Advancing Antimicrobial Stewardship in Utah

ACP – Utah Chapter

Eddie Stenehjem, MD MSc
Intermountain Medical Center
Medical Director, Antimicrobial Stewardship
February 28th, 2015
Objective

- Define Antibiotic Stewardship

- Understand why do we need Antibiotic Stewardship and how it is a public health matter

- Describe the national trends in Antimicrobial Stewardship
What is Antibiotic Stewardship?

Systematic efforts to optimize the use of antibiotics to maximize benefits, minimize resistance and decrease adverse events.
Core Elements
Antibiotic Stewardship Program

- 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
Improvement Interventions

- Antimicrobial Stewardship
  - Guidelines and Clinical Pathways
  - Antimicrobial Indications
  - Formulary Restriction
  - Prospective Audit with Feedback

- Education
- Dose optimization
- IV to PO conversion
- Rapid Diagnostics
- Decision Support

Antimicrobial Stewardship
What is Antibiotic Stewardship?

Optimizing:
1. Drug selection
2. Drug dosing
3. Drug route
4. Drug duration

In order to maximize clinical cure (or prevention of infection) and limit unintended consequences.

- Emergence of resistance
- ADE
- Selection of pathogenic organisms (C. diff)
What is Antibiotic Stewardship?

This isn’t a new topic
• The public will demand [the drug and]...then will begin an era... of abuses....In such a case the thoughtless person playing with penicillin treatment is morally responsible for the death of the man who finally succumbs to infection with penicillin-resistant organism.

"We must recognize that the misuse of antibiotics affects the cost of medical care and the ecology of the bacterial flora. These are matters of concern to all physicians because the practice of one affects all."
“Virtually all reports agree that careful, discriminating use of antimicrobial agents remains the keystone for minimizing this problem (antimicrobial resistance). This need must be communicated more effectively to prescribers.”

John McGowan, MD
In its recent annual report on global risks, the World Economic Forum (WEF) concluded that “arguably the greatest risk . . . to human health comes in the form of antibiotic-resistant bacteria. We live in a bacterial world where we will never be able to stay ahead of the mutation curve. A test of our resilience is how far behind the curve we allow ourselves to fall.”¹
WHY ARE WE STILL TALKING ABOUT THIS????
Why Stewardship?

1. All Antibiotics Fail
2. Rising Resistance
3. Dry (damp?) pipeline
4. It is the right thing to do
Why Stewardship?

1. All Antibiotics Fail
2. Rising Resistance
3. Dry (damp?) pipeline
4. We will have to
Antibiotic resistance is ancient

Vanessa M. D’Costa¹,²*, Christine E. King³,⁴*, Lindsay Kalan¹,², Mariya Morar¹,², Wilson W. L. Sung⁴, Carsten Schwarz³, Duane Froese⁵, Grant Zazula⁶, Fabrice Calmels⁵, Regis Debruyne⁷, G. Brian Golding⁴, Hendrik N. Poinar¹,³,⁴ & Gerard D. Wright¹,²
Antibiotic Resistance Is Prevalent in an Isolated Cave Microbiome

Kirandeep Bhullar¹, Nicholas Waglechner¹, Andrew Pawlowski¹, Kalinka Koteva¹, Eric D. Banks², Michael D. Johnston², Hazel A. Barton², Gerard D. Wright¹*

Lechuguilla Cave, Carlsbad Caverns National Park, New Mexico
93 strains cultured
\( \frac{1}{3} \) gram positive | \( \frac{2}{3} \) gram negative
The Shared Antibiotic Resistome of Soil Bacteria and Human Pathogens

Kevin J. Forsberg, Alejandro Reyes, Bin Wang, Elizabeth M. Selleck, Morten O. A. Sommer, Gautam Dantas

Soil microorganisms represent one of the ancient evolutionary origins of antibiotic resistance and have been proposed as a reservoir of resistance genes available for exchange with clinical pathogens. Using a high-throughput functional metagenomic approach in conjunction with a pipeline for the de novo assembly of short-read sequence data from functional selections (termed PARFuMS), we provide evidence for recent exchange of antibiotic resistance genes between environmental bacteria and clinical pathogens. We describe multidrug-resistant soil bacteria containing resistance cassettes against five classes of antibiotics (β-lactams, aminoglycosides, amphenicols, sulfonamides, and tetracyclines) that have perfect nucleotide identity to genes from diverse human pathogens. This identity encompasses noncoding regions as well as multiple mobilization sequences, offering not only evidence of lateral exchange but also a mechanism by which antibiotic resistance disseminates.

The continued evolution and widespread dissemination of antibiotic resistance genes in human pathogens is a preeminent clinical challenge (1). Environmental reservoirs have long been implicated as a source of resistance found in human pathogens (2). However, apart from certain opportunistic bacterial pathogens, among which the same species can be found in the environment or infecting humans (3), examples of resistance genes from environmental bacteria with high identity to those of pathogens are rare (4, 5). The two documented examples are of K. pneumoniae and Shewanella isolates, which are found free-living in environmental settings (5, 6) yet have resistance genes (CTX-M β-lactamase and qnrA genes, respectively) with high identity (100% identity in clinical K. pneumoniae isolates) to those of pathogens (4, 5). The limited examples of resistance genes shared between environmental microbes and human pathogens raise questions regarding the clinical impact of environmental resistance. For instance, whether shared resistance
All Antibiotics Fail
Resistance Genes are 30,000 years ahead!

Antibiotic deployment

Antibiotic resistance observed
Antibiotic exposure increases the risks of resistance

Bloodstream Infections Caused by Extended-Spectrum-β-Lactamase-Producing *Klebsiella pneumoniae*: Risk Factors, Molecular Epidemiology, and Clinical Outcome

TABLE 4. Logistic regression analysis of risk factors for bloodstream infections caused by ESBL-producing *K. pneumoniae* and non-ESBL-producing *K. pneumoniae*

<table>
<thead>
<tr>
<th>Cause of BSI and characteristic</th>
<th>Z</th>
<th>P value</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESBL-producing <em>K. pneumoniae</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>4.97</td>
<td>&lt;0.001</td>
<td>1.14 (1.08–1.21)</td>
</tr>
<tr>
<td>Length of hospitalization</td>
<td>2.64</td>
<td>&lt;0.001</td>
<td>1.10 (1.04–1.16)</td>
</tr>
<tr>
<td>Previous antibiotic therapy</td>
<td>3.30</td>
<td>0.001</td>
<td>11.81 (2.73–51.08)</td>
</tr>
</tbody>
</table>
1/21/2015 – 40 y/o female with a renal transplant presents with pyelonephritis: RX: Cipro
### 1/21/2015 – 40 y/o female with a renal transplant presents with pyelonephritis: RX: Cipro

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Culture Type</th>
<th>Source</th>
<th>Result</th>
<th>Accession</th>
<th>Updated</th>
<th>Susceptibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/21/2015</td>
<td>08:39</td>
<td>Urine Culture</td>
<td>Urine</td>
<td>&gt;100,000 CFU/mL, <em>Escherichia coli</em></td>
<td>W5692251</td>
<td>01/23/2015</td>
<td>Amoxicillin/clavulanic acid, ampicillin/sulbactam, ampicillin, cefazolin, cefepime, cepotaxime, cefoxitin, ceftazidime, ceftriaxone, cefuroxime, ciprofloxacin, gentamicin, imipenem, meropenem, nitrofurantoin, piperacillin/tazobactam, tobramycin, trimeth/sulfa</td>
</tr>
</tbody>
</table>

### 2/1/2015 – “UTI is coming back”: RX: Bactrim

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Culture Type</th>
<th>Source</th>
<th>Result</th>
<th>Accession</th>
<th>Updated</th>
<th>Susceptibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>02/01/2015</td>
<td>13:45</td>
<td>Urine Culture</td>
<td>Urine Urine, Clean Catch</td>
<td>&gt;100,000 CFU/mL, <em>Escherichia coli</em></td>
<td>X2722434</td>
<td>02/03/2015</td>
<td>Amoxicillin/clavulanic acid, cefazolin, cefepime, cepotaxime, ceftazidime, ceftriaxone, cefuroxime, gentamicin, imipenem, meropenem, nitrofurantoin, piperacillin/tazobactam, tobramycin, trimeth/sulfa</td>
</tr>
</tbody>
</table>

**Method:** MIC
An example...

1/21/2015 – 40 y/o female with a renal transplant presents with pyelonephritis: RX: Cipro

2/1/2015 – “UTI is coming back”: RX: Bactrim

2/19/2015 – Fever, admit ICU
Antimicrobial resistance jeopardizes all of our medical advances
Why Stewardship?

1. All Antibiotics Fail
2. Rising Resistance
3. Dry (damp?) pipeline
4. We will have to
**Impact of Antibiotic Resistance**

<table>
<thead>
<tr>
<th>Organism</th>
<th>Increased risk of death (OR)</th>
<th>Attributable LOS (days)</th>
<th>Attributable cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRSA bacteremia</td>
<td>1.9</td>
<td>2.2</td>
<td>$6,916</td>
</tr>
<tr>
<td>MRSA surgical infection</td>
<td>3.4</td>
<td>2.6</td>
<td>$13,901</td>
</tr>
<tr>
<td>VRE infection</td>
<td>2.1</td>
<td>6.2</td>
<td>$12,766</td>
</tr>
<tr>
<td>Resistant Pseudomonas infection</td>
<td>3.0</td>
<td>5.7</td>
<td>$11,981</td>
</tr>
<tr>
<td>Resistant <em>Enterobacter</em> infection</td>
<td>5.0</td>
<td>9</td>
<td>$29,379</td>
</tr>
</tbody>
</table>

Total cost of antimicrobial resistance is estimated to be **30 billion dollars annually**

ANTIBIOTIC RESISTANCE THREATS in the United States, 2013
Urgent Threats
- *Clostridium difficile*
- Carbapenem-resistant Enterobacteriaceae (CRE)

Serious Threats
- Multidrug-resistant *Acinetobacter*
- Fluconazole-resistant *Candida* (a fungus)
- Extended spectrum β-lactamase producing Enterobacteriaceae (ESBLs)
- Vancomycin-resistant *Enterococcus* (VRE)
- Multidrug-resistant *Pseudomonas aeruginosa*

Concerning Threats
- Methicillin-resistant *Staphylococcus aureus* (MRSA)
- Drug-resistant *Streptococcus pneumoniae*
CRE = *Enterobacteriaceae* resistant to one of the carbapenems (imipenem or meropenem) and third generation cephalosporins (ceftriaxone)

“Nightmare Bacteria” Threat

States with one type of drug-resistant infection, carbapenem-resistant Enterobacteriaceae (CRE), in 2001 and 2013.

2013 CRE Reported to CDC

Feb 2015: Only Idaho and Maine remain CRE free
Drug-resistant bacteria linked to two deaths at UCLA hospital

By Steve Almasy, CNN

Updated 1:46 AM ET, Thu February 19, 2015

2 deaths possibly linked to 'superbug' at UCLA hospital after 7 infected, 179 exposed
Enzymes that mediate resistance to extended-spectrum cephalosporins (third generation) and monobactams but do not affect carbapenems.
Rate of ESBL in an Integrated Healthcare System, 2004-2012
Stewardship Paradox

- Broader empiric therapy
- Increased pressure for resistance
- More Resistance
- Don’t choose wrong!
Why Stewardship?

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Total Number of New Antibacterial Agents

1983-1987
1988-1992
1993-1997
1998-2002
2003-2007
2008-2012

ANTIBIOTIC DEVELOPMENT IS DWINDLING

Source: The Epidemic of Antibiotic-Resistant Infections, CID 2008:46 (15 January)
The Last 10 Years

- Telithromycin – 2004
- Tigecycline – 2005
- Doripenem – 2007
- Telavancin – 2009
- Ceftaroline – 2010
- Fidaxomicin – 2011
Bad Bugs Need Drugs

10x '20

Ten new ANTIBIOTICS by 2020
Total Number of New Antibacterial Agents

- 1983-1987
- 1988-1992
- 1993-1997
- 1998-2002
- 2003-2007
- 2008-2012

ANTIBIOTIC DEVELOPMENT IS DWINDLING

2013 - 2014
New Drugs!!!

LIPOGLYCOPEPTIDE
• Dalbavancin – FDA Approved 5/2014
• Ortivancin – FDA Approved 8/2014

OXAZOLIDINONE
• Tedizolid – FDA Approved 6/2014

Cephalosporin/beta lactamase inhibitor
• Ceftolozane/tazobactam
### Antibiotic Pipeline

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>WT P &lt;i&gt;aerug&lt;/i&gt;</th>
<th>ESBL</th>
<th>KPC</th>
<th>NDM-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceftolozane/tazobactam&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Ceftazidime-avibactam&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Ceftaroline-avibactam&lt;sup&gt;a&lt;/sup&gt;</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Imipenem/MK-7655&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Plazomicin&lt;sup&gt;b&lt;/sup&gt;</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>?</td>
</tr>
<tr>
<td>Eravacycline&lt;sup&gt;c&lt;/sup&gt;</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>?</td>
</tr>
<tr>
<td>Brilacidin&lt;sup&gt;d&lt;/sup&gt;</td>
<td>?</td>
<td>Y</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>

**Legend:**
- **a.** β-lactamase inhibitor
- **b.** Aminoglycoside
- **c.** Fluorocycline (targets ribosome)
- **d.** Peptide defense protein mimetic

**Key:**
- WT=wild type
- ESBL=Extended spectrum beta lactamase
- KPC=Klebsiella pneumoniae carbapenemase
- NDM-1=New Delhi metallo-β-lactamase
Why Stewardship?

1. All Antibiotics Fail
2. Rising Resistance
3. Dry (damp?) pipeline
4. We will have to
The right thing to do…

1. Improved clinical outcomes
2. Decrease antimicrobial resistance
3. Improved patient safety
4. Decreased cost
5. Decreased patient burden
<table>
<thead>
<tr>
<th>No Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. C.2.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 the process is followed.</td>
</tr>
<tr>
<td>1. C.2.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 pharmacists, formulary restrictions, evidence-based guidelines and recommendations).</td>
</tr>
<tr>
<td>1. C.2.c Antibiotic orders include an indication for use.</td>
</tr>
<tr>
<td>1. C.2.d There is a mechanism in place to prompt clinicians to review antibiotic courses of therapy after 72 hours of treatment.</td>
</tr>
<tr>
<td>1. C.2.e The facility has a system in place to identify patients currently receiving intravenous antibiotics who might be eligible to receive oral antibiotic treatment.</td>
</tr>
</tbody>
</table>
IDSA Policy Statement
2012

1. Antimicrobial Stewardship Programs Should be Required through Regulatory Mechanisms

2. Antimicrobial Stewardship Should be Monitored in Ambulatory Settings
2006: Mandates stewardship programs for CA’s acute care hospitals and requires the state health department to assess them for compliance.

“Develop a process for evaluating the judicious use of antibiotics” and Pediatric Infectious Disease Society issued a policy statement in April 2012 for the mandatory implementation of antimicrobial stewardship.

July 2015: Hospitals must put into effect ASP that follow federal and professional society guidelines and include a process to evaluate the judicious use of antimicrobials. The stewardship teams must be multidisciplinary and include “at least one physician or pharmacist” who has expertise and training in antimicrobial stewardship.”
Europe launches 12 point plan to tackle antimicrobial resistance

Rory Watson

The European Commission presented its first action plan to tackle antimicrobial resistance to drugs on 17 November, as new research that was based on Europe-wide surveillance data confirmed that carbapenem resistant Klebsiella pneumoniae is on the rise.

Announcing the initiative, the health and consumer policy commissioner, John Dalli, said, “We need to take swift and determined action if we do not want to lose antimicrobial medicines as essential treatment against bacterial infections in both humans and animals.”

He emphasised the scale of the problem by pointing out that some 25 000 patients die each year in the European Union from infections caused by drug resistant bacteria and that the cost of related healthcare expenditure and productivity losses is as high as €1.5bn (£1.3bn; $2bn).

The plan aims to limit the spread of antimicrobial infections in humans and animals and to develop new antimicrobial treatments. It sets out 12 ways to achieve these aims, including increasing awareness among the medical and veterinary communities and the general public on the appropriate use of antimicrobials; strengthening controls in hospitals; and tightening legislation to restrict the use of antibiotics in animals.

The latest data from the European Centre for Disease Prevention and Control, which has consistently warned of the dangers of antimicrobial resistance, paint a mixed picture. They reveal a decrease in meticillin resistant Staphylococcus aureus in seven countries (the United Kingdom, Ireland, Austria, Cyprus, Estonia, France, and Greece) but an increase in Italy, Hungary, Germany, and Slovenia.

However, the centre confirms that for the first time several European countries are reporting that between 15% and almost 50% of K pneumoniae from bloodstream infections are resistant to carbapenems, the major last line class of antibiotics. In 2009 the problem existed on a major scale only in Greece, but by last year it had risen noticeably in Austria, Cyprus, Hungary, and Italy.

The centre’s director, Marc Sprenger, warned that failure to take appropriate measures would mean that “treatment options for patients with bloodstream infections, pneumonia, and urinary tract infections in hospitals will be severely limited.”

He called on hospital managers to pay more attention to hygiene and recommended that patients who crossed national frontiers for treatment should be routinely screened to reduce the risk of transmission of carbapenem resistant bacteria.

The new importance the commission is giving to antimicrobial resistance was immediately welcomed by the pharmaceutical and veterinary industries and patients’ groups.

The EU Community Strategy Against Antimicrobial Resistance is at http://ec.europa.eu/healthtopics/antimicrobial_resistance/.
National Goals and Policies

Before September 18, 2014

• No national in-patient stewardship goals or policies.
  • Stewardship questions included as “non-citation” questions on CMS in-patient infection control worksheet.
Why Are National Goals and Policies Important?

- There is plenty of evidence that:
  - Antibiotics are overused (in-patient and out-patient)
  - Antibiotic stewardship improves patient outcomes
  - Antibiotic stewardship saves money
- Despite that, strong stewardship programs are not universal and not a high priority in many facilities.
- Many have suggested that stewardship will not make large advances without national policies
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
Eight high level recommendations to the president to combat antibiotic resistance:

- Ensure strong federal leadership
- Effective surveillance and response
- Fundamental research
- Clinical trials with new antibiotics
- Increase economic incentives for new antibiotics
- **Improve stewardship of existing antibiotics**
- Limit the use of antibiotics in animal agriculture
- Ensure effective international coordination
Improving Stewardship in Healthcare

- CMS should use reimbursement to drive stewardship.
  - Add requirement for robust stewardship programs to conditions of participation for all hospitals and nursing homes, by 2017.
  - Follow with similar requirement for long term acute care hospitals, ambulatory surgical centers and dialysis centers.
  - Expand physician quality reporting system to include quality measures that discourage inappropriate prescribing in outpatient practices.
  - CMS reimbursement – Gather and publically report data on antibiotic use and resistance
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
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

Executive Order -- Combating Antibiotic-Resistant Bacteria

EXECTUVE ORDER

COMBATING ANTIBIOTIC-RESISTANT BACTERIA

By the authority vested in me as President by the Constitution and the laws of the United States of America, I hereby order as follows:

Section 1. Policy. The discovery of antibiotics in the early 20th century fundamentally transformed human and veterinary medicine. Antibiotics save millions of lives each year in the United States and around the world. The rise of antibiotic-resistant bacteria, however, represents a serious threat to public health and the economy. The Centers for Disease Control and Prevention (CDC) in the Department of Health and Human Services (HHS) estimates that annually at least two million illnesses and 23,000 deaths are caused by antibiotic-resistant bacteria in the United States alone.
Executive Order on Combating Antibiotic Resistant Bacteria

- Describes combating antibiotic resistance is a national security priority.
- Creates federal task force and Presidential advisory council to guide implementation of the national strategy.
- Addresses various areas relevant to resistance, including stewardship.
– **Sec. 5. Improved Antibiotic Stewardship.**

(a) “By the end of calendar year 2016, HHS shall review existing regulations and propose new regulations …that require hospitals…to implement robust antibiotic stewardship programs that adhere to best practices.”
Why Stewardship?

1. All Antibiotics Fail
2. Rising Resistance
3. Dry (damp?) pipeline
4. It is the right thing to do and we will have to
• *Increased emphasis in the past 5 years*
  – 2012: 2 of 22 hospitals with ID led ASP (PCH and McKay Dee)
  – 2015: 20 of 22 hospitals with ID led ASP

• *Corporate AS Committee*

• *ASP faculty:*
  McKay Dee (Dustin Waters, PharmD)
  PCMC (Jared Olson, PharmD; Emily Thorell, MD)
  IMC (Whitney Buckel, PharmD; Eddie Stenehjem, MD)
  Utah Valley (Josh Caraccio, PharmD)
  LDS (Brandon Webb, MD)

*Part-time ID/MD support*
Large Hospitals

Quarterly DOT Rate over 3 years of 6 Large Hospitals

Antimicrobial Rate per 1000 Patient Days

Time


126 128 132 138
144 154
Overall
## Influence of Timing of Speciation on Antibiotic Use: MSSA

<table>
<thead>
<tr>
<th></th>
<th>MMP N=50</th>
<th>PNAF N=50</th>
<th>TC N=50</th>
<th>P*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received vancomycin</td>
<td>46 (92%)</td>
<td>46 (92%)</td>
<td>44 (88%)</td>
<td>NS</td>
</tr>
<tr>
<td>Median [95% CI] number vancomycin doses</td>
<td>2 [1-3]</td>
<td>5 [4-5]</td>
<td>4 [3-4]</td>
<td>0.001</td>
</tr>
<tr>
<td>N (%) of patients who received a single vancomycin dose</td>
<td>21/45 (47%)</td>
<td>4/45 (9%)</td>
<td>4/44 (9%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Nafcillin or cefazolin, N (%)</td>
<td>44 (88%)</td>
<td>40 (80%)</td>
<td>37 (74%)</td>
<td>0.2</td>
</tr>
</tbody>
</table>

*Kruskal Wallis with Dunn’s correction for continuous variables; Chi Square for proportions

MMP=multiplex molecular panel
TC=Tube coagulase
PNAF=Peptide nucleic acid fluorescence in situ hybridization
CI=Confidence interval
Total Hospital Cost: MSSA only

- Total Hospital Cost, Median [95% CI]
  - MMP (N=50): $18,049 [$14,820-$27,180]
  - Control (N=150): $23,154 [$19,057-$30,260]

MMP=multiplex, molecular panel
CI=Confidence Interval
Groups compared with Wilcoxon Rank Sum
What about our small community hospitals?

Define an antibiotic stewardship strategy for Intermountain’s smaller hospitals that optimizes outcomes while maximizing resources.
<table>
<thead>
<tr>
<th>Hospital</th>
<th>Staffed Bed Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermountain Medical Center</td>
<td>472</td>
</tr>
<tr>
<td>Utah Valley</td>
<td>375</td>
</tr>
<tr>
<td>McKay-Dee</td>
<td>300</td>
</tr>
<tr>
<td>Primary Children's</td>
<td>289</td>
</tr>
<tr>
<td>Dixie Regional</td>
<td>245</td>
</tr>
<tr>
<td>LDS</td>
<td>243</td>
</tr>
<tr>
<td>Logan Regional</td>
<td>128</td>
</tr>
<tr>
<td>American Fork</td>
<td>89</td>
</tr>
<tr>
<td>Riverton</td>
<td>88</td>
</tr>
<tr>
<td>Alta View</td>
<td>66</td>
</tr>
<tr>
<td>Valley View</td>
<td>48</td>
</tr>
<tr>
<td>Park City Medical Center</td>
<td>30</td>
</tr>
<tr>
<td>Cassia Regional</td>
<td>25</td>
</tr>
<tr>
<td>Sevier Valley</td>
<td>24</td>
</tr>
<tr>
<td>Orem Community</td>
<td>18</td>
</tr>
<tr>
<td>Bear River Valley</td>
<td>16</td>
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<tr>
<td>Heber Valley</td>
<td>16</td>
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<tr>
<td>Delta Community</td>
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</tr>
<tr>
<td>Garfield Memorial</td>
<td>14</td>
</tr>
<tr>
<td>Sanpete Valley</td>
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</tr>
<tr>
<td>Fillmore Community</td>
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</tbody>
</table>

**Large Urban Hospitals**
- ASP focused
- Formal ID consultation available

**Small Community Hospitals**
- 15 Hospitals
- 597 Beds
- 25% of IHC Beds
- No formal ASPs
- No Infectious Diseases MD support
National Priority

• 72% of all US hospitals have < 200 beds
• Very few have ID / ASP support
• Antimicrobial use is just as high
DIAGNOSIS AND MANAGEMENT OF

Acute Cough (Bronchitis)
2013 update

This care process model (CPM) is produced by Intermountain Healthcare’s Lower Respiratory Tract Infection Team, a workgroup of the Primary Care Clinical Program. The CPM provides best-practice recommendations for differential diagnosis and management of acute cough and bronchitis.

KEY POINTS

• **Diagnosis of acute bronchitis should be made only after ruling out other sources of cough** — including pneumonia, asthma, influenza, pertussis, and acute exacerbations of chronic bronchitis (AECB). The algorithm on pages 2 and 3 guides that evaluation and diagnostic process. Local infection surveillance programs such as Germ Watch can provide up-to-date information about communicable diseases that routinely affect our communities.

• **If acute bronchitis is the diagnosis, antibiotics are NOT the answer!** Despite ongoing evidence that antibiotics are NOT needed for acute bronchitis, latest data show that their use is actually increasing. SelectHealth rates rose from 70% in 2008 to nearly 75% in 2010 (see graph at right), which mirrors the national trend. Unnecessary antibiotic use increases risk for disease complications related to drug-resistance pathogens, and increases healthcare costs.

• **Withholding antibiotics has no significant effect on patient satisfaction or return visits.** Studies show that **education efforts and the time a healthcare provider spends with the patient** are the biggest determinants of patient satisfaction results. See the ACUTE BRONCHITIS TREATMENT RECOMMENDATIONS box in the algorithm inside for tips on communicating with patients about cough illnesses and antibiotic resistance.

WHAT’S NEW IN THIS UPDATE?

• New data showing an upward trend in unnecessary use of antibiotics for treatment of acute bronchitis — reinforcing our need to do better!

• Updated information on sinusitis, influenza, and pertussis testing and treatment, with links to more information.

• Summary of evidence base for symptom relief of acute cough (see ACUTE BRONCHITIS TREATMENT RECOMMENDATIONS box inside).

• New and revised provider and patient education materials to support physicians in differential diagnosis and evidence-based treatment of acute cough (bronchitis) and related illnesses.

GOALS

• **Help providers improve accuracy of diagnosis** of acute bronchitis and other lower respiratory tract infections.

• **Reduce the unnecessary use of antibiotics for treatment of acute bronchitis,** thereby sparing patients the additional risks and associated costs.
**Intermountain Data – ICD9 Dx Bronchitis**

**2013 Data: 47% Received ABX**

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<thead>
<tr>
<th>Antibiotic</th>
<th>Quantity</th>
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<td>AMOX-CLAV</td>
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<tr>
<td>METRONIDAZOL</td>
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</table>
What can you do?

1. Use an order set
2. Review / de-escalate antibiotics
3. Treat infections, not positive cultures
4. Send appropriate samples to microbiology
5. Write an indication and stop date for abx
6. Take out catheters
7. Wear the yellow gowns
8. Utilize your ASP team
Thank You

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