The Role of the Epidemiologist in Healthcare Antimicrobial Stewardship

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Disclosures: None
Ask Yourself

"Are these antibiotics necessary?"
"What alternatives can we offer?"

Bacteria

Antibiotics do not kill viruses, they kill bacteria. When possible, get a culture to determine if antibiotics will be effective.

Conserve

Conserve the antibiotics we have by only prescribing when appropriate, and for the shortest duration possible. Consult your facility’s antibiogram for selection of appropriate antibiotics. Make sure your patients complete their course if you prescribe an antibiotic.

Don’t give in to pressure

Don’t let patients pressure you into prescribing unnecessary antibiotics. Do select the appropriate antibiotic, which could mean changing the medication based on the antibiogram.

Educate

Educate your patients on WHY antibiotics are not needed for:

- Colds or flu;
- Most coughs and bronchitis;
- Sore throats not caused by strep;
- Runny noses; or
- Most ear aches.

Using antibiotics the wrong way can cause bacteria to grow into superbugs. This could make your next infection much harder to treat.

Stop the Spread of Antibiotic Resistance with APIC.

Learn more: apic.org/IIPW

International Infection Prevention Week
October 15-21, 2017
U.S. Antibiotic Awareness Week is November 13-19, 2017. U.S. Antibiotic Awareness Week (formerly “Get Smart About Antibiotics Week”) is an annual one-week observance to raise awareness of the threat of antibiotic resistance and the importance of appropriate antibiotic prescribing and use. Oct 4, 2017

U.S. Antibiotic Awareness Week | CDC
https://www.cdc.gov/antibiotic-use/week/index.html

World Antibiotic Awareness Week, 13-19 November 2017

Learn how to handle antibiotics with care

7 November 2017 -- Are you organizing an event or activity this World Antibiotic Awareness Week? Let the world know by adding your event to our interactive platform and find out what is happening in your country or region. Play the interactive game and learn about antibiotic resistance and how to prevent it. Help spread awareness by sharing messages from FAO, OIE and WHO on social media.

Interactive game and platform
World Antibiotic Awareness Week 2017

This year’s theme: Seek advice from a qualified healthcare professional before taking antibiotics. Only take antibiotics after the prescription by a healthcare professional. Antibiotics are a precious resource, so it is important to get the right advice before taking them. This not only ensures you and your family get the best treatment, responsible use of antibiotics will also help reduce the threat of antibiotic resistance.

Infographics

You can reduce the risk of infection by:

- washing your hands properly
- covering your nose and mouth
- limiting close contact with others when you are sick
- disposing of used tissues
- eating and drinking for the right rises
- ensuring that water and food are safe

You can also reduce the spread of antibiotic resistance by:

- not using leftover antibiotics
- ensuring your vaccinations are up-to-date
- reporting drug resistance

Posters

Misuse of ANTIBIOTICS puts us all at risk.

Videos

The Bug Busters: Saving the Miracles of Modern Medicine, Short Version

World Antibiotic Awareness Week 2017, 13-19 November 2017
What Does An Epidemiologist Do?

Identify Relevant Sources, Collect by Appropriate Methods, Manage, Analyze, Interpret and Report DATA to Drive Efforts In Control and Prevention

- Populations (Groups) are focus rather than individuals
What Does An Antimicrobial Stewardship Epidemiologist Do?

Identify Relevant Sources, Collect by Appropriate Methods, Manage, Analyze, Interpret and Report DATA to Drive EFFORTS IN Healthcare Antimicrobial Stewardship (HAS)

- Populations (Groups) are focus rather than individuals
Hospital collects, analyzes, and reports data on its HAS program
  - Feedback on resistance patterns
  - Strategies to counter resistance

The hospital takes action on improvement opportunities identified in the HAS program
ANTIMICROBIAL STEWARDSHIP AND OTHER HEALTHCARE EPI OVERLAP

- Safety
  - Infection Control
  - Employee (“Occupational”) Health, Personnel Safety
  - Antimicrobial Stewardship

- Quality Improvement/Promotion
  - Antimicrobial Stewardship

- Value
  - Technology Assessment, Product Evaluation, Resource Utilization
  - Drug and Instrument Management
The primary goal of antimicrobial stewardship is to optimize clinical outcomes while minimizing unintended consequences of antimicrobial use, including toxicity, the selection of pathogenic organisms (such as Clostridium difficile), and the emergence of resistance. Thus, the appropriate use of antimicrobials is an essential part of patient safety.
FOCUS OF PRACTICAL EPIDEMIOLOGY

Question 1 – What Should Be Done?
Collect analyze, interpret, and report population-based DATA to inform plans for treatment, control and prevention (BUT other team members involved in developing and implementing plan)

Question 2 – Is Plan Being Implemented?
Collect, analyze, interpret, and report population-based DATA on process measures to evaluate implementation of plan elements (BUT other team members involved in interpreting data and further action)

Question 3 – Is Plan Working?
Collect, analyze, interpret, and report population-based DATA on outcome measures to evaluate effectiveness of the plan (BUT other team members involved in using data and further action)
These data lead back to Question 1 – “continuous loop”
FOCUS ON TEAM

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TJC Standards on Healthcare
Antimicrobial Stewardship

- Antimicrobial stewardship multidisciplinary team that includes pharmacist(s), infection preventionist(s), practitioner(s), an infectious diseases physician
The Epidemiologist As A Team Member

**Epidemiologist**

Q1 What Should Be Done?
- Provides DATA on Occurrence, Trends, Risk Determinants, Etc.

Q2 Is It Being Done?
- Provides DATA on PROCESS Measures

Q3 Is It Working?
- Provides DATA on OUTCOME Measures

**Team**

- Decides on Appropriate Actions

RETURN TO Q1
1. Providing DATA to Better Define Problems

❖ For Team

❖ For Public Education

The Epidemiologist as a Team Member - QUESTION 1

**Epidemiologist**

**Q1 What Should Be Done?**

1. Provides Descriptive DATA (Occurrence, Trends, Etc.)
2. Provides DATA on Risk Determinants/Drivers
3. Provides DATA on Special Populations and Settings of Increased Risk

**Team**

1. Decides on Appropriate Actions
2. Defines Indicators for Monitoring Implementation for Question 2
CDC's National Healthcare Safety Network is the nation's most widely used healthcare-associated infection tracking system. NHSN provides facilities, states, regions, and the nation with data needed to identify problem areas, measure progress of prevention efforts, and ultimately eliminate healthcare-associated infections.

In addition, NHSN allows healthcare facilities to track blood safety errors and important healthcare process measures such as healthcare personnel influenza vaccine status and infection control adherence rates.
Management of Adults With Hospital-acquired and Ventilator-associated Pneumonia: 2016 Clinical Practice Guidelines by the Infectious Diseases Society of America and the American Thoracic Society

SOME CURRENT ROLES FOR THE EPIDEMIOLOGIST IN HAS

1. Providing DATA to Better Define Problems
   - For Team
   - For Public Education
A return to the pre-antimicrobial era?
The effects of antimicrobial resistance will be felt most acutely in lower-income countries

Baker S. Science 2015; 347: 1064-1066

Outbreak of Colistin-Resistant, Carbapenemase-Producing Klebsiella pneumoniae: Are We at the End of the Road?

Van Duin D, Doi Y. J Clin Microbiol 2015; 53: 3116-3117

A Scary New Superbug Gene Has Reached at Least 19 Countries

Bacteria that resist last-resort drugs were identified two months ago in China. Now scientists are finding them all over.


Jan 22, 2016
In the last several years, the frequency and spectrum of antimicrobial-resistant infections have increased in both the hospital and the community. Certain infections that are essentially untreated have begun to occur as epidemics both in the developing world and in institutional settings in the United States. The increasing frequency of drug resistance has been attributed to combinations of microbial characteristics, selective pressures of antimicrobial use, and societal and technologic changes that enhance the transmission of drug-resistant organisms. Antimicrobial resistance is resulting in increased morbidity, mortality, and health-care costs. Prevention and control of these infections will require new antimicrobial agents, prudent use of existing agents, new vaccines, and enhanced public health efforts to reduce transmission.
POST ANTIBIOTIC ERA
1947

“It is for its power over grave Staphylococcal infections that we always have had most reason to be grateful for the discovery of penicillin, and that power is already on the wane.”

“Polymixin finds its clearest indication in serious infections due to *Ps. pyocyaneae*, an organism which is apt to be resistant to all other drugs whatsoever.”

POST-ANTIMICROBIAL ERA – PUBLIC PERCEPTION?

1. Antibiotic Era = All bacterial infections treatable, so Post-Antimicrobial Era = No bacterial infections treatable.
POST-ANTIBIOTIC ERA - REALISTIC DEFINITION FROM DATA

2. Antibiotic Era = All bacterial infections treatable, so Post-Antibiotic Era = SOME bacterial infections not treatable
The CTEI (Can’t Treat Every Infection) ERA
2. Providing DATA on Risk Determinants/Drivers of Antimicrobial Resistance and its Consequences – Adjusting for Influential Variables
Emergence of Antibiotic Resistance in Hospitals, 1935-1975

• “The dominant factor in the emergence and spread of antibiotic-resistant bacterial pathogens, whether in hospital wards or in the community, is clearly the intensive use of the antibiotic agents to which resistance emerges and then spreads.”

Finland M. Rev Infect Dis 1979; 1: 4-21
“... although the link between human antimicrobial use and resistance seems clear cut, this association is complex. Confounding factors mean a uniform approach to understanding resistance cannot be taken. “These factors include pathogen–drug interactions, pathogen-host interactions, mutation rates of the pathogen, emergence of successful antimicrobial resistant clones, the transmission rates of pathogens between human beings, animals, and the environment, cross-resistance, and selection of co-resistance to unrelated drugs.”
Adjustment for Case Mix for Benchmarking

Prevention Status Report | 2013

Healthcare-Associated Infections

Georgia

Central line-associated bloodstream infection—standardized infection ratio

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<th>Year</th>
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<th>GA</th>
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<td>2011</td>
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What is a standardized infection ratio (SIR)?

The SIR is a summary measure used to track HAIs over time. It adjusts for the fact that each healthcare facility treats different types of patients. The SIR compares the number of infections reported to the National Healthcare Safety Network in 2011 to the number of infections that would be predicted based on national, historical baseline data:

\[
SIR = \frac{\text{Observed # of HAIs}}{\text{Predicted # of HAIs}}
\]

http://www.cdc.gov/stltpublichealth/psr/hai/index.html
accessed Jan 27, 2015
1. Antimicrobial Use (AU) Option

Introduction: Rates of resistance to antimicrobial agents continue to increase at hospitals in the United States. The two main reasons for this increase are patient-to-patient transmission of resistant organisms and selection of resistant organisms because of antimicrobial exposure. Previous studies have shown that feedback of reliable reports of rates of antimicrobial use and resistance to clinicians can improve the appropriateness of antimicrobial usage.

Objectives: The primary objective of the Antimicrobial Use (AU) Option is to facilitate risk-adjusted inter- and intra-facility benchmarking of antimicrobial usage. A secondary objective is to evaluate trends of antimicrobial usage over time at the facility and national levels.

SOME CURRENT ROLES FOR THE EPIDEMIOLOGIST IN HAS

3. Providing DATA to define populations and settings of increased risk for antibacterial resistance, stratified by organism/drug group
Identifying Special Populations At Risk

“... epidemiology separates populations within epidemics into smaller and smaller groups at increasing risk of disease.”

IDENTIFYING THOSE AT SPECIAL RISK

Quantitative Variable (Proportion Not Treatable in Given Population)

NOT TREATABLE

OVERALL POPULATION

SPECIFIC GROUP (ICU, DIALYSIS, ETC.)
Resistance - Modern Medicine at Risk

- Patients who receive specialized care will be at highest risk
  - Cancer chemotherapy
  - Complex surgery
  - Joint replacements
  - Organ transplants
  - Chronic conditions (e.g., rheumatoid arthritis)
  - Dialysis

CDC slide set at haiwinnablebattle_presentation-2015-final.pptx
The Epidemiologist As A Team Member – QUESTION 2

**Epidemiologist**

**Q1** What Should Be Done?  
Provides DATA on Occurrence, Trends, Risk Determinants, Etc.

**Q2** Is It Being Done?  
Provides DATA on PROCESS Measures

**Q3** Is It Working?  
Provides DATA on OUTCOME Measures

**Team**

1. Decides on Appropriate Actions  
2. Defines Indicators for Monitoring  
Decides on Appropriate Actions  
Decides on Appropriate Actions  
RETURN TO Q1
5. Providing DATA to monitor **PROCESS of Appropriate Antibacterial Use** – “Is It Being Done?”

- **TEAM** develops guides/indicators
- **TEAM** evaluates results
TJC Element 9

“Action: implementing recommended actions, such as systematic evaluation of ongoing treatment need, after a set period of initial treatment (for example, “antibiotic time out” after 48 hours
Results: The majority of CCGs and acute trusts reported reviewing national AMS toolkits formally or informally (60% and 87%, respectively). However, only 13% of CCGs and 46% of acute trusts had developed an action plan for the implementation of these toolkits.

Conclusions: The majority of healthcare organizations review national AMS toolkits; however, implementation of the toolkits, through the development of action plans to deliver AMS interventions, requires improvement.


Q2 Is It Being Done? Provides DATA on PROCESS Measures

Team Focus on **How to Implement Better** Rather Than on Results
Findings: The survey was completed by 14 of the 15 AMTs (response rate 93 %). **Results demonstrated good compliance** with 9 of the 10 key European indicators included in the survey; 7 (50 %) of AMTs achieved all 9 indicators and 14 (100 %) of AMTs achieved at least 6 out of 9 indicators (67 %).

SOME CURRENT ROLES FOR THE EPIDEMIOLOGIST IN HAS

6. Providing DATA on effectiveness of control measures or new drugs – “Is It Working?”

- OUTCOME measures
“Measurement for improvement is not focused on judging whether data meet a compliance threshold or target but rather is a means of determining whether the changes we make to improve are effective and to what degree.”

Universal Screening and Decolonization for Control of MRSA in Nursing Homes: A Cluster Randomized Controlled Study

RESULTS. NHs were randomly allocated to a control group (51 NHs, 2,412 residents) or an intervention group (53 NHs, 2,338 residents). Characteristics of NHs and residents were similar in both groups. The mean screening rates were 86% (range, 27%-100%) in control NHs and 87% (20%-100%) in intervention NHs. Prevalence of MRSA carriage averaged 8.9% in both control NHs (range, 0%-43%) and intervention NHs (range, 0%-38%) at baseline, and this rate significantly declined to 6.6% in control NHs and to 5.8% in intervention NHs after 12 months. However, the decline did not differ between groups (P = .66).

CONCLUSION. Universal screening followed by decolonization of carriers did not significantly reduce the prevalence of the MRSA carriage rate at 1 year compared with standard precautions.

Amer J Infect Control 2015 (April); 36: 401-408

Comparison of control strategies for methicillin-resistant Staphylococcus aureus

Mary T. Bessesen MDa,*, Karla Lopez BSNb, Karen Guerin MSC, Karen Hendrickson BSNd, Shavetta Williams MSPHd, Susan O'Connor-Wright MSd, Donald Granger MDde

Conclusion: Significant reductions in MRSA HAI were associated with implementation of the MRSA control bundle. The bundle that included full contact precautions for colonized patients was no more effective in prevention of MRSA transmissions than a similar bundle that omitted the use of cover gowns.

Amer J Infect Control 2013; 41: 1048-1052
Is It Working? YES – and Sustainable

Strict Infection Control Leads to Low Incidence of Methicillin-Resistant *Staphylococcus aureus* Bloodstream Infection over 20 Years

Andreas F. Widmer, MD, MS;¹ Botond Lakatos, MD;¹ Reno Frei, MD²

Infect Control Hosp Epidemiol 2015; 36: 702-709

Time series analysis of the impact of an intervention in Tayside, Scotland to reduce primary care broad-spectrum antimicrobial use

Virginia Hernandez-Santiago*, Charis A. Marwick, Andrea Patton, Peter G. Davey, Peter T. Donnan and Bruce Guthrie

Conclusions: A real-world intervention to reduce primary care prescribing of antimicrobials associated with CDI led to large, sustained reductions in the targeted prescribing, largely due to substitution with guideline-recommended antimicrobials rather than by avoiding antimicrobial use altogether. Further research is needed to examine the impact on antimicrobial resistance.

J Antimicrob Chemother 2015; 70: 2397-2404
Show Me the Money: Long-Term Financial Impact of an Antimicrobial Stewardship Program

James R. Beardsley, PharmD;¹
John C. Williamson, PharmD;¹
James W. Johnson, PharmD;¹ Vera P. Luther, MD;²
Rebekah H. Wrenn, PharmD;¹ Christopher C. Ohl, MD²

The financial impact of an antimicrobial stewardship program in operation for more than 11 years was determined by calculating the reduction in antimicrobial expenditures minus program labor costs. Depending on the method of inflation adjustment used, the program was associated with average cost savings of $920,070 to $2,064,441 per year.

Infect Control Hosp Epidemiol 2012;33(4):398-400
7. Providing Outcome DATA targeted to Action

Example: Targeted Assessment for Prevention (TAP)
The Five "W"s of the Targeted Assessment for Prevention (TAP) Strategy

WHAT is the TAP strategy?
The Targeted Assessment for Prevention (TAP) strategy is a method developed by the Centers for Disease Control and Prevention (CDC) to use data for action to prevent healthcare-associated infections (HAIs). The TAP strategy targets healthcare facilities and specific units within facilities with a disproportionate burden of HAIs so that gaps in infection prevention in the targeted locations can be addressed. The TAP report uses a metric called the cumulative attributable difference (CAD). The CAD is the number of infections that must be prevented to achieve a HAI reduction goal and is calculated by subtracting a numerical prevention target from an observed number of HAIs. The TAP report allows for the ranking of facilities, or locations within individual facilities, by the CAD to prioritize prevention efforts where they will have their greatest impact.

Cumulative Attributable Difference

http://health.state.tn.us/ceds/HAI/calculator.shtml

TAP report capability in NHSN for CLABSIs, CAUTIs, and CIDs.
SOME CURRENT ROLES FOR THE EPIDEMIOLOGIST IN HAS

8. Careful evaluation of new DATA methods and tools
Biased Reporting

UC Health nurse sues health system for covering up scope-related outbreak
Written by Shannon Barnet (Twitter | Google+) | June 22, 2016

A University of Cincinnati Health nurse has filed a whistle-blower lawsuit against the system, claiming UC Health failed to prevent the spread of multidrug-resistant bacteria and covered up its role in the outbreak, FOX 19 NOW reports.

According to the report, as many as 100 patients may have developed an infection as a result of the care they received at UC Health. The nurse's lawsuit claims UC Health launched an investigation after recording a spike in the number of infections in patients who had undergone a bronchoscopy. Allegedly, the nurse suggested reaching out to an outside agency to investigate the medical devices and infections, but was told "no" because the organization didn't want an audit.

Eric Deters, a spokesman for the law firm that took the nurse's case, told FOX 19 NOW the health system decided to simply deal with the patient infections rather than tackling the root of the problem — the bronchoscopes being used for the procedure.

"They stop checking the bronchoscopes," Mr. Deters told reporters. "They were culturing these scopes to check and see if they were causing an infection or if they were infected. Well, by no longer checking the scopes they weren't going to find any problems so there would be no need for an outside audit."

"The evidence base to determine the most cost-effective systems for surveillance of antibiotic use and resistance remains weak worldwide."

PREVALENCE SURVEYS
(CROSS SECTIONAL, “SNAPSHOT”)
The Healthcare Epidemiologist’s Friend
“Prevalence surveys of healthcare-associated infections offer advantages over incidence surveys, including the relative ease of performance, a reduced requirement for resources, the ability to include increased numbers of hospitals within a shorter period of time, and the possibility of more rapid data analysis and feedback. They also have been shown useful in monitoring the effectiveness of infection control programmes.”

TWO ANTIMICROBIAL RESISTANT ORGANISMS (ARO) OF CDC INTEREST

CDC List:

- **Group 1 - Urgent**
  - Example: *Carbapenem-resistant Enterobacteriaceae*

- **Group 2 - Serious**
  - Example: MRSA

- **Group 3 – Concerning**

  • **CORECT TREATMENT?**

WARD 6B

- Infection?
- Organism?
- Appropriate (Correct) Therapy?
- Prevalence of **Infection** - 9/10

- MRSA: Correct
- Pneumo: Correct
- MRSA: Correct
- E coli: Correct
- CRE: Correct
- MSSA: Correct
- KPC3: Wrong
- No Ortansm Identified
- MRSA: Wrong
- Prevalence of ARO Infections - 5/9

- MRSA Correct
- Pneumo Correct
- MRSA Correct
- E. coli Correct
- CRE Correct
- MSSA Correct
- KPC3 Wrong
- No Ortsasm Identified
- MRSA Wrong
- Prevalence of **Staph Infections** - 4/10

- **MRSA**
  - Correct

- **Pneumo**
  - Correct

- **MRSA**
  - Correct

- **E. coli**
  - Correct

- **CRE**
  - Correct

- **MSSA**
  - Correct

- **KPC3**
  - Wrong

- **No Ortsnm Identified**

- **MRSA**
  - Wrong
- Prevalence of MRSA In Staph Infections – 3/4
- Prevalence of Appropriate Treatment in Staph Infections – 3/4

- MRSA Correct
- Pneumo Correct
- MRSA Correct
- E. coli Correct
- CRE Correct
- MSSA Correct
- KPC3 Wrong
- No Ortsnsm Identified
- MRSA Wrong
- Prevalence of **Appropriate Treatment in MRSA Infections – 2/3**

- MRSA
  - Correct

- Pneumo
  - Correct

- MRSA
  - Correct

- E. coli
  - Correct

- CRE
  - Correct

- MSSA
  - Correct

- KPC3
  - Wrong

- No Ortsnsm Identified

- MRSA
  - Wrong
Uses of a Prevalence Survey

**Epidemiologist**

Q1 What Should Be Done?
- Provides DATA on Occurrence, Trends, Risk Determinants, Etc.

Q2 Is It Being Done?
- Provides DATA on PROCESS Measures

Q3 Is It Working?
- Provides DATA on OUTCOME Measures

**DATA for Team**

- What Is Current Pattern of Resistant Organism By Location?
- How Complete is Observance of “Antibiotic Time-Out”?
- Has Requirement for “Antibiotic Time Out” Changed Pattern of Resistant Organisms?
MRSA Prevalence in 590 US Hospitals

This project examines the numbers and types of HAIs, the types of antimicrobial drugs (such as antibiotics), and the reasons antimicrobial drugs are used in hospitals and nursing homes. This information will help create policies and procedures to make healthcare safer for patients in U.S. healthcare facilities.

Phase 4 (2015-2016)

Data collection for this survey was expanded to be able to describe the quality of antimicrobial drug prescribing. About 200 acute care hospitals in 10 EIP states participated. Hospital survey dates occurred between May and September 2015. Initial results are expected in 2017.

Objectives

- Estimate HAI number and frequency
- Identify HAIs by
  - pathogen (including antimicrobial-resistant pathogens)
  - major infection site
- Describe the indications for antimicrobial use
- Identify changes in HAI and antimicrobial use prevalence, burden and epidemiology over time
- Describe the quality of antimicrobial drug prescribing in selected clinical circumstances

https://www.cdc.gov/hai/eip/antibiotic-use.html
Point-Prevalence of Healthcare-Associated Infection in China in 2010: A Large Multicenter Epidemiological Survey

hospitals) across mainland China in 2010. Of the 407,208 patients involved, 14,674 had developed 1 or more HAI (3.60% [95% confidence interval (CI), 3.54%–3.66%]). Lower respiratory tract infection was the most common type of HAI (8,739 [59.55%] of 14,674 cases) and included post-operative pneumonia (1,392 [9.49%] of 14,674 cases), followed by upper respiratory tract infection (2,169 [14.78%] of 14,674 cases), urinary tract infection (1,570 [10.70%] of 14,674 cases), surgical site infection (1,302 [8.87%] of 14,674 cases), skin and soft-tissue infection (909 [6.19%] of 14,674 cases), and gastrointestinal infection (753 [5.13%] of 14,674 cases). A total of 6,965 pathogens were isolated from patients with HAI. Pseudomonas aeruginosa was the most commonly isolated pathogen (1,196 [17.17%] of 6,965 isolates), followed by Escherichia coli (936 [13.44%] of 6,965), Acinetobacter baumannii (767 [11.01%] of 6,965), Klebsiella pneumoniae (747 [10.73%] of 6,965), and Staphylococcus aureus (615 [8.83%] of 6,965). The antimicrobial use prevalence (AUP) was 49.63% (202,085 of 407,208). Among the patients who re-
TAKE-HOME

- Epidemiologist = DATA for Control and Prevention in Healthcare Antimicrobial Stewardship (HAS)
- Epidemiologist = Member of HAS TEAM
- Epidemiologist – DATA for What Should We Do?, Is Plan Being Implemented? (PROCESS), and Is Plan Working? (OUTCOME)
- Prevalence Study useful in answering the three questions above in HAS