

The slide features abstract green geometric shapes. On the left, a solid green triangle points downwards. On the right, a complex arrangement of overlapping translucent green triangles and polygons creates a layered, geometric effect. The text is centered on a white background.

Antibiotic Stewardship

Translating best practices to rural Nebraska

Faith Regional Health Services

Norfolk, Nebraska

Process of Identifying Need

- ▶ Up to 50% of antibiotics used in hospital settings are deemed inappropriate
- ▶ Antibiotic stewardship programs are vital resources for improving antibiotic use
- ▶ Increasing resistance noted at Faith Regional over the past several years
- ▶ Centers for Disease Control – Core Elements of a Hospital Antibiotic Stewardship Program Checklist is provided to hospitals to determine specific needs per facility
- ▶ Project identification and prioritization at Faith Regional Health Services
 1. Update of order sets
 2. Urinalysis contamination
 3. IV to PO conversion per protocol
 4. Pharmacokinetic dosing improvements
 5. Microbiology reporting/antibiogram

CDC. Core Elements of Hospital Antibiotic Stewardship Programs. Atlanta, GA: US Department of Health and Human Services, CDC; 2014. Available at <http://www.cdc.gov/getsmart/healthcare/implementation/core-elements.html>

Process Improvement Methods

1. Revision and update of order sets

- ▶ Involved ASP pharmacist, hospital medicine & ID physicians, quality
- ▶ PDSA methodology used
- ▶ Determined a large focus would be on practitioner education and IT changes in the EMR
- ▶ Updates based on national guidelines and recommendations

2. Urinalysis contamination

- ▶ Involved infection preventionist, ASP pharmacist, hospital medicine physician, RN clinical educator, quality
- ▶ Baseline ER rate = 25% and inpatient rate = 31.5%
- ▶ Education provided to staff and patients
- ▶ New kit obtained

Process Improvement Methods

3. IV to PO conversion protocol

- ▶ Involved ASP pharmacist, pharmacy department
- ▶ Protocol designed and approved in committees
- ▶ Pharmacists make conversions daily
- ▶ ASP pharmacist tracks and reports to exec team and ASP committee
- ▶ Baseline cost/administration data obtained for IV levofloxacin use

4. Pharmacokinetic dosing improvements

- ▶ Involved pharmacy, nursing staff
- ▶ Optimized drug kinetics of piperacillin/tazobactam and vancomycin
- ▶ ASP pharmacist provided extensive education

5. Microbiology lab reporting & antibiogram

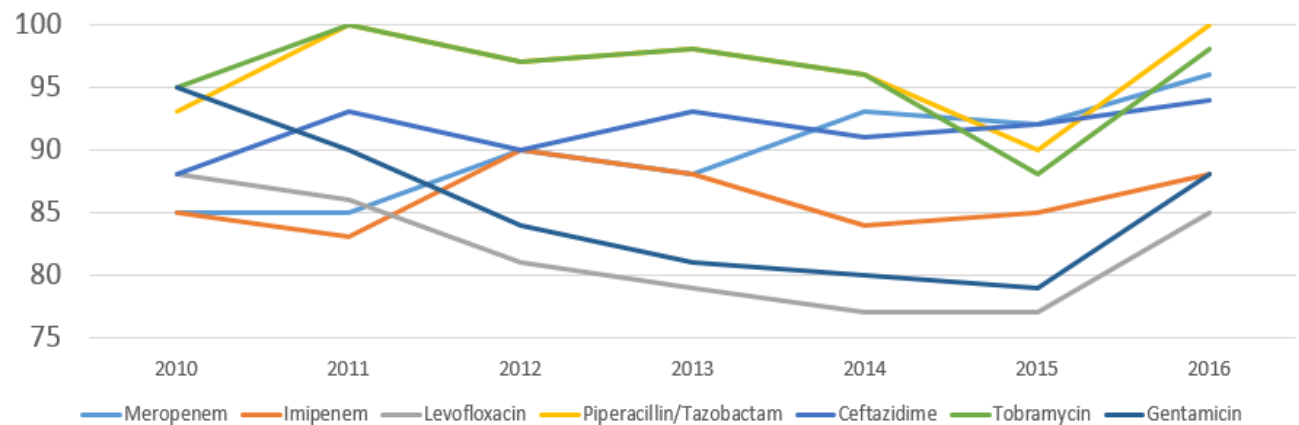
- ▶ Involved micro, pharmacy, practitioners
- ▶ Updated antibiogram constructed in accordance with CLSI guidelines
- ▶ Education provided by ASP RP & MD

Results

1. Order Set Updates

- Susceptibility of *Pseudomonas aeruginosa* isolates to selected antibiotics shows increased effectiveness of several antibiotics since the beginning of ASP efforts in 2015
- Also experienced a decrease in carbapenem usage by 25% in 2 years

Pseudomonas aeruginosa
Antibiotic Susceptibility 2010-2016
Faith Regional Health Services, Norfolk, Nebraska



Baseline (August – October 2016)

LOCATION	MONTH	TOTAL MICROSCOPIC DONE	TOTAL WITH MODERATE/MANY EPITHELIALS
Emergency	AUGUST 2016	256	76 (30%)
Emergency	SEPTEMBER 2016	217	57 (26%)
Emergency	OCTOBER 2016	235	46 (20%)
		Total: 708	Total: 179 (25%)
Inpatient	AUGUST 2016	106	36 (34%)
Inpatient	SEPTEMBER 2016	88	24 (27%)
Inpatient	OCTOBER 2016	75	25 (34%)
		Total: 269	Total: 85 (31.5%)

Post UA Kit Standardization, Education (Feb – April 2017)

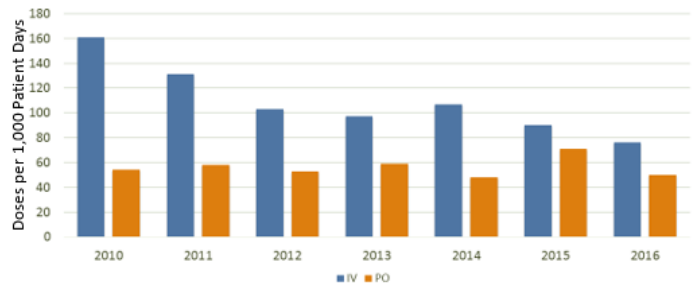
LOCATION	MONTH	TOTAL MICROSCOPIC DONE	TOTAL WITH MODERATE/MANY EPITHELIALS
Emergency	FEBRUARY 2017	213	33 (15%)
Emergency	MARCH 2017	222	37 (17%)
Emergency	APRIL 2017	204	19 (9%)
		Total: 638	Total: 89 (14%)
Inpatient	FEBRUARY 2017	78	12 (15%)
Inpatient	MARCH 2017	100	19 (19%)
Inpatient	APRIL 2017	88	15 (17%)
		Total: 266	Total: 46 (17%)

2. UA contamination rates

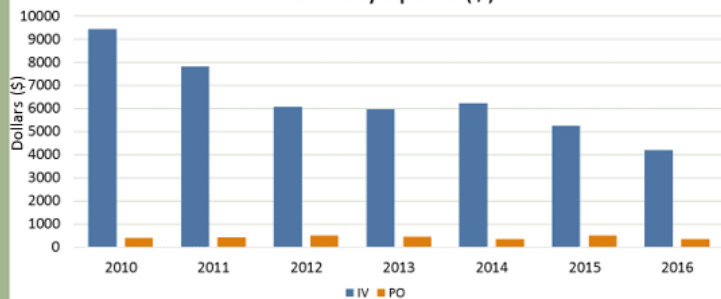
- Baseline ED: 25%, Inpatient 31.5%
- Follow Up: ED 14%, Inpatient 17%

Results

IV to PO Levofloxacin
Doses per 1,000 Patient Days



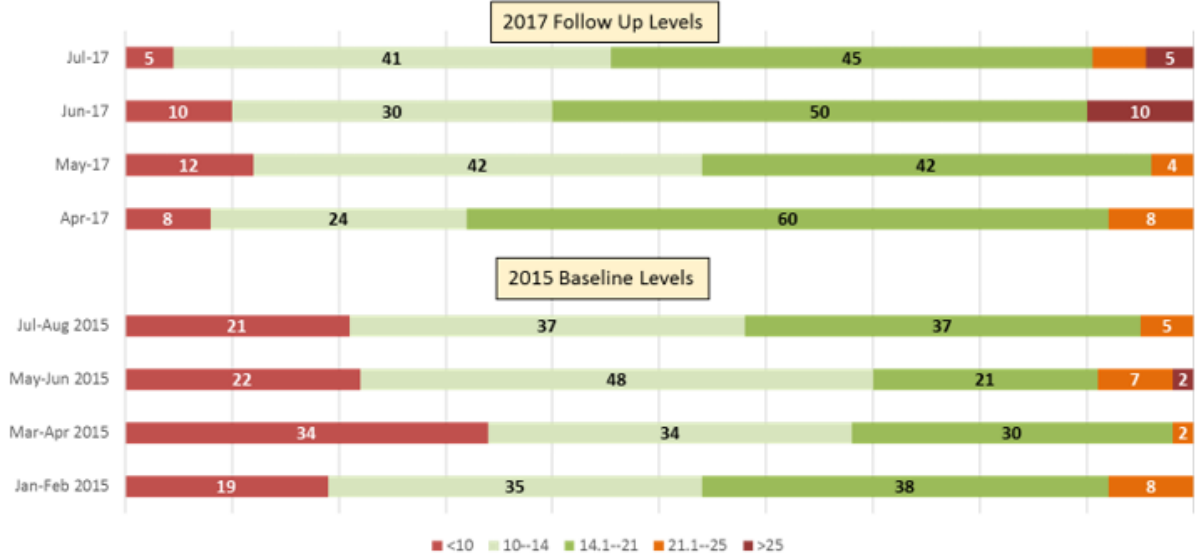
IV to PO Levofloxacin
Pharmacy Spend (\$)



4. Pharmacokinetic Dosing Improvements

- ▶ 2015 baseline levels were subtherapeutic (<10 mg/L) 20-30% of the time, promoting resistance
- ▶ 2017 Follow up levels were subtherapeutic (<10 mg/L) less than 15% of the time

Initial Vancomycin Trough Level
Pharmacy to Dose Protocol



3. IV to PO Conversion Protocol

- ▶ Impact of focused IV to PO conversion efforts on rates on levofloxacin usage (A) and pharmacy spending (B)

Results

- ▶ Providing an accurate and reliable antibiogram to practitioners proved to be a useful resource in combating resistance
- ▶ The antibiogram guides antibiotic choices for order sets, allowing practitioners to choose the antibiotic that works the best
- ▶ Three more antibiograms were also constructed, providing information on urine, emergency room, and advanced wound center isolates specifically

Clinical Laboratory Standards Institute. 2017.
Available at <https://clsi.org/standards/>

Faith Regional Health Services - BLOOD/TISSUE/RESP Antibiogram 2015-2016														
Period: Jan 2015 - Dec 2016					Gram Positive					Gram Negative				
# isolates					# of isolates: 469					# of isolates: 289				
					41	167	121	38	102	127	50	33	27	52
					8 %	36 %	26 %	8 %	22 %	44 %	17 %	12 %	9 %	18 %
					<i>Strep pneumoniae</i>	<i>Staph aureus (MSSA)</i>	<i>Staph aureus (MRSA)</i>	<i>Staph epi (coag. neg.)</i>	<i>Enterococcus</i>	<i>Escherichia coli</i>	<i>Enterobacter cloacae</i>	<i>Klebsiella pneumoniae</i>	<i>Proteus mirabilis</i>	<i>Pseudomonas aeruginosa</i>
Ampicillin IV/Amoxicillin PO	-	-	-	-	93					56	R	R	70	-
Augmentin PO	90	100	R	44	-					83	-	97	85	-
AMP/SUL (Unasyn) IV	-	100	R	44	-					61	R	94	78	-
Aztreonam (Azactam) IV	-	-	-	-	-					92	94	97	100	92
Cefazolin (Ancef) IV	-	100	R	45	-					83	R	97	85	-
Cefepime IV	100	-	-	-	-					93	98	97	100	94
Cefotaxime (Claforan) IV	-	-	-	-	-					93	90	97	100	R
Ceftazidime (Fortaz) IV	-	-	-	-	-					91	92	97	100	94
Ceftriaxone (Rocephin) IV	86	-	-	-	-					90	60	97	96	R
Cefuroxime (Zinacef) IV	62	-	-	-	-					87	R	94	96	-
Clindamycin (Cleocin) PO/IV	86	70	64	66	-					-	-	-	-	-
Ertapenem (Invanz) IV	-	-	-	-	-					100	96	100	100	R
Gentamicin IV	-	99	-	87	-					88	100	97	85	88
Imipenem/Cilastatin (Primaxin) IV	-	-	-	-	-					100	100	100	R	88
Levofloxacin PO/IV	100	87	34	58	-					78	100	97	78	85
Linezolid (Zyvox) PO/IV	-	100	100	100	98					-	-	-	-	-
Meropenem	-	-	-	-	-					100	100	100	100	96
Nafcillin IV/Dicloxacillin PO	-	100	R	45	-					-	-	-	-	-
Penicillin PO/IV	71	-	-	-	93					-	-	-	-	-
Piperacillin/Tazobactam (Zosyn) IV	-	-	-	-	-					95	96	97	100	100
Tetracycline PO/IV	86	92	95	87	41					69	94	88	-	-
TMP/SMX (Bactrim/Septa) PO/IV	71	100	98	79	-					76	98	91	67	-
Tobramycin IV	-	-	-	-	-					88	100	97	85	98
Vancomycin IV	100	100	100	100	95					-	-	-	-	-

Relative Cost	Usual Dose Assumes normal renal function. Dosage adjustments may be necessary in renal dysfunction.
\$	1 gram q6h
\$	875 mg q12h
\$\$	1.5 grams q6h
\$\$\$\$	2 grams q8h
\$\$	1-2 grams q8h
\$\$	1-2 grams q12h
\$	1-2 grams q8h
\$\$	1-2 grams q8h
\$	0.75-1.5 grams q8h
\$\$	600 mg q8h
\$\$\$\$	1 gram q24h
\$	Rx to Dose
\$\$\$\$	500 mg q6h
\$	500 mg q24h
\$\$\$\$	600 mg q12h
\$\$\$	1 gram q8h
\$\$	1-2 grams q4h
\$	5 million units q6h
\$\$	3.375 grams q6h
\$	100 mg q12h
\$\$	10 mg/kg TMP/day
\$	Rx to Dose
\$	Rx to Dose

R = intrinsic resistance (-) = drug not tested or drug not indicated

Lessons Learned

- ▶ A dedicated leader responsible for outcomes is crucial to a successful program
- ▶ A large culture change, such as introducing a new program in a hospital requires time
- ▶ Engaging providers and seeking their specific input increases acceptance of changes
- ▶ Initiative fatigue may be a barrier to successful completion of projects
- ▶ Other hospitals across Nebraska have limited resources for implementation of an ASP, and FRHS ASP has been able to serve as a mentor based on our experiences
- ▶ Future directions include expansion into outpatient and long term care settings, extending antibiotic stewardship to the full continuum of patient care