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

ORLANDO HEALTH®

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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 patent HARM

Albert RH. Diagnosis and treatment of acute bronchitis. *Am Fam Physician*. 2010;82(11):1345-50.
Irwin RS, Baumann MH, Bolser DC, et al. Diagnosis and management of cough: ACCP evidence-based clinical practice guidelines. Chest. 2006;129(1 Suppl).
Gonzales R, Bartlett JG, Besser RE, et al. Principles of appropriate antibiotic use for treatment of uncomplicated acute bronchitis. Ann Intern Med. 2001;134(6):521-9.
Cosgrove SE et al. Inf Cont & Hosp Epid 2012; 33: 374-380
Chang HT et al. *Infect Control Hosp Epidemiol* 2007; 28:926-931

Importance of Antimicrobial Stewardship:

- All antimicrobial use, appropriate or not, carries a risk for developing resistance.
- Antimicrobials should be use ***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

U.S. Centers for Disease Control and Prevention, *Antibiotic Resistance Threats.*

FORUM ON ANTIBIOTIC STEWARDSHIP

JUNE 2, 2015

National Action Plan Goals:

1. Slow the Emergence of Resistant Bacteria and Prevent the Spread of Resistant Infections.
2. Strengthen National One-Health Surveillance Efforts to Combat Resistance.
3. Advance Development and Use of Rapid and Innovative Diagnostic Tests for Identification and Characterization of Resistant Bacteria.
4. Accelerate Basic and Applied Research and Development for New Antibiotics, Other Therapeutics, and Vaccines
5. Improve International Collaboration and Capacities for Antibiotic-resistance Prevention, Surveillance, Control, and Antibiotic Research and Development.

Joint Commission / CMS Regulations

Joint Commission

Requirement

Official Publication of Joint Commission Requirements

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*
   - *Infection prevention plans*
   - *Performance improvement plans*
   - *Strategic plans*
   - *Using the electronic health record to collect antimicrobial stewardship data*

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

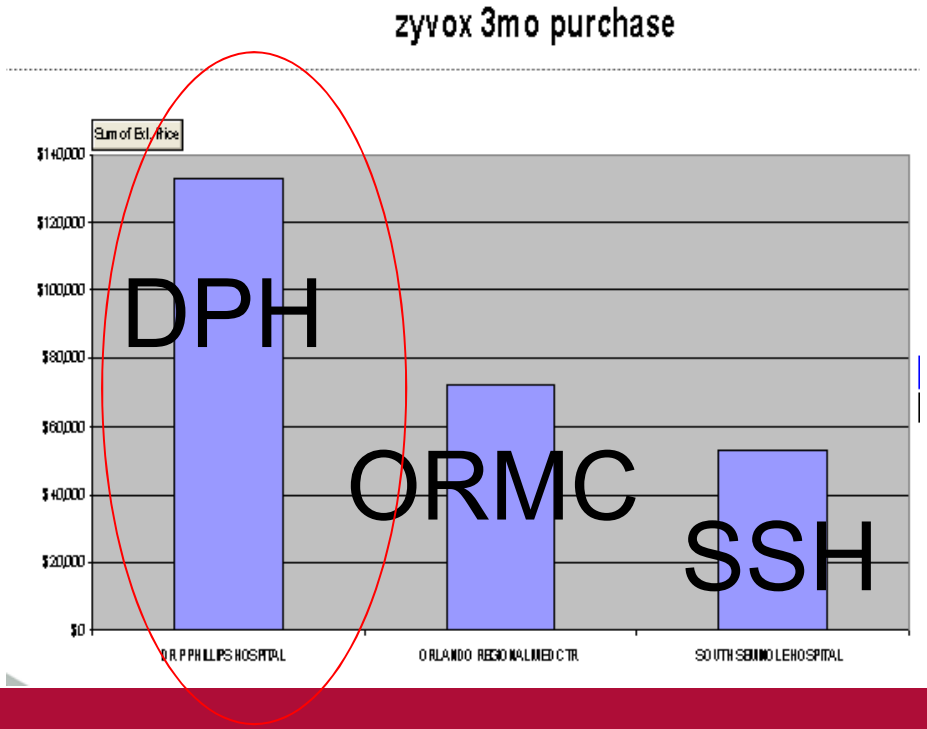
Building an Antimicrobial Stewardship Program (ASP) from scratch…

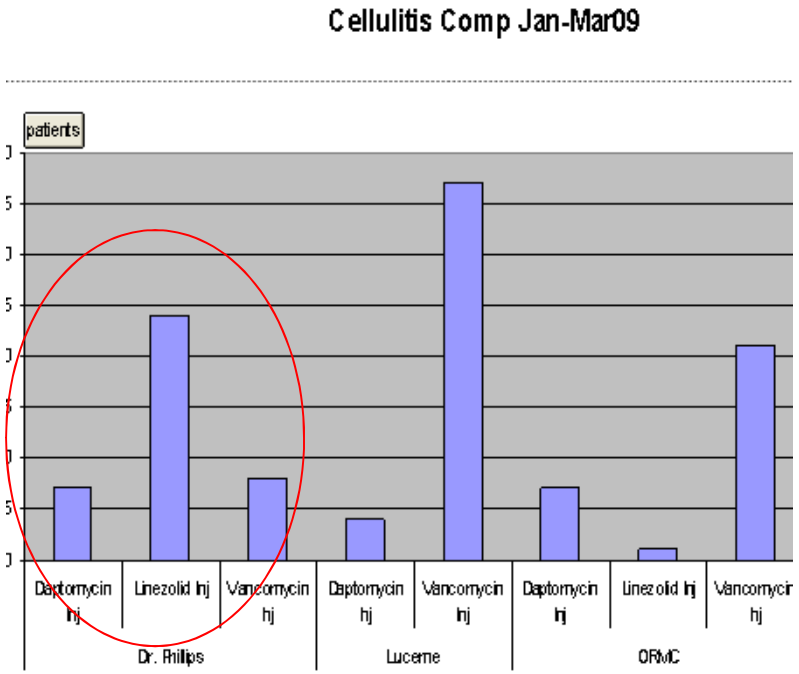
Dr. P. Phillips Hospital (DPH)

- 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 ……..

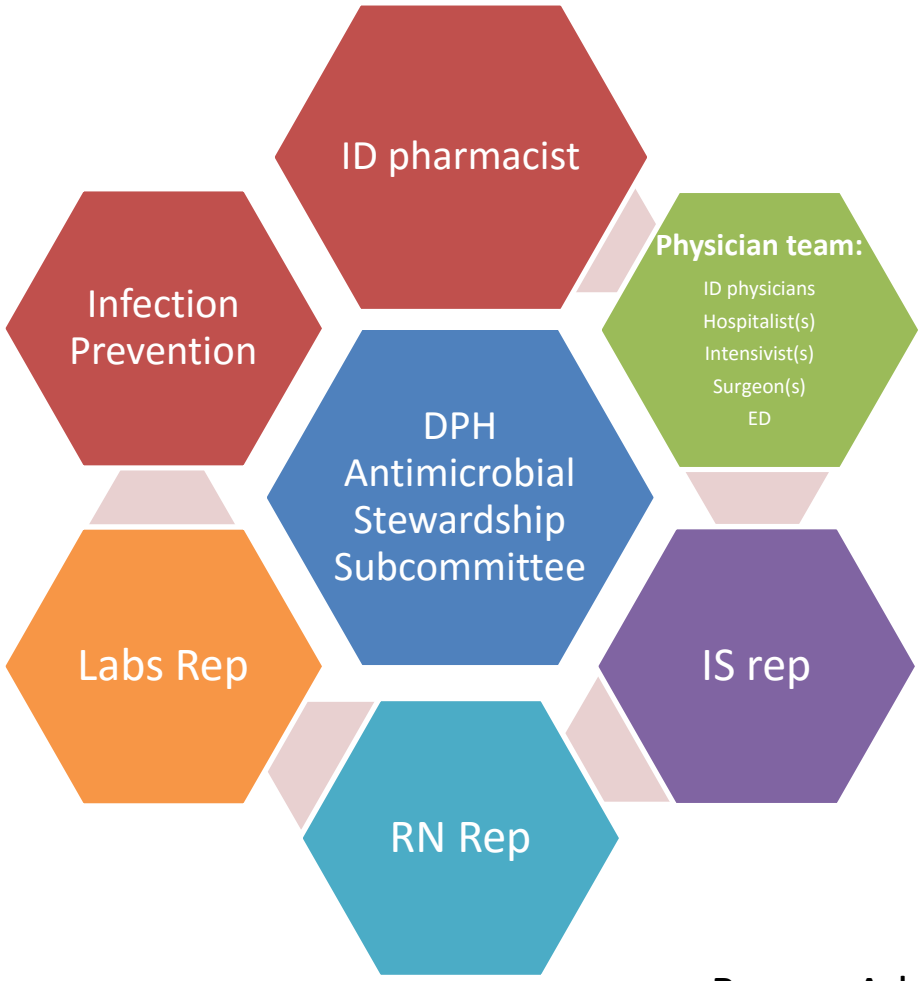
- Limited ID pharmacist role (>50% staffing)
- No antibiotic restriction (failed in the past)
- No electronic chart system (paper notes → hard to read ☹)
- No software, IS reports…..
- Low antimicrobial susceptibility Antibiogram
  - Antibiogram had not been done for years
- Big Drug Rep influence
- 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:



Bonus: Adm Rep, Epidemiologist

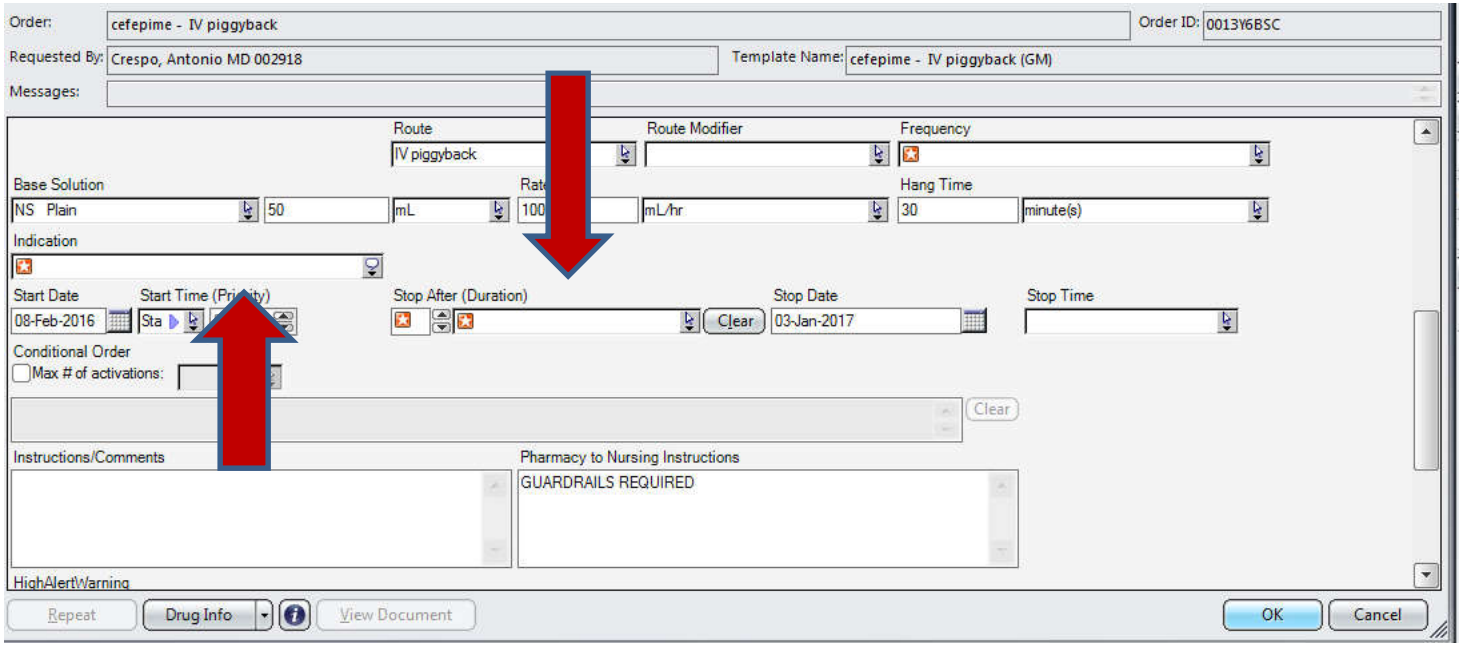
Low Hanging Fruits:

- 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:

Month	Total Mer orders	Total days on Mer	Avg. days on Mer	Range	# of pt on Mer >10days
August	36	209	5.8	2 – 14	3
September	27	169	6.3	2 – 12	2
October	38	226	5.9	1 - 17	7

Prescribing Physician per each Month

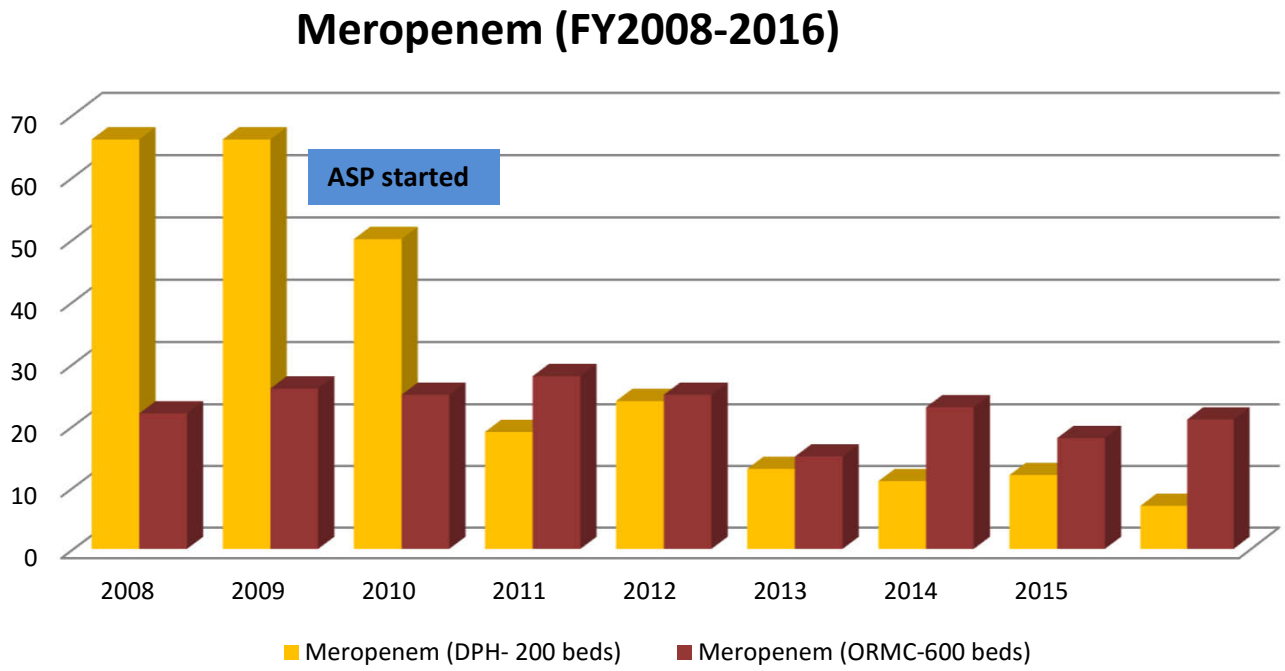
	ID	Hospitalist	Intensivist	Pulmonologist	Surgeon	GI
August	15	12	6	3	0	0
September	9	9	9	0	0	0
October	9	14	12	0	2	1

Meropenem indications per Month:

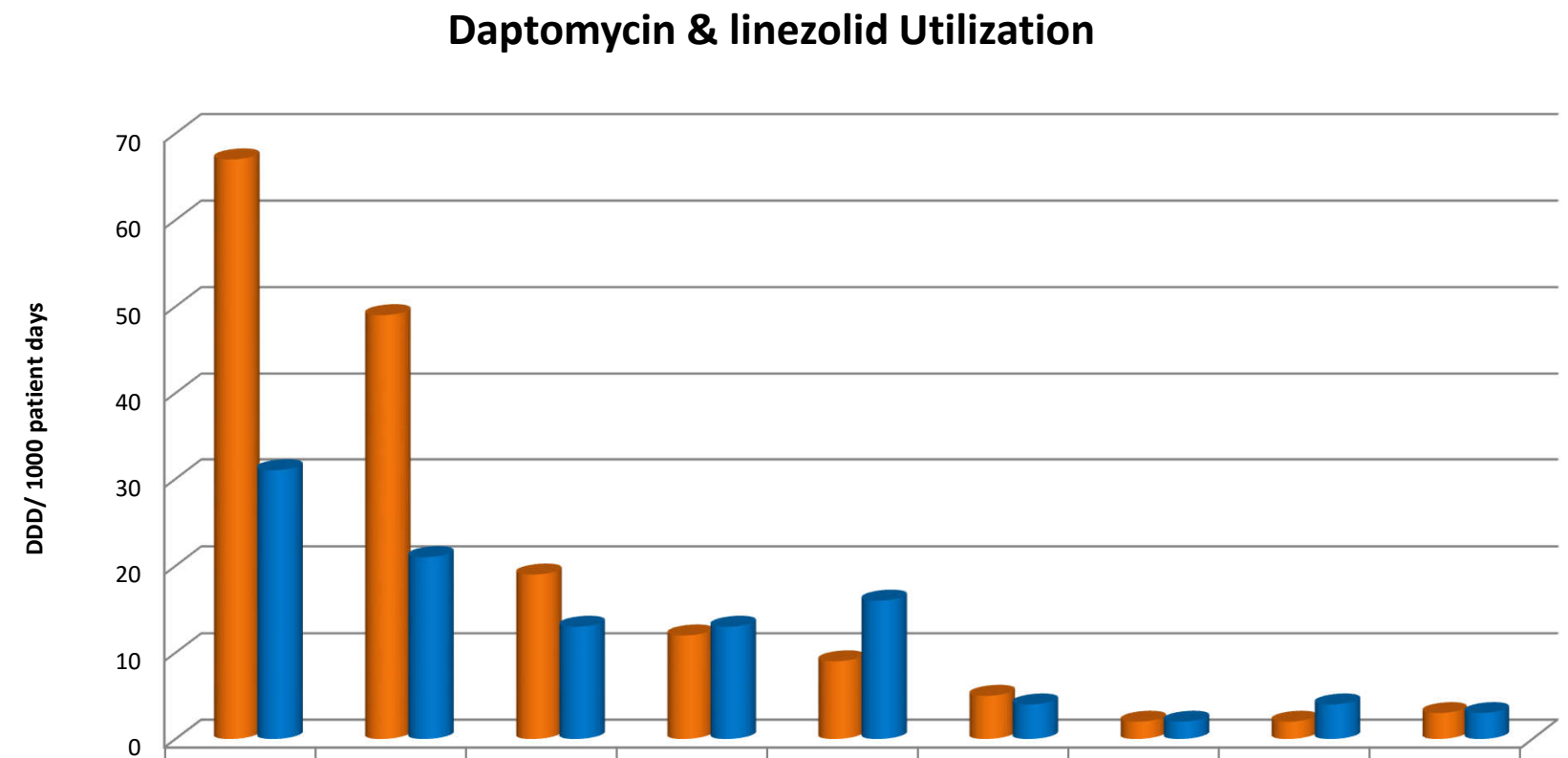
	PNA	Sepsis	UTI	Wound infx	Abd infx	Bacteremia	Pancreatitis	Peritonitis	FN	Pre-op proph	Misc
August	11	7	6	8	1	2	1	0	0	0	0
Sept	5	4	6	5	0	0	2	3	0	0	2
October	9	8	4	5	3	0	2	1	4	1	1

Handling Overuse Antimicrobials:

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



Ex. Handling Overuse Antimicrobials:



	2008	2009	2010	2011	2012	2013	2014	2015	2016
Linezolid	67	49	19	12	9	5	2	2	3
Daptomycin	31	21	13	13	16	4	2	4	3

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

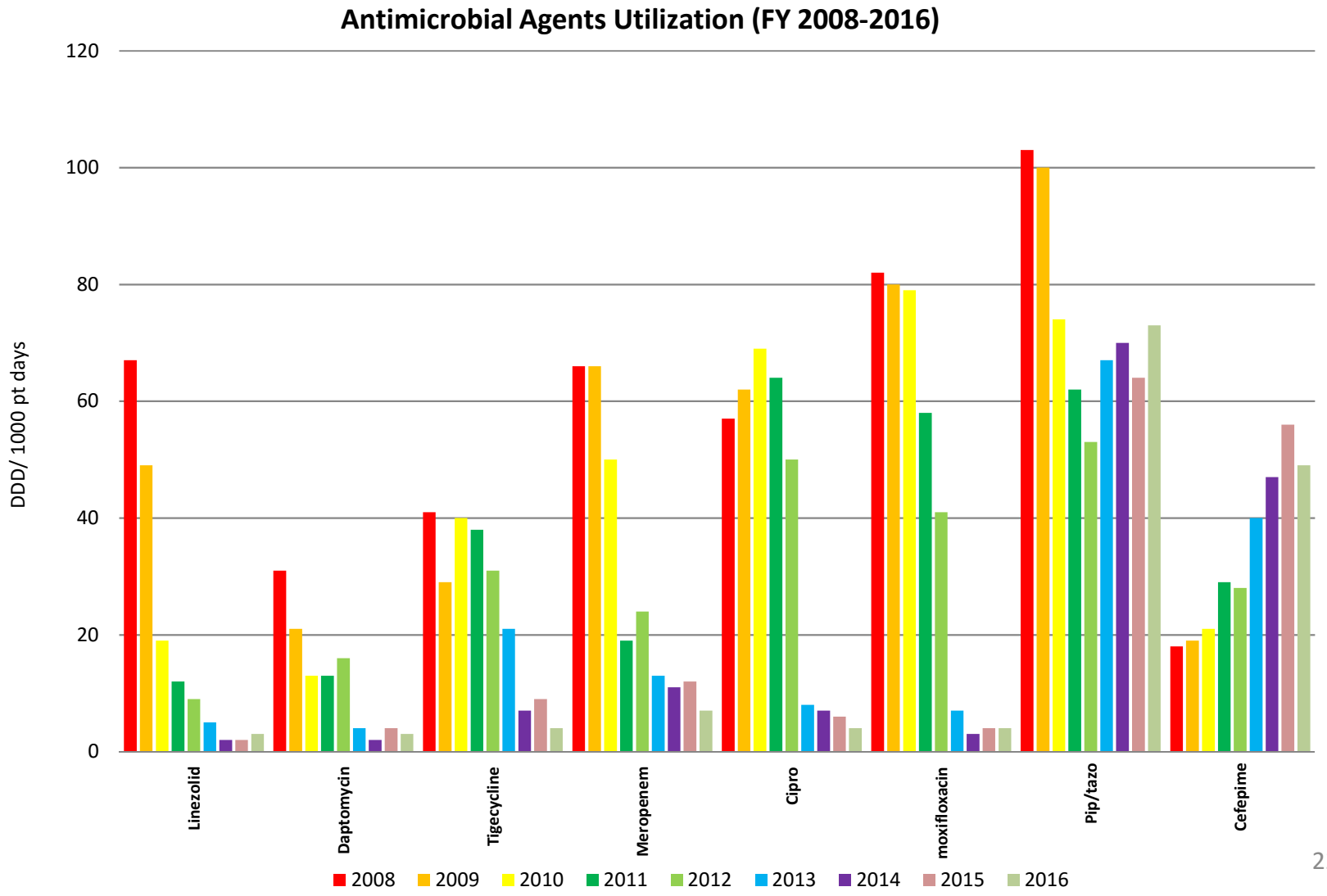
Curr Treat Options Infect Dis. 2014; 6(2): 101–112.

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

Ibrahim OM, Polk RE. Infect Dis Clin North Am. 2014 Jun; 28(2):195-214

Major antimicrobial agent utilization:



Perform Annual Antibiogram

- Monitoring the bacterial resistances
- May see improvement from ASP

DPH Antimicrobial Susceptibility Report
July 2015 to June 2016
Microbiology Laboratory Number: 321-841-5226

	No. Tested	Ampicillin[$$$]	Clindamycin[$$$]	Doxycycline[/$$$]	Daptomycin[$$$$$$]	Gentamicin[$]	Linezolid[$$$$$]	Nitrofurantoin[$] urine only	Nafcillin[$$$$]	Trimeth/Sulfa[$$$$]	Vancomycin[$]
MIC breakpoint, mcg/mL		≤8[c]	≤0.5	≤4	≤1[d]/≤4[ce]	≤1	≤4[de]/≤2[c]	≤32	≤2[d]/≤0.25[e]	≤2/38	≤4[ce]/≤2[d]
All *Staphylococcus aureus*	338	–	70	97	100	100[g]	100	100	59	97	100
MRSA	139	–	60	94	100	100[g]	100	99	0	93	100
MSSA	199	–	80	99	100	100[g]	100	100	100*	100	100
Staphylococcus epidermidis	19	–	60	84	100	95[g]	100	100	33	–	100
Enterococcus faecalis	110	100	–	23	100	71[h]	99	99	–	–	98
Enterococcus faecium	20	25	–	–	100	79[h]	95	26	–	–	70

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

Graeme N. Forrest, et al Michael Postelnick; Use of Electronic Health Records and Clinical Decision Support Systems for Antimicrobial Stewardship, CID, Vol59,Oct 2014, Pages S122–S133

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.diff positive, positive cultures, ordering restricted antibiotic etc

Link to alert:
https://www.vigilanzportal.com/dpms/Login.aspx?AlertID=

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&Application=ICM&status=P&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):

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

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

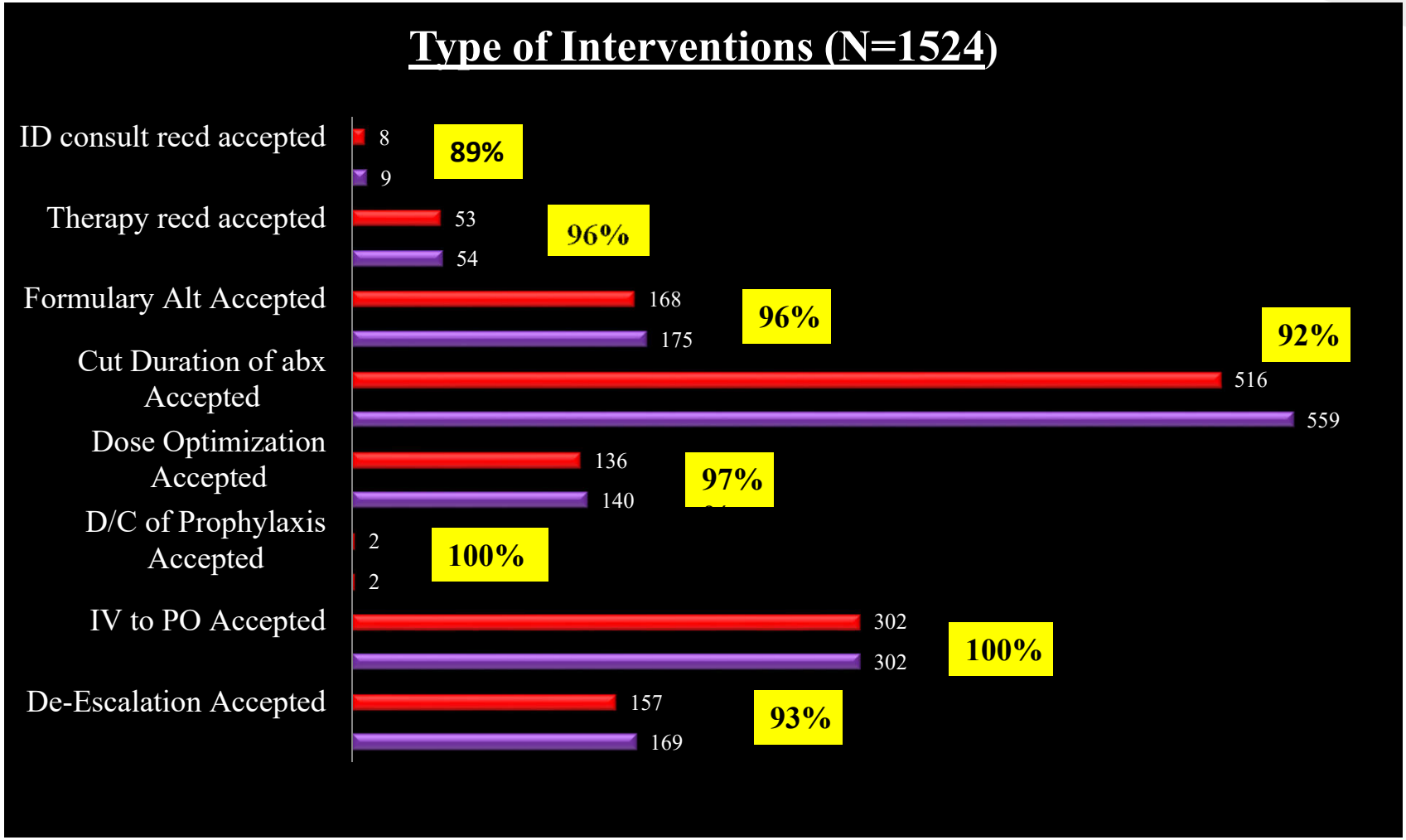
Quality:

→ Ways to Sustain Antimicrobial Stewardship Program (ASP)

Tracking ASP Related Interventions

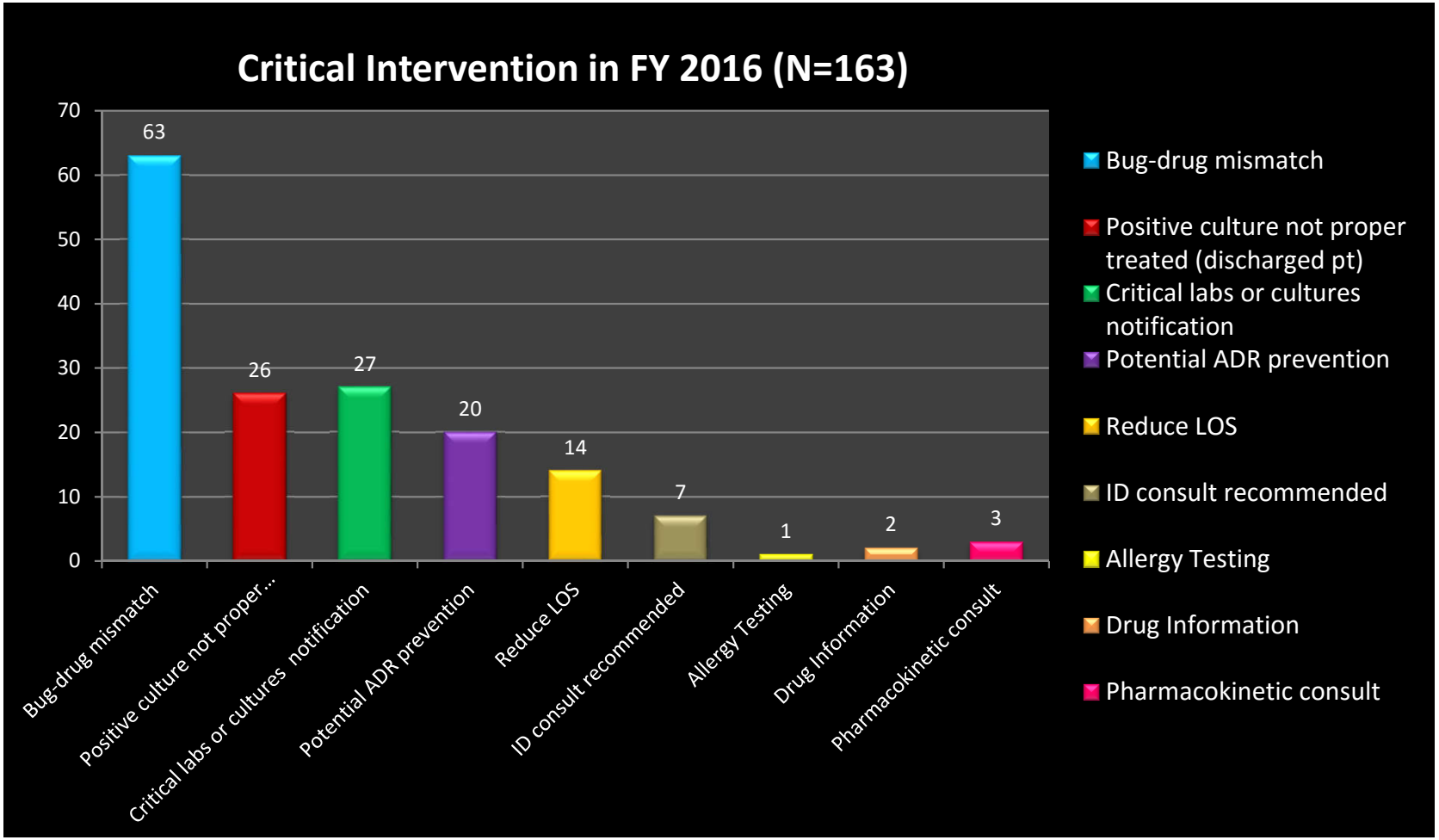
- Job security!
  - Data to show to your boss, ASP meeting
- Review the acceptance and rejection rates
  - Knowing the trends:
    - Any particular providers who usually reject the interventions?
    - Who are those accept the intervention most often
- Track the potential cost saving from ASP
- Track 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%

Critical Interventions:



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

Fiscal Year	# of CAUTI
2011	25
2012	15
2013	11
2014	3
2015	2
2016	3

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

Fiscal Year	# of HACDI
2010	53
2011	82
2012	64
2013	75
2014	43
2015	52 →86
2016	61

EIAS to PCR test

42% reduction in a year

NSHN criteria changed

We did It: Zero CAUTI for 411 days

Team Members:

Suet-ping Lau, Pharm.D	– Infectious Diseases pharmacist
Antonio Crespo, MD	– Chief Quality Officer
Roberto Rojas-Diaz, MD	– Infectious Diseases Physician
Sam Venus, MD	– Intensivist
Margaret Parr, BSN,RN,CIC	– Infection Preventionist

Background:

Catheter associated urinary tract infection (CAUTI) is the most common healthcare associated infection (HAI) in the United States. Studies have shown 26% of patient develop bacteriuria after having a urinary catheter for 2-10 days and 25% 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 indwelling urinary catheter and encourage using external condom catheter (Texas catheter)
- Implemented CAUTI bundle in ICU
- Established Unit Quality Triads to address unit specific challenges
- Utilized bladder scanners to asses urinary retention
- Removed urinary catheter before post-operative day 2 (POD2) or avoided insertion when able
- Mandated an indication for inserting urinary catheter
- Limited insertion urinary catheter to RN using aseptic technique and sterile equipment

CAUTI Rounds (ID physician + pharmacist)

- Rounds conducted weekly on all floors except ICU
- Educate hospital staff, patients, and family members to avoid / remove indwelling urinary catheter or use external condom catheter
- Later, more CAUTI rounds to nurses & hospitalists rounds

ICU CAUTI bundle (Intensivist)

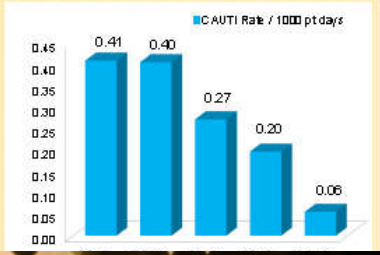
- Educate all ICU staff to avoid / remove indwelling urinary catheter or use external condom catheter
- Urinary catheter checklist during daily ICU rounds
- Utilize bladder scanners

Hospital wide

- Mandatory indication for inserting urinary catheter
- Educate all RNs on proper insertion technique
- Only trained RNs can insert urinary catheter
- Limit urinary catheter use in post-surgical patients to POD 2
- Utilize bladder scanners

Outcomes:

Graph 1: Number of CAUTI cases fromfiscal year 2010 – 2014:



Over 40% reduction of HACDI in a Year

Team Members:

Suet-ping Lau, Pharm.D	– Infectious Diseases pharmacist
Crespo Antonio, MD	– Chief Quality Officer
Margaret Parr, RN, BSN, CIC	– Infection Preventionist

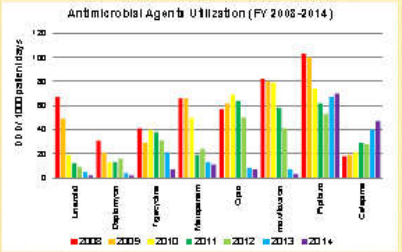
Background:

The incidence of Clostridium difficile infection (CDI) has had a marked increase during the last decade. Because of this, in 2013, the Department of Health & Human Service (HHS) set a 5-year reduction goal of 30%. 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 $11,456. Despite the establishment of a antimicrobial stewardship program since 2010, our HACDI rate at Dr. P. Phillips Hospital (DPH) was still not under control.

Aim:

Outcomes:

Graph 1: Antimicrobial utilization from FY 2008 - 2014



Graph 2: Pantoprazole utilization from FY 2011- 2014

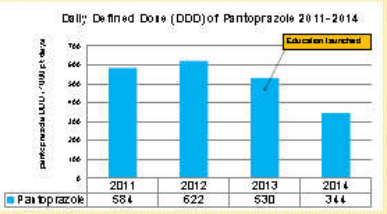


Table 1: HACDI rate from 2010 to 2014

Fiscal Year	# of HACDI	Rate / 1,000 patient days	Remarks
2010	53	0.83	Changed EIA to PCR testing in Feb, 2010
2011	82	1.33	
2012	64	1.08	
2013	75	1.34	
2014	43	0.8	

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 efforts at DPH, we were able to have a 43% reduction of our HACDI in FY 2014 compared to FY2013, exceeding the 5-year 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 Antibiogram

Pseudomonas *aeruginosa*	2010	2011	2012	2013	2014	2015	2016	2017
Amikacin	95	95	96	96	98	98	98	97
Cefepime	64	83	85	90	91	89	87	95
Ciprofloxacin	57	71	75	88	80	79	84	91
Pipercillin-Tazobactam	75	89	92	92	96	93	94	96
Meropenem	64	79	86	89	95	93	96	97

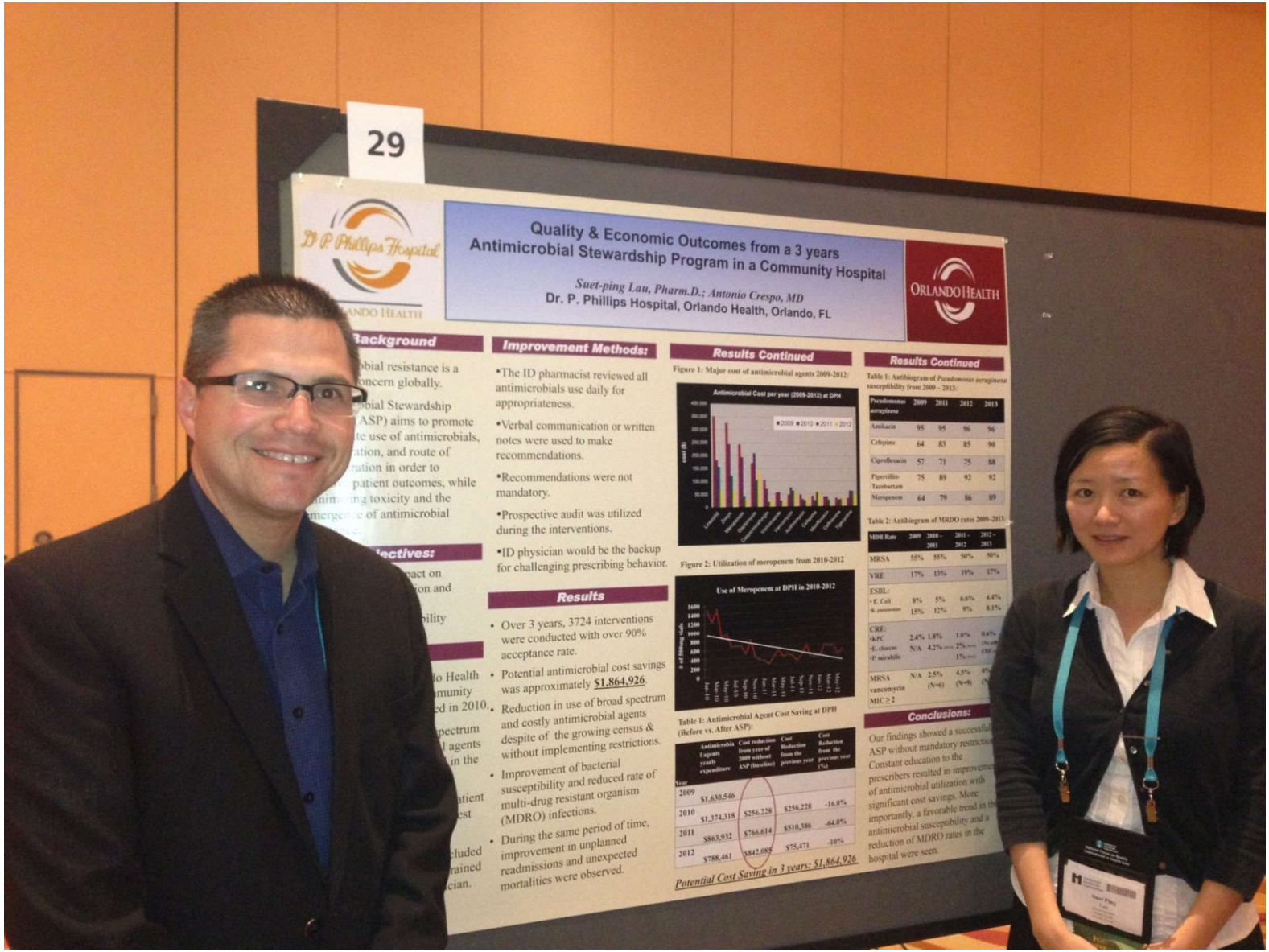
Improvement of bacterial resistance:

Rates of Multiple Drug Resistant organisms (MDRO):

MDRO Rate	2009-2010	2010 – 2011	2011 – 2012	2012– 2013	2013-2014	2014-2015	2015-2016	2016-2017
MRSA	55%	55%	50%	50%	51%	46%	41%	36%
VRE	17%	13%	19%	17%	18%	14%	5.3%	5%
ESBL: • E. *Coli* •K. *pneumoniae*	 8% 15%	 5% 12%	 6.6% 9%	 4.5% 8.2%	 6.1% 4%	 8.6% 8.2%	 9.5% 11.2%	 9.6% 7%
CRE: • KPC	 2.4%	 1.8%	 1.6%	 0.6%	 0.7%	 1%	 0	 0
•MRSA vancomycin MIC ≥ 2	NA	2.5% (N=6)	4.5% (N=9)	0	1.7% (N=3)*	0	0	0.9% (N=1)

*: Labs removed vancomycin MIC 1.5

Poster Presentation at IHI Dec, 2013



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

Thank you!

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