dysfunction?	❑ Yes ❑ No
H. Dose optimization (pharmacokinetics/pharmacodynamics) to optimize the treatment of organisms with reduced susceptibility?	❑ Yes ❑ No
I. Automatic alerts in situations where therapy might be unnecessarily duplicative?	❑ Yes ❑ No
J. Time-sensitive automatic stop orders for specified antibiotic prescriptions?	❑ Yes ❑ No
DIAGNOSIS AND INFECTIONS SPECIFIC INTERVENTIONS ***Does your facility have specific interventions in place to ensure optimal use of antibiotics to treat the following common infections?***	**ACTION PERFORMED**
K. Community-acquired pneumonia	❑ Yes ❑ No
L. Urinary tract infection	❑ Yes ❑ No
M. Skin and soft tissue infections	❑ Yes ❑ No
N. Surgical prophylaxis	❑ Yes ❑ No
O. Empiric treatment of Methicillin-resistant Staphylococcus aureus (MRSA)	❑ Yes ❑ No

CDC ASP Guidance

A. Non-C. Difficile infection (CDI) antibiotics in new cases of CDI	❑ Yes ❑ No
B. Culture-proven invasive (e.g., blood stream) infections	❑ Yes ❑ No
TRACKING: MONITORING ANTIBIOTIC PRESCRIBING, USE, AND RESISTANCE	
PROCESS MEASURES	**MEASURE PERFORMED**
A. Does your stewardship program monitor adherence to a documentation policy (dose, duration, and indication)?	❑ Yes ❑ No
B. Does your stewardship program monitor adherence to facility-specific treatment recommendations?	❑ Yes ❑ No
C. Does your stewardship program monitor compliance with one of more of the specific interventions in place?	❑ Yes ❑ No
ANTIBIOTIC USE AND OUTCOME MEASURES	**MEASURE PERFORMED**
D. Does your facility track rates of C. difficile infection?	❑ Yes ❑ No
E. Does your facility produce an antibiogram (cumulative antibiotic susceptibility report?	❑ Yes ❑ No
Does your facility monitor antibiotic use (consumption) at the unit and/or facility wide level by one of the following metrics:	**MEASURE PERFORMED**
F. By counts of antibiotic(s) administered to patients per day (Days of Therapy; DOT)?	❑ Yes ❑ No
G. By number of grams of antibiotics used (Defined Daily Dose, DDD)?	❑ Yes ❑ No
H. By direct expenditure for antibiotics (purchasing costs)?	❑ Yes ❑ No
REPORTING INFORMATION TO STAFF ON IMPROVING ANTIBIOTIC USE AND RESISTANCE	
A. Does you stewardship program share facility-specific reports on antibiotic use with prescribers?	❑ Yes ❑ No
B. Has a current antibiogram been distributed to prescribers at your facility?	❑ Yes ❑ No
C. Do prescribers ever receive direct, personalized communication about how they can improve their antibiotic prescribing?	❑ Yes ❑ No
EDUCATION	
A. Does your stewardship program provide education to clinicians and other relevant staff on improving antibiotic prescribing?	❑ Yes ❑ No

VA Directive

Department of Veterans Affairs
Veterans Health Administration
Washington, DC 20420

VHA DIRECTIVE 1031
Transmittal Sheet
January 22, 2014

ANTIMICROBIAL STEWARDSHIP PROGRAMS (ASP)

1. REASON FOR ISSUE: This Veterans Health Administration (VHA) Directive establishes a policy for the implementation and maintenance of Antimicrobial Stewardship Programs (ASP) at all VA medical facilities.

2. SUMMARY OF CONTENTS: This is a new VHA Directive for VA medical facilities to implement or augment ASPs.

3. RELATED ISSUES: None.

4. FOLLOW-UP RESPONSIBILITY: The Office of Patient Care Services is responsible for the contents of this Directive. Questions relating to the clinical aspects of this Directive and to ASPs may be referred to Specialty Care Services (10P4E), National Infectious Diseases Service at 513-246-0270. Questions regarding the pharmacy aspects of this Directive may be referred to the Pharmacy and Benefits Management Service (10P4P) at 708-786-7862.

5. RESCISSIONS: None.

6. RECERTIFICATION: This VHA Directive is scheduled for recertification on or before the last working day of January 2019.

Robert A. Petzel, M.D.
Under Secretary for Health

DISTRIBUTION: E-mailed to the VHA Publications Distribution List on January 23, 2014.

Antibiogram Development

Arizona Department of Health Services Antibiogram Toolkit

Arizona Healthcare-Associated Infections (HAI) Program

Patient Outreach

You are Smart

You are careful about taking medicines — and giving medicines to children. But there is a problem. Many people take antibiotics when they do not need them. Antibiotics do not work for every illness.

BE SMART

Antibiotics Will Not Help a **Cold** or the **Flu**.

Lela had a cold two weeks ago. Lela's grandmother did the right things. She made sure the child received plenty of rest and fluids... Grandmother knew that giving the child antibiotics would not be smart.

What Is An Antibiotic?

An antibiotic is a medicine that destroys bacteria. Antibiotics have many different names such as amoxicillin and azithromycin.

For more information talk with your healthcare provider, call 1-800-CDC-INFO or go to

www.cdc.gov/getsmart

BE SMART

Antibiotics Will Not Help a **Cold** or the **Flu**.

EXECUTIVE ORDER 13676: COMBATING ANTIBIOTIC RESISTANT BACTERIA AND CMS (COP)

CMS Pilot Survey Questions

DEPARTMENT OF HEALTH & HUMAN SERVICES
Centers for Medicare & Medicaid Services
7500 Security Boulevard, Mail Stop C2-21-16
Baltimore, Maryland 21244-1850

Office of Clinical Standards & Quality/Survey & Certification Group

REF: S&C: 12-32-Hospital

DATE: **May 18, 2012**

TO: State Survey Agency Directors

FROM: Director
Survey & Certification Group

SUBJECT: Patient Safety Initiative Pilot Phase – Revised Draft Surveyor Worksheets

Memorandum Summary

- ***Patient Safety Initiative***: The Centers for Medicare & Medicaid Services (CMS) is testing three revised surveyor worksheets for assessing compliance with three hospital Conditions of Participation (CoPs): Quality Assessment and Performance Improvement (QAPI), Infection Control, and Discharge Planning. We are focusing on compliance with these CoPs as a means to reduce hospital-acquired conditions (HACs), including healthcare associated infections (HAIs), and preventable readmissions.

- ***Draft Worksheets Made Public:*** Via this memorandum we are making these revised draft worksheets publicly available. We emphasize there may be additional revisions based on information gathered during the pilot test phase, which will end sometime in FY 2013.

CMS Pilot Survey Questions

Section 1. C. Systems to prevent transmission of MDROs and promote antibiotic stewardship, Surveillance

Elements to be assessed		Manner of Assessment Code (check all that apply) & Surveyor Notes	
1. C.1 The hospital has policies and procedures to minimize the risk of transmission of multidrug-resistant organisms (MDROs) within the hospital (between or amongst patients and health care personnel).	☐ Yes ☐ No ☐ N/A	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	
No citation			
1. C.2 The primary interview participants can provide evidence that the hospital identifies patients with MDROs and has implemented policies and procedures aimed at preventing the development and transmission of MDROs.	☐ Yes ☐ No ☐ N/A	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	
No citation			
1. C.3.a Facility has a multidisciplinary process in place to review antimicrobial utilization, local susceptibility patterns, and antimicrobial agents in the formulary *and* there is evidence that the process is followed.	☐ Yes ☐ No ☐ N/A	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	

Interview = 1 Observation = 2 Infection Control Document Review = 3 Medical Record Review = 4 Other Document Review = 5

CMS Pilot Survey Questions

1. C.3.b Systems are in place to prompt clinicians to use appropriate antimicrobial agents (e.g., computerized physician order entry, comments in microbiology susceptibility reports, notifications from clinical pharmacist, formulary restrictions, evidenced based guidelines and recommendations).	☐ Yes ☐ No ☐ N/A	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	
1. C.3.c Antibiotic orders include an indication for use.	☐ Yes ☐ No ☐ N/A	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	
1. C.3.d There is a mechanism in place to prompt clinicians to review antibiotic courses of therapy after 72 hours of treatment.	☐ Yes ☐ No ☐ N/A	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	
1. C.3.e The facility has a system in place to identify patients currently receiving intravenous antibiotics who might be eligible to receive oral antibiotic treatment.	☐ Yes ☐ No ☐ N/A	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	

REPORT TO THE PRESIDENT ON COMBATING ANTIBIOTIC RESISTANCE

Executive Office of the President

President's Council of Advisors on

Science and Technology

September 2014

Recommendation to President's Council of Advisors on Science and Technology

Recommendation 6. Improving Stewardship of Existing Antibiotics in Health Care

(1) Centers for Medicare and Medicaid Services (CMS) should use reimbursement incentives to drive antibiotic stewardship.

(1) Stewardship programs in hospitals and long-term care facilities. By the end of 2017, CMS should have Federal regulations (Conditions of Participation) in place that will require U.S. hospitals, critical access hospitals, and long-term care and nursing home facilities to develop and implement robust antibiotic stewardship programs that adhere to best practices. Similar requirements should be phased in rapidly for other settings including long-term acute care hospitals, other post-acute facilities, ambulatory surgery centers, and dialysis centers.

Executive Order 13676

- National Action Plan for Combating Antibiotic-Resistant Bacteria was developed in response to Executive Order 13676 issued by President Barack Obama on September 18,2014

NATIONAL ACTION PLAN FOR COMBATING ANTIBIOTIC-RESISTANT BACTERIA

MARCH 2015

THE WHITE HOUSE
WASHINGTON

TABLE 2: GOALS AND OBJECTIVES: Combating Antibiotic-Resistant Bacteria	
GOAL 1: Slow the Emergence of Resistant Bacteria and Prevent the Spread of Resistant Infections	
Objectives	
1.1	Implement public health programs and reporting policies that advance antibiotic-resistance prevention and foster antibiotic stewardship in healthcare settings and the community.
1.2	Eliminate the use of medically-important antibiotics for growth promotion in food- producing animals and bring other agricultural uses of antibiotics, for treatment, control, and prevention of disease, under veterinary oversight.
1.3	Identify and implement measures to foster stewardship of antibiotics in animals.
GOAL 2 : Strengthen National One-Health Surveillance Efforts to Combat Resistance Objectives	
2.1	Create a regional public health laboratory network to strengthen national capacity to detect resistant bacterial strains and a specimen repository to facilitate development and evaluation of diagnostic tests and treatments.
2.2	Expand and strengthen the national infrastructure for public health surveillance and data reporting, and wprovide incentives for timely reporting of antibiotic-resistance and antibiotic use in all healthcare settings.
2.3	Develop, expand, and maintain capacity in State and Federal veterinary and food safety laboratories to conduct antibiotic susceptibility testing and characterize select zoonotic and animal pathogens.
2.4	Enhance monitoring of antibiotic-resistance patterns, as well as antibiotic sales, usage, and management practices, at multiple points in the production chain for food animals and retail meat.
GOAL 3: Advance Development and Use of Rapid and Innovative Diagnostic Tests for Identification and Characterization of Resistant Bacteria	
Objectives	
3.1	Develop and validate new diagnostics—including tests that rapidly distinguish between viral and bacterial pathogens and tests that detect antibiotic-resistance—that can be implemented easily in a wide range of settings.
3.2	Expand availability and use of diagnostics to improve treatment of antibiotic-resistant infections, enhance infection control, and facilitate outbreak detection and response in healthcare and community settings.
GOAL 4: Accelerate Research to Develop New Antibiotics, Other Therapeutics, Vaccines, and Diagnostics	
Objectives	
4.1	Conduct research to enhance understanding of environmental factors that facilitate the development of antibiotic-resistance and the spread of resistance genes that are common to animals and humans.
4.2	Increase research focused on understanding the nature of microbial communities, how antibiotics affect them, and how they can be harnessed to prevent disease.
4.3	Intensify research and development of new therapeutics and vaccines, first-in-class drugs, and new combination therapies for treatment of bacterial infections.
4.4	Develop non-traditional therapeutics and innovative strategies to minimize outbreaks caused by resistant bacteria in human and animal populations.
4.5	Expand ongoing efforts to provide key data and materials to support the development of promising antibacterial drug candidates.

- IHS will follow the National Action Plan for Combating Antimicrobial Resistant Bacteria
- Including reporting desired information to appropriate data repositories

TABLE 2: GOALS AND OBJECTIVES: Combating Antibiotic-Resistant Bacteria	
GOAL 5: Improve international collaboration and capacities for prevention, surveillance and antibiotic research and development	
Objectives	
Surveillance	
5.1	Promote laboratory capability to identify at least 3 of the 7 WHO priority antimicrobial resistant (AMR) pathogens[2] using standardized, reliable detection assays.
5.2	Collaborate with WHO, OIE, and other international efforts focused on the development of integrated, laboratory-based surveillance to detect and monitor antibiotic-resistance in relevant animal and human foodborne pathogens.
5.3	Develop a mechanism for international communication of critical events that may signify new resistance trends with global public and animal health implications.
5.4	Promote the generation and dissemination of information needed to effectively address antibiotic-resistance.
Research and Development	
5.5	Establish and promote international collaboration and public-private partnerships to incentivize development of new therapeutics to counter antibiotic-resistance including new, next- generation, and other alternatives to antibiotics, vaccines, and affordable, rapidly deployable, point-of-need diagnostics.
Prevention and Control	
5.6	Support countries to develop and implement national plans to combat antibiotic-resistance and strategies to enhance antimicrobial stewardship.
5.7	Partner with other nations to promote quality, safety, and efficacy of antibiotics and strengthen their pharmaceutical supply chains.
5.8	Coordinate regulatory approaches by collaborating with international organizations such as FAO and OIE to harmonize international data submission requirements and risk assessment.

[2] The WHO priority AMR pathogens are a subset of the pathogens identified as urgent and serious threats in Table 3.

TABLE 3: CDC's Antibiotic-Resistant Threats in the United States, 2013
URGENT Threat Level Pathogens (3)
Clostridium difficile
250,000 infections per year requiring hospitalization or affecting hospitalized patients.
14,000 deaths per year.
At least $1 Billion in excess medical costs per year.
C. difficile deaths increased 400% between 2000-2007 because of the emergence of a strain resistant to a common antibiotic class (fluoroquinolones).
Almost half of infections occur in people younger than 65, but more than 90% of deaths occur in people 65 and older.
Half of *C. difficile* infections first show symptoms in hospitalized or recently hospitalized patients, and half show symptoms in nursing home patients or in people recently cared for in doctors' offices and clinics who received antibiotics.
The majority (71%) of pediatric *Clostridium difficile* infections, which are bacterial infections that cause severe diarrhea and are potentially life-threatening, occur among children in the general community, 73% were found to have recently taken antibiotics prescribed in doctor's offices for other outpatient settings.[6]
Carbapenem-Resistant *Enterobacteriaceae**
Out of ~140,000 healthcare-associated *Enterobacteriaceae* infections per year, more than 9,000 are caused by CRE (7,900 *CR-Klebsiella spp*; 1,400 CR-E. coli.).
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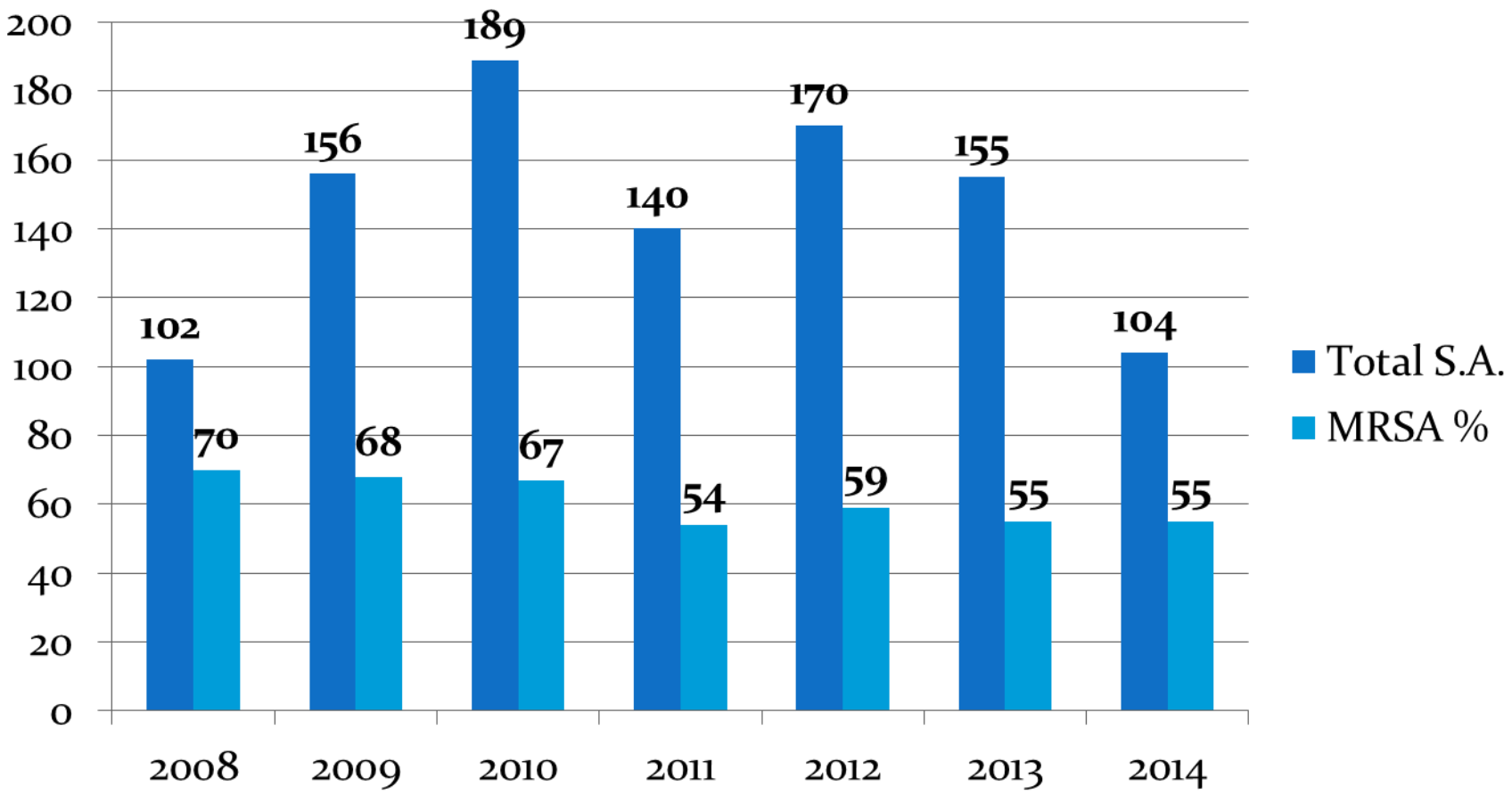
44 States have had at least one type of CRE confirmed by CDC testing.
CRE are resistant to nearly all antibiotics including carbapenems—the antibiotic of last resort.
***Neisseria gonorrhoeae** (Notifiable to CDC)**
Neisseria gonorrhoeae causes gonorrhea, is the second most common reportable infection in the United States, and is developing resistance to the cephalosporin antibiotics, the last line treatment option for this infection.
Of the 820,000 cases per year, 30% (246,000) now demonstrate resistance to at least one antibiotic.
If cephalosporin-resistant *N. gonorrhoeae* becomes widespread, the public health impact during a 10-year period is estimated to be 75,000 additional cases of pelvic inflammatory disease, 15,000 cases of epididymitis, and 222 additional HIV infections, with an estimated direct medical cost of at least $235 million.

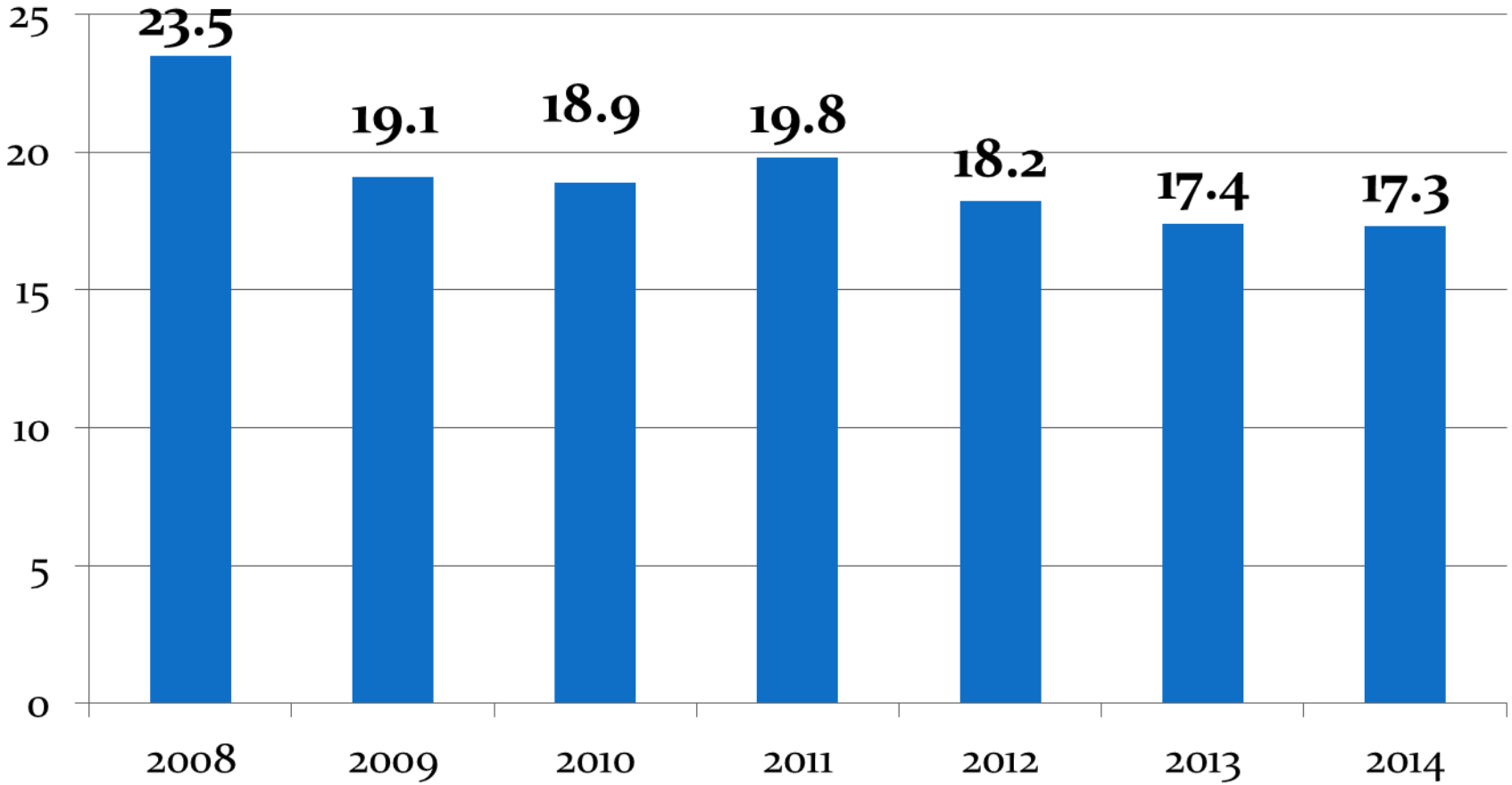
- All these pathogens have been found at IHS facilities

WINNEBAGO OUTCOMES AND GREAT PLAINS AREA INITIATIVES

Percent MRSA at Winnebago



Winnebago Percent of Patients Receiving Antimicrobials



Great Plains Area Initiatives

- Assigned 2 I.D. Pharmacists as Area consultants
- Backed by Area Governing Body, CMO, and CPO
- Each Service Unit has identified a physician and pharmacist champion
- Area-wide Guidelines have been developed and distributed
- Service Unit CMO's report ASP progress to Area CMO
- CDC has backed and is supporting program
- South Dakota Dept. of Health also active supporter

IHS-Wide Initiatives

- ASP Workgroup
- Provided recommendations for Indian Health Service ASP implementation
- Provided examples of guidelines
- Recommended development of IHS ASP group to help individual SU with questions
- Follow the National Action Plan for Combating Antimicrobial Resistant Bacteria

Questions?

It was on a short-cut through the hospital kitchens that Albert was first approached by a member of the Antibiotic Resistance.