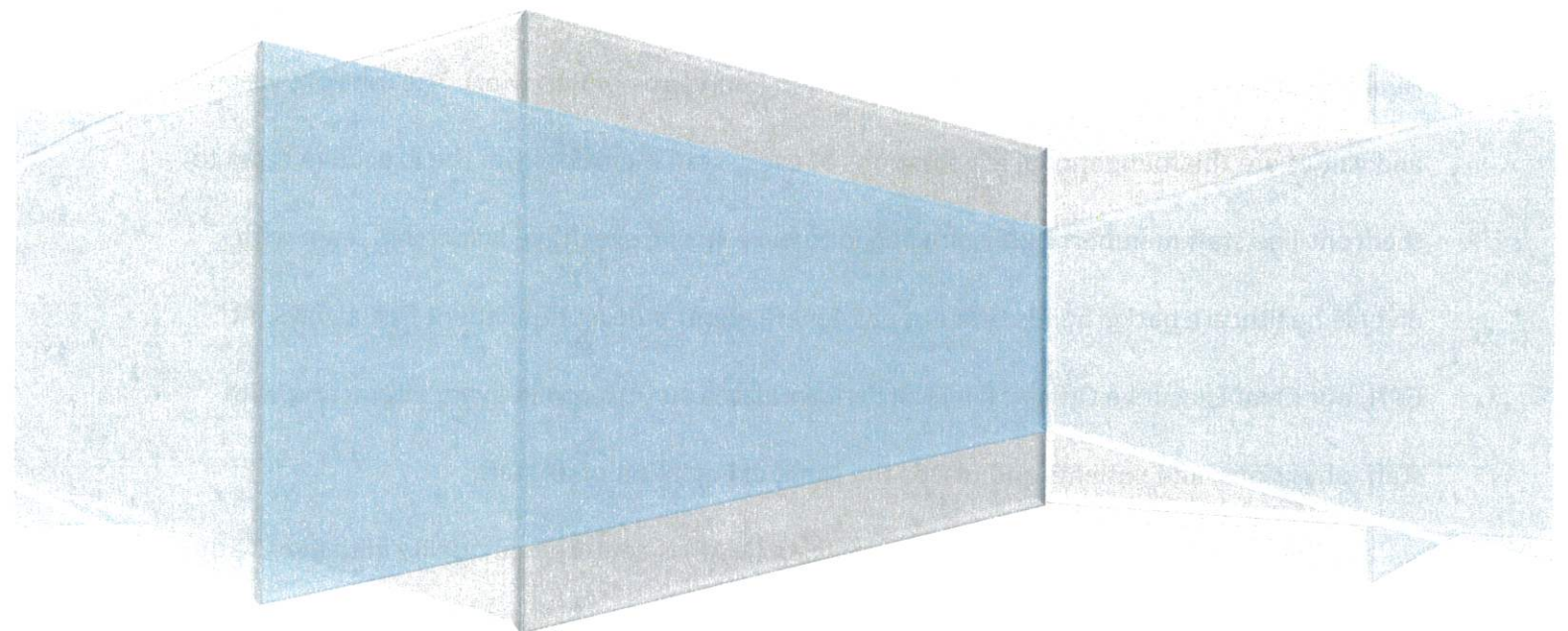


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NHA Quest for Excellence Award

Antibiotic Stewardship and Improvement of Antibiotic Susceptibility

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board of directors (BOD) initially voiced their support of antibiotic stewardship (ABS) in 2016 when the ABS program was initiated. This initiative has continued through to 2023 and is now demonstrating improvement in patient outcomes. The ABS program has continued to grow and gain support from all levels of the organizational leadership.

Process of Identifying Need

Over the last 20 years, there has been an increasing threat of antibiotic overuse and antibiotic resistance in hospitals which has steered tremendous efforts toward optimizing antibiotic use (Charani and Holmes, 2019). However, despite the robust evidence supporting optimal antibiotic usage and guidelines, the results have remained sub-optimal in many settings, including in hospitals (Charani and Holmes, 2019). In fact, the Centers for Disease Control (CDC) estimates that more than half of all antibiotics prescribed in United States acute care hospitals are either unnecessary or inappropriate (CDC, 2022). Like all medications, antibiotics have serious side effects such as adverse drug reactions and can lead to other serious infections such as *Clostridium Difficile (Cdiff)*. Patients that are unnecessarily exposed to antibiotics are placed at risk for serious adverse events with no clinical benefit. The CDC has identified antibiotic misuse as one of the most serious and growing threats to public health today and estimates more than 2.8 million antibiotic-resistant infections occur in the United States annually, with approximately 35,000 deaths per year as a result (CDC, 2022).

Internal data review at Great Plains Health demonstrated an opportunity for improved antibiotic stewardship with the acute-care, inpatient population. Areas of misuse included excessive duration of therapy, not following appropriate antibiotic indications, use of agents with broader spectrum than necessary, inappropriate treatment of asymptomatic bacteriuria,

planning stage of the PDSA cycle, a team was created to research the scope of ongoing ABS opportunities for improvement at GPH. The team included the key stakeholders of pharmacy, infectious disease physician, microbiology lab, infection control, nursing, and quality. The team meets monthly to review patients on antibiotics and with positive cultures. In addition, the team began tracking physician response rates to recommendations and resistance patterns of antibiotics at GPH.

During the do phase of the PDSA cycle, the team created data spread sheets and reports within the electronic medical record (EMR) in order to capture data including provider response rates, IV to oral conversions and patient resistance patterns. Information Systems was pulled in and was instrumental in this phase with creating customized reports in an effort to leverage current technologies. GPH utilizes the capability of the current EMR and data spreadsheets to capture the antibiotic stewardship data required.

Through the study phase, the team created process maps of both the current and future process maps utilizing Lean methodologies. The process maps included how antibiotics were being ordered and reviewed for appropriateness at GPH. Multiple small tests of change were utilized for a comprehensive testing of the EMR system for ongoing measurement of ABS data and goals. The team created a work list that could be utilized for the team to rapidly perform a 48-hour review of inpatient antibiotic usage in comparison to culture results. The ABS team reviews its processes annually with the GPH Medical Executive Board, Board Quality Committee and the Medical Staff for ongoing approval and support. The concept of a concurrent daily review committee reviewing patient charts and making recommendations to providers was not initially a favorable process when first initiated in 2016. The first few phone calls from the

During the pandemic, the ABS team was not able to meet in person given the demands of the ID physician and other staff as well as COVID-19 restrictions. The team began to meet daily at 8:15 AM using Zoom technology and continue to meet via Zoom given its convenience. The process of ABS review typically takes about one hour each day depending on the inpatient census. The team consists of ID provider, ID physician assistants, infection control, and pharmacist daily. Microbiology laboratory staff are utilized on an ad hoc basis. The team completes several alert reviews including: a 48-hour review of antibiotic patients in comparison to any cultures resulted, an IV to oral (PO) review to determine patients that could be transitioned from IV antibiotics to oral administration or any other alerts such as “drug to bug” mismatch or therapeutic duplication of antibiotics by classification. The ABS review assists with facilitating discharge and decreased length of stay as well as can assist in decreasing expense and complications associated with IV medication administrations.

For 2023, the prospective audits and feedback continue to be conducted five days per week, Monday through Friday. Recommendations are made to the attending provider through phone calls, notes through the EMR or secure texting based on the provider preference of notification. A number of metrics are currently being utilized for monitoring of ABS results. Table A below details number of patients reviewed, total interventions, interventions accepted, IV to PO, De-escalation, Discontinuation of therapy and acceptance rates from July 2019 through 2023 YTD. Recommendations are being made on approximately 30% of antibiotic reviews with a 68% acceptance rate from providers YTD 2023. The ABS data collected is reviewed and discussed at a number of internal committees including The Infection Control

2018 to April 2023 (See Figure 4). The return on investment for these interventions are much greater than a saved antibiotic dose or stay in the hospital but the improved susceptibility toward these harmful bacteria and the long-term effects of antibiotic overuse on patients.

As part of the Antibigram, prices of each medication are also displayed as an assist to the providers to also improve financial stewardship with patients on equally effective susceptibility antibiotics (See Figure 5). This assists with reducing the financial burden for the patient, supporting the community and ensuring improved compliance of antibiotic medications.

Lessons Learned, Replicability, Sustainability

Lessons learned from the antibiotic stewardship improvement quality initiative include the imperative to implement education early and often and capture data every step of the way. The ABS Team learned through this process improvement the importance of providing education to all staff system-wide not just upon initiation of the project but frequently and often. GPH has collaborated annually with the Education Department to ensure reoccurring education resources are offered. All hospital and clinic staff are invited and encouraged to attend the educational offerings. ABS is a hospital-wide initiative that affects every department including environmental staff in their cleaning products and isolation terminal cleaning procedures, laundry staff with transport and cleaning of linen and information systems to help with help with problem solving and solutions.

Another lesson learned was physician leadership is required for a successful ABS program. Facilities without an Infectious Disease Physician could utilize a hospitalist or other physician champion or perhaps telehealth infectious disease technology. Physicians appreciate

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[and/infection-prevention-and-control-and-antibiotic-stewardship-program-interpretive-](https://www.cms.gov/medicareprovider-enrollment-and-certificationsurvey/certificationgeninfopolicy-and-memos-states-and/infection-prevention-and-control-and-antibiotic-stewardship-program-interpretive-guidance-update)

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Figure 1: ASP impact on use of Fluoroquinolones

Fluoroquinolones (IV route) - Since April 2018

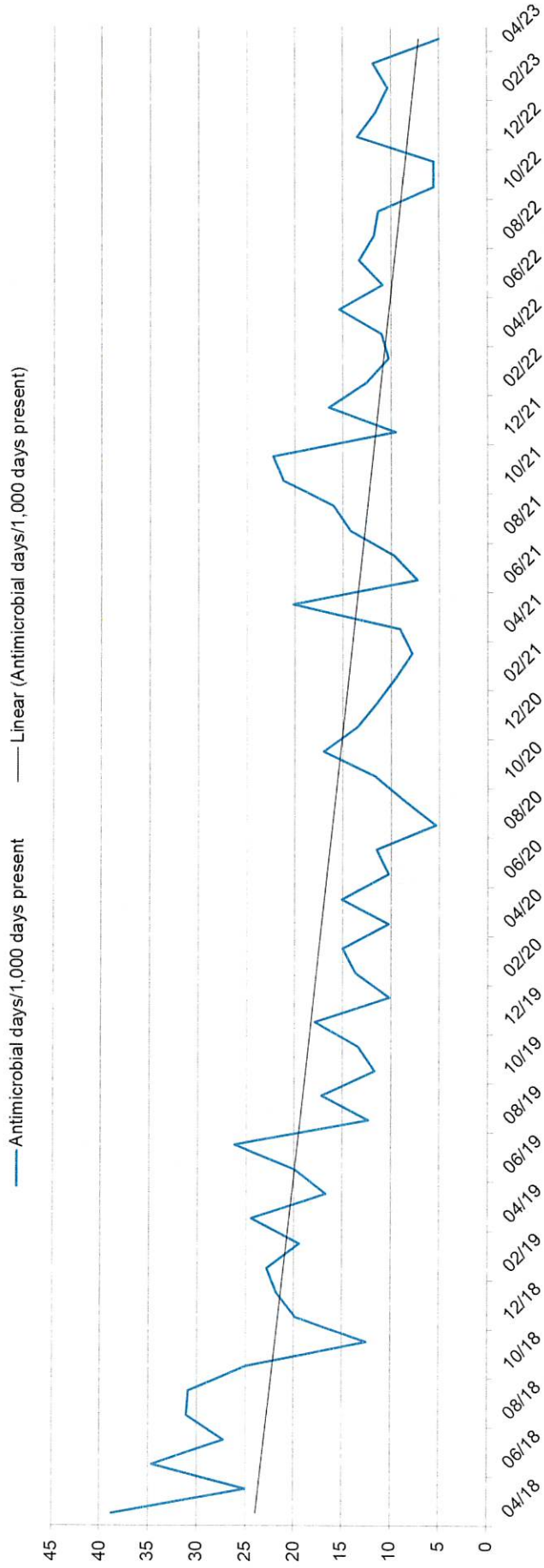


Figure 3: ASP impact on antibiotic resistance

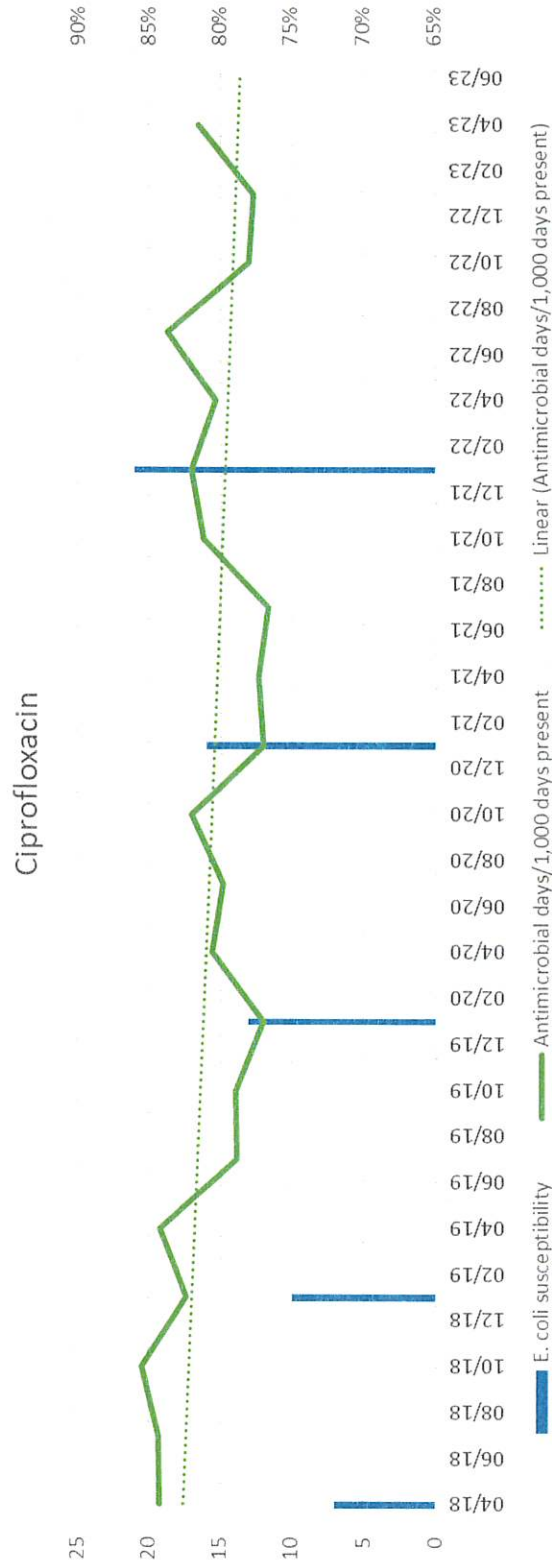




Figure 5: Antibioqram

2023 Inpatient Antibiotic Susceptibility

Represents isolates from January 2022 - December 2022 (Single or first isolates)

Antibiotic	GPH Cost*	Isolates (Systemic & Urine)										
		Gram positive				Gram negative						
		E. faecalis (group D)	Methicillin-Resistant Staphylococcus aureus (MRSA)	Staphylococcus aureus (MSSA)	Methicillin-Susceptible Staphylococcus aureus (MSSA)	Staphylococcus (Coag. Neg.)	Streptococcus pneumoniae	Enterobacter cloacae	Escherichia coli	Methicillin pneumoniae	Pseudomonas aeruginosa	Proteus mirabilis
Total Number of Isolates	PO	149	112	276	151	24	59	809	113	103		
Ampicillin	\$1	149 (149) 100%						506 (809) 62%	0 (142) 0%	71 (105) 68%		
Ampicillin/sulb (Unasyn)	\$12	N/A						560 (809) 69%	137 (142) 89%	76 (103) 73%		
Cefazolin (Ancef)	\$4	N/A						0 (59) 0%	196 (142) 95%	81 (103) 78%		
Cefepime (Maxipime)	\$13	N/A						59 (59) 100%	109 (113) 96%	84 (103) 81%		
Ceftazidime (Fortaz)	\$16	N/A						55 (59) 98%	137 (142) 96%	84 (103) 81%		
						non-CSF 24 (24) 100%		772 (809) 95%	137 (142) 96%	84 (103) 81%		
						CSF 20 (24) 83%		702 (809) 86%	137 (142) 96%	84 (103) 81%		
Ceftriaxone (Rocephin)	\$2	N/A						59 (59) 100%	140 (142) 98%	65 (103) 63%		
Ciprofloxacin	\$4	\$1	24 (112) 21%	242 (276) 88%	107 (151) 70%							
Clindamycin	\$7	\$1	71 (107) 66%	187 (265) 71%	63 (99) 63%							
Erythromycin	\$290	\$35	13 (107) 12%	163 (265) 62%	47 (99) 47%							
Gentamicin	\$9	N/A	110 (112) 98%	274 (276) 99%	143 (151) 94%							
Imipenem/Cilastatin (Primaxin)	\$13	N/A										
Levofloxacin (Levaquin)	\$2	\$1	24 (112) 21%	244 (276) 88%	106 (151) 70%							
Linezolid (Zyvox)	\$15	\$3	111 (111) 100%									
Nafticillin/Oxacillin	\$47	N/A	0 (112) 0%	276 (276) 100%	69 (151) 45%							
Nitrofurantoin	N/A	\$1	5 (5) 100%	12 (12) 100%	52 (52) 100%							
						non-CSF 24 (24) 100%		709 (721) 98%	50 (106) 47%	0 (64) 0%		
						CSF 19 (24) 79%						
Penicillin	\$23	\$1	0 (112) 0%	78 (275) 28%	26 (151) 17%							
Piperacillin/Tezo (Zosyn)§	\$24	N/A										
Rifampin	\$140	\$2	112 (112) 100%	276 (276) 100%	150 (151) 99%							
Sulfamethoxazole/trimp (Bactrim)	\$42	\$1	110 (112) 98%	268 (276) 97%	113 (151) 74%							
								55 (59) 93%	139 (142) 97%	103 (103) 100%		
								58 (59) 98%	138 (142) 98%	61 (103) 59%		

Antibiotic Stewardship and Improvement of Antibiotic Susceptibility

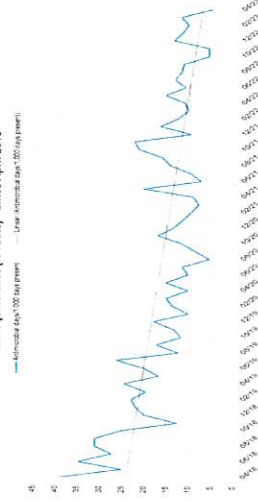
Great Plains Health, North Platte, NE



Background

- CDC estimates 50% all antibiotics given in hospitals are unnecessary or inappropriate
- Trends with excessive duration, broader spectrum than necessary, missing IV to po conversions, lack of de-escalation
- Leadership initiative to improve ABS in acute inpatient PPS hospital

Fluoroquinolones (IV route) - Since April 2018



Aims

- Ensure best practice of Antibiotic Stewardship team for acute inpatients aimed at reducing antibiotic overuse and adverse outcomes related to overuse
- Team led by Infectious Disease Nurse, Infectious Disease Physician, PA's and Pharmacy
- M-F 8:15 AM Review of patients on antibiotics utilizing Zoom for team reviews
- Recommendations to providers

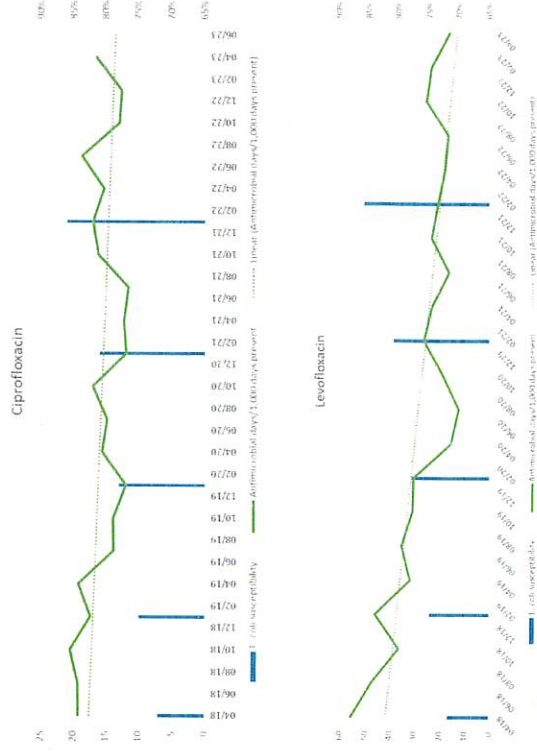
Plan

- Implementation of multidisciplinary team – ID, Pharmacy, Infection Prevention
- Data capture through EMR review, spreadsheets for monthly data analysis and response rates
- Ongoing monitoring and assessment of the metrics with adjustment and ongoing PDSA cycles to fine tune the process and outcomes

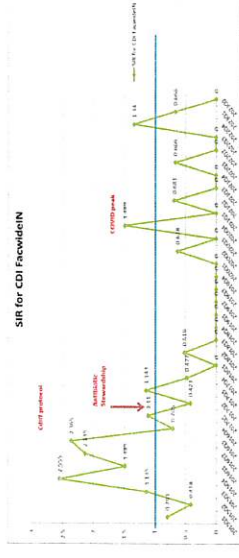
Measure

- Number of patients reviewed
- Total Patient Interventions
- De-escalation recommendations
- Discontinue treatment recommendations
- Antibiotic usage and Susceptibility rates

Results



- 68% Recommendation Acceptance Rate
- Decrease in Fluoroquinolone usage from 38 AB days/1000 days present to 5 (April 2018-April 2023)
- Decrease CDIFF SIR from 2.555 in 2015 to 0 in 2022
- Levofloxacin usage decreased from 55 AB days/1000 days to 16 and susceptibility from 18 to 50% from 2018 to 2023



Next Steps

- Focused asymptomatic bacteriuria process improvement
- Treatment and management of cellulitis process improvement
- Capture more cost savings from interventions
- Outpatient antibiotic stewardship

Team

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