Building a strong Antimicrobial Stewardship Program in a community hospital with limited resources

Sue Lau, Pharm.D
Infectious Disease Pharmacist
Orlando Health – Dr P Philips Hospital
21st September, 2017
Disclosure:

• I have no financial conflict of interest to report
Program Outlines:

• Evaluate the importance of an Antimicrobial Stewardship Program (ASP)
• Apply the steps of building up an ASP from scratch with limited resources
• Identify ways to sustain the ASP
• Show the accomplishments from the ASP at Dr. P. Phillips Hospital
Why We Care?

• Global antimicrobial resistance is happening!
  – In 2001, only 1 state reported a case of carbapenem-resistant enterobacteriaceae (CRE) vs. only 2 states without CRE in early 2015
  – Multi-drug resistant organisms (MDRO) cause at least 2 millions infection / year and ~23,000 death in U.S.

• About 50% antibiotics used in the inpatient setting are unnecessary

• Antibiotics are the most common cause of adverse drug events

• Improving antibiotic prescribing can reduce patient HARM
Importance of Antimicrobial Stewardship:

• All antimicrobial use, appropriate or not, carries a risk for developing resistance.
• Antimicrobials should be used judiciously and prescribed only when recommended
  • Use the Right drug, dose, and duration
• Antimicrobial stewardship efforts are critical to limit the development of antibiotic resistance
National Action Plan Goals:

1. Slow the Emergence of Resistant Bacteria and Prevent the Spread of Resistant Infections.
4. Accelerate Basic and Applied Research and Development for New Antibiotics, Other Therapeutics, and Vaccines
Joint Commission / CMS Regulations

New Antimicrobial Stewardship Standard

Applicable to Hospitals and Critical Access Hospitals

Effective January 1, 2017

Medication Management (MM)

Standard MM.09.01.01
The [critical access] hospital has an antimicrobial stewardship program based on current scientific literature.

Elements of Performance for MM.09.01.01

1. Leaders establish antimicrobial stewardship as an organizational priority. (See also LD.01.03.01, EP 5)

   Note: Examples of leadership commitment to an antimicrobial stewardship program are as follows:
   - Accountability documents
   - Budget plans

2. The [critical access] hospital educates staff and licensed independent practitioners involved in antimicrobial ordering, dispensing, administration, and monitoring about antimicrobial resistance and antimicrobial stewardship practices. Education occurs upon hire or granting of initial privileges and periodically thereafter, based on organizational need.

3. The [critical access] hospital educates patients, and their families as needed, regarding the appropriate use of antimicrobial medications, including antibiotics. (For more information on patient education, refer to Stan-

Continued on page 4
Building an Antimicrobial Stewardship Program (ASP) from scratch...
Dr. P. Phillips Hospital (DPH)

- Located in Southwest Orlando in Central Florida
- Community Hospital
- 237 acute care beds medical & surgical facility
- Not for-profit organization
- Adult population
- Part of Orlando Health
  - Orlando Regional Medical Center (ORMC)
  - UF Health Cancer Center (UFHCC)
  - Winnie Palmer Hospital (WPH)
  - Arnold Palmer Hospital (APH)
  - South Seminole Hospital (SSH)
  - Health Central Hospital (HCH)
  - South Lake Hospital (SLH)
Prior to the ASP

- DPH was the highest in term of the antimicrobial utilization and cost at Orlando Health (OH):
  - Meropenem, linezolid, daptomycin, tigecycline... etc
- The antibiotic Cost / Patient Day Equivalent (PDE):
  - $33.6 at DPH vs. $22.9 at ORMC
- The usage of meropenem was above the national average
ASP in Dr. P. Phillips Hospital

- Started in fiscal year 2010
- ID trained pharmacist (1 FTE) plus an enthusiastic ID physician (0 FTE)

**Goals / Mission:**

- Ensuring the proper use of antimicrobials:
  - To optimize patient outcomes
  - To reduce adverse drug events including secondary infection
  - To prevent or slow the emergence of antimicrobial resistance
  - To promote cost-effectiveness regimen
Limited Resources…
Toughest Moment ……..

- Limited ID pharmacist role (>50% staffing)
- No antibiotic restriction (failed in the past)
- No electronic chart system (paper notes → hard to read 😞)
- No software, IS reports…..
- Low antimicrobial susceptibility Antibiogram
  - Antibiogram had not been done for years
- Big Drug Rep influence
- Challenging physicians:
  - 4 private ID physician groups
  - Private hospitalist groups: switching patients everyday
  - Physicians were not taking their responsibilities on antibiotics
  - Intensivists using broad spectrum & NEW abx – no streamlining
  - Surgeons using tigecycline, meropenem for surgical prophylaxis
- Commonly seen pts on prolonged abx course for no reason
Overview ASP Duties:

Daily antimicrobial agents monitoring & surveillance:
- Review all C.diff positive cases
- Review all patients on antimicrobials:
  - IV to PO switch
  - Bug-drug Mismatch
  - Possibility de-escalation per culture results
  - Decrease the duration of antimicrobials
  - Formulary alternatives per culture results, allergies, pharmacotherapy
  - Dose optimization per renal / hepatic function
  - Discontinue surgical prophylaxis antimicrobial agent(s)
  - Allergies investigation (Antimicrobial Allergy Team)
  - Monitor high cost / broad spectrum / high toxicity / national shortage agents:
    - Meropenem, tigecycline, linezolid, daptomycin, colistin, aminoglycosides, ampho-B
Establish Local ASP Subcommittee:

- ID pharmacist
- Infection Prevention
- DPH Antimicrobial Stewardship Subcommittee
- Labs Rep
- RN Rep
- IS rep
- Bonus: Adm Rep, Epidemiologist

Physician team:
- ID physicians
- Hospitalist(s)
- Intensivist(s)
- Surgeon(s)
- ED

ORLANDO HEALTH®
Low Hanging Fruits:

• Implement Pharmacy Protocols:
  – Mandatory Vancomycin, Aminoglycosides, and Colistin / Polymyxin B Dosing pharmacy consult protocol
    • Education pharmacy staff for proper dosing
  – IV to PO Pharmacy protocol
    • Antibiotics with high bioavailability (e.g. metronidazole, ciprofloxacin)
  – Automatic post-op antibiotic protocol (core measure)
  – Antimicrobial renal dosing adjustment protocol
  – Advocate alternative dosing with B- lactams extended infusion:
    • Piperacillin- tazobactam 4 hours infusion Protocol
    • Nafcillin continuous infusion
Low Hanging Fruits:

Reduction of Inappropriate Antimicrobial use

- **Mandatory Antimicrobial INDICATION:**
  - Ensure choosing the proper agents and dosing
- **Mandatory Antimicrobial STOP DATE**
  - To avoid prolonged duration
Handling Overuse Antimicrobials:

• Can be done without mandatory restriction!
• For example Meropenem:
  – Data collection
  – Comparison with other similar hospitals (apple to apple)
  – Conduct Medication Utilization Evaluation (MUE)

To: DPH Antimicrobial Stewardship Program Subcommittee
From: Suetping Lau, Pharm.D
Re: Meropenem MUE

A review was conducted for all patients who received Meropenem (Mer) at DPH during the month of August through October, 2010.

Data Review:

<table>
<thead>
<tr>
<th>Month</th>
<th>Total Mer orders</th>
<th>Total days on Mer</th>
<th>Avg. days on Mer</th>
<th>Range</th>
<th># of pt on Mer &gt;10days</th>
</tr>
</thead>
<tbody>
<tr>
<td>August</td>
<td>36</td>
<td>209</td>
<td>5.8</td>
<td>2 – 14</td>
<td>3</td>
</tr>
<tr>
<td>September</td>
<td>27</td>
<td>169</td>
<td>6.3</td>
<td>2 – 12</td>
<td>2</td>
</tr>
<tr>
<td>October</td>
<td>38</td>
<td>226</td>
<td>5.9</td>
<td>1 – 17</td>
<td>7</td>
</tr>
</tbody>
</table>

Prescribing Physician per each Month

<table>
<thead>
<tr>
<th></th>
<th>ID</th>
<th>Hospitalist</th>
<th>Intensivist</th>
<th>Pulmonologist</th>
<th>Surgeon</th>
<th>GI</th>
</tr>
</thead>
<tbody>
<tr>
<td>August</td>
<td>15</td>
<td>12</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>September</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>October</td>
<td>9</td>
<td>14</td>
<td>12</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Meropenem indications per Month:

<table>
<thead>
<tr>
<th></th>
<th>PNA</th>
<th>Sepsis</th>
<th>UTI</th>
<th>Wound infx</th>
<th>Abd infx</th>
<th>Bacteremia</th>
<th>Pancreatitis</th>
<th>Peritonitis</th>
<th>FN</th>
<th>Pre-op proph</th>
<th>Misc</th>
</tr>
</thead>
<tbody>
<tr>
<td>August</td>
<td>11</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sept</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>October</td>
<td>9</td>
<td>8</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Handling Overuse Antimicrobials:

- Present MUE results to Stewardship meeting, department meetings
- Meet / Educate individual prescribers
- Daily review with all of meropenem orders

![Meropenem (FY2008-2016) chart]

Meropenem (FY2008-2016)

- Meropenem (DPH- 200 beds)
- Meropenem (ORMC-600 beds)

ASP started
Ex. Handling Overuse Antimicrobials:

Daptomycin & linezolid Utilization

<table>
<thead>
<tr>
<th>Year</th>
<th>Linezolid</th>
<th>Daptomycin</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>67</td>
<td>31</td>
</tr>
<tr>
<td>2009</td>
<td>49</td>
<td>21</td>
</tr>
<tr>
<td>2010</td>
<td>19</td>
<td>13</td>
</tr>
<tr>
<td>2011</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>2012</td>
<td>9</td>
<td>16</td>
</tr>
<tr>
<td>2013</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>2014</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2015</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>2016</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
Surveillance of Antimicrobial Usage:

• Monitor progress and efficacy of antimicrobial usage

• Common Methods:
  – Define Daily Dose (DDD)
    • Amount of drug that a typical patient might receive on any day for therapeutic purposes
  – Days of Therapy (DOT)
    • Broadly applicable to a pediatric population
  – Antimicrobial purchased data
    • Easiest data to obtain from pharmacy
    • Administrative favorable ($$$)
    • Cost can be impacted switching from brand to generic, shortage etc

Surveillance of Antimicrobial Usage:

- Antibiotic consumption estimates vary based on the method of calculation (i.e., DDD versus DOT)
- Which method to pick?
  - Doesn’t matter
  - Most important – using consistent metric!
    - Monitor its own consumption trends.
    - Time series analyses allow trends to be detected
- How often to do?
  - Depends.....
  - When starting the ASP, quarterly or semi-annually may need
  - Once stabilized ASP, it can be done annually
Major antimicrobial agent utilization:

Antimicrobial Agents Utilization (FY 2008-2016)

- Linezolid
- Daptomycin
- Tigecycline
- Meropenem
- Cipro
- Moxifloxacin
- Pip/tazo
- Cefepime

DDD/1000 pt days

- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
Perform Annual Antibiogram

– Monitoring the bacterial resistances
– May see improvement from ASP

**DPH Antimicrobial Susceptibility Report**

*July 2015 to June 2016*

Microbiology Laboratory Number: 221-5225

<table>
<thead>
<tr>
<th>MIC breakpoint, mcg/mL</th>
<th>≤0.5</th>
<th>≤4</th>
<th>≤1</th>
<th>≤0.25</th>
<th>≤2</th>
<th>≤4/≤2</th>
<th>≤2/≤1/≤2</th>
<th>≤2/≤2/≤1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Staphylococcus aureus</strong></td>
<td>88</td>
<td>70</td>
<td>97</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td><strong>MRSA</strong></td>
<td>138</td>
<td>60</td>
<td>94</td>
<td>100</td>
<td>100</td>
<td>99</td>
<td>93</td>
<td>100</td>
</tr>
<tr>
<td><strong>MSSA</strong></td>
<td>199</td>
<td>80</td>
<td>99</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td><strong>Staphylococcus epidermidis</strong></td>
<td>18</td>
<td>60</td>
<td>84</td>
<td>100</td>
<td>95</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td><strong>Enterococcus faecalis</strong></td>
<td>110</td>
<td>100</td>
<td>23</td>
<td>100</td>
<td>71</td>
<td>99</td>
<td>99</td>
<td>98</td>
</tr>
<tr>
<td><strong>Enterococcus faecium</strong></td>
<td>20</td>
<td>25</td>
<td>20</td>
<td>100</td>
<td>79</td>
<td>95</td>
<td>26</td>
<td>70</td>
</tr>
</tbody>
</table>
Data mining software Assistance

- Enhance ASP activities
- Provide Real-Time alerts
- Able to custom report for individuals’ needed
- Common Electronic Health Record (HER)s systems:
  - Epic HER
  - Cerner HER
- Clinical Decision Support systems (CDSSs)
  - TheraDoc
  - SafetySurveillor
  - Quality Compass PathFinder
  - Sentri7
  - Medminded
  - Vigilanz

ASP weekday Surveillance at DPH

- Review daily antimicrobial use in each hospital unit
- Utilization of Vigilanz alerts:
  - Positive blood cultures, positive PCR blood culture, C.dif positive, positive cultures, ordering restricted antibiotic etc

**Link to alert:**

- 320001@vigilanzcorp.com
- Sent: Wed 5/11/2016 6:02 AM
- To: Lau, Suet-ping

Alert Date: 05/11/2016 06:01
Alert/Warning ID: 1233546
Alert Type: Alert
Action Expected Date: 05/11/2016 06:01
Link to alert: https://www.vigilanzportal.com/dpms/Login.aspx?
AlertID=1233546&amp;Application=ICM&amp;status=P&amp;clientid=320001
Module: ICM
Module Name: Dynamic Infection Control Module
Priority: High
Rule: DPH Pharmacy - Positive Blood Culture by Nanosphere
System: Vigilanz Corp
Antimicrobial Agent Cost Saving at DPH (Before vs. After ASP):

<table>
<thead>
<tr>
<th>Year</th>
<th>Antimicrobial agents yearly expenditure</th>
<th>Cost reduction from year of 2009 without ASP (baseline)</th>
<th>Cost Reduction from the previous year</th>
<th>Cost Reduction from the previous year (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>$1,630,546</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>$1,374,318</td>
<td>$256,228</td>
<td>$256,228</td>
<td>-16.0%</td>
</tr>
<tr>
<td>2011</td>
<td>$863,932</td>
<td>$766,614</td>
<td>$510,386</td>
<td>-37.0%</td>
</tr>
<tr>
<td>2012</td>
<td>$788,461</td>
<td>$842,085</td>
<td>$75,471</td>
<td>-9%</td>
</tr>
<tr>
<td>2013</td>
<td>$550,106</td>
<td>$1,080,440</td>
<td>$238,355</td>
<td>-30%</td>
</tr>
</tbody>
</table>

*Potential Cost Saving in 4 years: $2,945,365*
Quality:

➔ Ways to Sustain Antimicrobial Stewardship Program (ASP)
Tracking ASP Related Interventions

• **Job security!**
  – Data to show to your boss, ASP meeting

• **Review the acceptance and rejection rates**
  – Knowing the trends:
    • Any particular providers who usually reject the interventions?
    • Who are those accept the intervention most often

• **Track the potential cost saving from ASP**

• **Track Critical interventions (quality)**
  – Reduce length of stay
  – Prevention Adverse Drug Reactions / bad consequences
  – Bug-Drug mismatch
Overall Intervention Acceptance Rate at DPH

Overall Acceptance Rate: 96%

Type of Interventions (N=1524)

- ID consult rec'd accepted: 89%
- Therapy rec'd accepted: 96%
- Formulary Alt Accepted: 96%
- Cut Duration of abx Accepted: 92%
- Dose Optimization Accepted: 97%
- D/C of Prophylaxis Accepted: 100%
- IV to PO Accepted: 100%
- De-Escalation Accepted: 93%
Critical Interventions:

Critical Intervention in FY 2016 (N=163)

- Bug-drug mismatch: 63
- Positive culture not properly treated (discharged pt)
- Critical labs or cultures notification: 26
- Potential ADR prevention
- Reduce LOS: 27
- ID consult recommended: 20
- Allergy Testing: 14
- Drug Information: 7
- Pharmacokinetic consult: 1
- ID consult recommended: 2
- Pharmacokinetic consult: 3
1st CAUTI Rounds at DPH

- Established the FIRST CAUTI prevention Rounds at DPH with the Infectious Diseases Physician in 2012
  - Weekly rounds with ID physician
  - Educated Staff and family member to remove unnecessary Foley catheter
- Developed electronic CAUTI Progress Note
- Assisted other sites to establish site wide CAUTI rounds
- Transfer the rounding to the unit charge nurse
- Successfully reduced the CAUTI rate at DPH

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th># of CAUTI</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>25</td>
</tr>
<tr>
<td>2012</td>
<td>15</td>
</tr>
<tr>
<td>2013</td>
<td>11</td>
</tr>
<tr>
<td>2014</td>
<td>3</td>
</tr>
<tr>
<td>2015</td>
<td>2</td>
</tr>
<tr>
<td>2016</td>
<td>3</td>
</tr>
</tbody>
</table>

411 days without CAUTI
C. Difficile Infection (CDI) Prevention

- **Collaborate Infection Preventionist**
  - Review all HACDI cases
  - C. diff task force: launched hand-washing Champaign
  - Unit Practice council

- **Reduced unnecessary antimicrobial usage**
  - Fluoroquinolones restriction at Orlando Health (FY2013)

- **Reduced proton pump inhibitor (PPI) usage**

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th># of HACDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>53</td>
</tr>
<tr>
<td>2011</td>
<td>82</td>
</tr>
<tr>
<td>2012</td>
<td>64</td>
</tr>
<tr>
<td>2013</td>
<td>75</td>
</tr>
<tr>
<td>2014</td>
<td>43</td>
</tr>
<tr>
<td>2015</td>
<td>52 → 86</td>
</tr>
<tr>
<td>2016</td>
<td>61</td>
</tr>
</tbody>
</table>

- EIAS to PCR test
- 42% reduction in a year
- NSHN criteria changed
**Background:**

Catheter-associated urinary tract infection (CAUTI) is the most common healthcare-associated infection (HAI) in the United States. Studies have shown 25% of patients develop bacteriuria after having a urinary catheter for 1-10 days and 36% of those patients would develop CAUTI. Over 560,000 CAUTI cases are reported annually which carries significant morbidity, mortality, and cost for the healthcare system.

**Aim:**

To develop targeted strategies for the prevention of CAUTI by limiting the use and duration of urinary catheterization.

**Actions Taken:**

The targeted strategies included:
- Established CAUTI prevention rounds in 2011.
- Educated staff to remove and reposition urinary catheter and encourage using external condom catheter (Texas catheter).
- Implement CAMI bundles in ICU.
- Established Unit Quality Teams to address unit-specific challenges.
- Utilized bladder scanners to assess urinary retention.
- Removed urinary catheter before post-operative day 2 (POD 2) or removed insertion when able.
- Mandated an instruction for inserting urinary catheter.
- Limited insertion urinary catheter to RN using sterile technique and sterile equipment.

**Outcomes:**

Graph 1: Number of CAUTI cases from fiscal year 2010 – 2016:

<table>
<thead>
<tr>
<th>Year</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>125</td>
</tr>
<tr>
<td>2011</td>
<td>110</td>
</tr>
<tr>
<td>2012</td>
<td>105</td>
</tr>
<tr>
<td>2013</td>
<td>95</td>
</tr>
<tr>
<td>2014</td>
<td>90</td>
</tr>
</tbody>
</table>

**Over 40% reduction of HACDI in a Year**

**Team Members:**
- Joanne Galvagni, MD
- Michelle Stroier
- Wendy Houghton
- Margaret Zeigler, RN, BSN

**Outcomes:**

- The incidence of Clostridium difficile infection (CDI) has had a marked increase during the last decade. Based on this, in 2013, the Department of Health & Human Services (HHS) set a 5-year reduction goal of 20%. Healthcare Associated Clostridium difficile infections (HACDI) is associated with increased hospital stay, cost, morbidity, and mortality. The approximate hospital cost of a CDI case ranges from $9,179 to $11,400. Graph 1 shows the establishment of an antimicrobial stewardship program since 2010, our HACDI rates at Dr P. Phillips Hospital (DPPH) was still not under control.

**Summary:**

Healthcare Associated Clostridium difficile infections (HACDI) prevention is complex and challenging. It requires all members of the healthcare team to work together. After a tremendous hospital-wide effort at DPPH, we were able to have a 43% reduction of our HACDI in FY 2014 compared to FY 2013, exceeding the 5% goal set by the HHS.
Antimicrobial Allergy Team (AAT)

- AAT established in DPH since October 2011
  - To evaluate patients who develop NEW vancomycin reaction(s) upon admission at DPH
  - Additional Pre-PEN service to evaluate patient who has history of Penicillin allergy

- Goals:
  - Complete patient allergy profile by eliminating invalid antibiotic allergy
  - Improve quality of patient care by broadening the antibiotic choices in the future
  - Improve the proper ways of administering vancomycin
  - Potential cost saving

- Successfully re-challenges Vancomycin/ PCN: 92%
Outpatient Antimicrobial Stewardship

• At least 30% antibiotics used in the outpatient setting are unnecessary
• Education Primary Care provider to promote appropriate prescribing antibiotics in clinics
Improvement of bacterial resistance:

DPH Annual Antiбиogram

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Amikacin</td>
<td>95</td>
<td>95</td>
<td>96</td>
<td>96</td>
<td>98</td>
<td>98</td>
<td>98</td>
<td>97</td>
</tr>
<tr>
<td>Cefepime</td>
<td>64</td>
<td>83</td>
<td>85</td>
<td>90</td>
<td>91</td>
<td>89</td>
<td>87</td>
<td>95</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>57</td>
<td>71</td>
<td>75</td>
<td>88</td>
<td>80</td>
<td>79</td>
<td>84</td>
<td>91</td>
</tr>
<tr>
<td>Pipercillin-Tazobactam</td>
<td>75</td>
<td>89</td>
<td>92</td>
<td>92</td>
<td>96</td>
<td>93</td>
<td>94</td>
<td>96</td>
</tr>
<tr>
<td>Meropenem</td>
<td>64</td>
<td>79</td>
<td>86</td>
<td>89</td>
<td>95</td>
<td>93</td>
<td>96</td>
<td>97</td>
</tr>
</tbody>
</table>
### Improvement of bacterial resistance: Rates of Multiple Drug Resistant organisms (MDRO):

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MRSA</td>
<td>55%</td>
<td>55%</td>
<td>50%</td>
<td>50%</td>
<td>51%</td>
<td>46%</td>
<td>41%</td>
<td>36%</td>
</tr>
<tr>
<td>VRE</td>
<td>17%</td>
<td>13%</td>
<td>19%</td>
<td>17%</td>
<td>18%</td>
<td>14%</td>
<td>5.3%</td>
<td>5%</td>
</tr>
<tr>
<td><strong>ESBL:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• E. Coli</td>
<td>8%</td>
<td>5%</td>
<td>6.6%</td>
<td>4.5%</td>
<td>6.1%</td>
<td>8.6%</td>
<td>9.5%</td>
<td>9.6%</td>
</tr>
<tr>
<td>• K. pneumoniae</td>
<td>15%</td>
<td>12%</td>
<td>9%</td>
<td>8.2%</td>
<td>4%</td>
<td>8.2%</td>
<td>11.2%</td>
<td>7%</td>
</tr>
<tr>
<td><strong>CRE:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• KPC</td>
<td>2.4%</td>
<td>1.8%</td>
<td>1.6%</td>
<td>0.6%</td>
<td>0.7%</td>
<td>1%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>MRSA vancomycin</strong></td>
<td>NA</td>
<td>2.5%</td>
<td>4.5%</td>
<td>0</td>
<td>1.7%</td>
<td>0</td>
<td>0</td>
<td>0.9%</td>
</tr>
<tr>
<td>MIC ≥ 2</td>
<td></td>
<td>(N=6)</td>
<td>(N=9)</td>
<td></td>
<td>(N=3)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*: Labs removed vancomycin MIC 1.5
Poster Presentation at IHI Dec, 2013

Quality & Economic Outcomes from a 3 year Antimicrobial Stewardship Program in a Community Hospital
Sue-ping Lai, Pharm.D.; Antonio Crepa, MD; Dr. P. Phillips Hospital, Orlando Health, Orlando, FL

Background
Antibiotic resistance is a major concern globally.
The Antimicrobial Stewardship Program (ASP) aims to promote the use of antimicrobials, duration, and route of treatment in order to improve patient outcomes, while maintaining bacterial susceptibility and the persistence of antimicrobials.

Objectives:
Accurate assessment of infection severity and appropriate initial antibiotic therapy.

Improvement Methods
• The ID pharmacist reviewed all antimicrobials used daily for appropriateness.
• Verbal communication or written notes were used to make recommendations.
• Recommendations were not mandatory.
• Prospective audit was utilized during the interventions.
• ID physician would be the backup for challenging prescribing behavior.

Results
• Over 3 years, 3724 interventions were conducted with 98% acceptance rate.
• Potential antimicrobial cost savings was approximately $1,404,756.
• Reduction in use of broad spectrum and costly antimicrobial agents despite the growing concern.
• Improvement of bacterial susceptibility and reduced rate of multi-drug resistant organism (MDRO) infections.
• During the same period of time, improvement in unplanned readmissions and unexpected mortalities were observed.

Conclusions
Our findings showed a successful ASP without regulatory compliance. Constant education to the prescribers resulted in improved judicious use of antibiotic utilization with significant cost savings. More importantly, a favorable trend in reduced antibiotic susceptibilities and reduction of MDRO rates in the hospital were seen.
Summary

- An ASP was successfully created in a community hospital with limited resources.
- Culture of antimicrobial stewardship has changed dramatically since the creation of the program.
- Support from physicians and hospital leadership with a dedicated ID trained pharmacist are the keys to the success.
- Improvement in resistance pattern and in controlling multidrug resistance has been noted.
- The program has spread to the entire organization.
Building a strong Antimicrobial Stewardship Program in a community hospital with limited resources

Sue Lau, Pharm.D
Infectious Disease Pharmacist
Orlando Health – Dr P Philips Hospital
21st September, 2017

Thank you!