CompleteRx®
Living Pharmacy

CASE STUDY

Antimicrobial Stewardship Program at Work

Situation

Over the past several decades, antimicrobial misuse has led to a growing amount of innate resistance to commonly available treatments for infectious diseases. In an attempt to combat this trend, major national and worldwide healthcare organizations have called for all hospitals to establish Antimicrobial Stewardship Programs (ASPs). Unfortunately, smaller and rural hospitals traditionally lack the formal infectious disease departments or providers necessary to easily enact this mandate—such was the case with one CompleteRx partner, a two-hospital (186- and 107-bed) rural community health system in New York and Pennsylvania. Before a partnership with CompleteRx, the health system struggled to find the resources to develop a formal infectious disease or antimicrobial stewardship program to combat growing challenges, including:

- Increased use of broad-spectrum antimicrobials (according to the CDC, half of all hospitalized patients receive at least one antimicrobial on a given day)
- Rising rates of Clostridium difficile *(C. diff.),* an inflammation of the colon often associated with antibiotic use
- Growing resistance of bacteria cultured in the health system to antibiotics (as demonstrated by antibiograms)



Solution

CompleteRx began working with the hospitals to leverage existing assets—i.e., pharmacists—to efficiently and effectively get ahead of ASP regulation and tackle the issues outlined above.

First, the team collaborated with the health system's Pharmacy and Therapeutics Committee (P&T) to form an Antimicrobial Stewardship Sub-committee, an interdisciplinary group of representatives from pharmacy, lab, nursing, providers, information technology, clinical education, infection prevention, quality, microbiology and more. Second, the team secured executive buy-in, tapping two vice presidents of the health system and a member of the health system board to join the sub-committee. Finally, the team enacted a mission statement and a charter to establish a plan of attack and guidelines by which they would track their progress toward the following key target areas: decreasing broad-spectrum antimicrobial use and lowering hospital-onset *C. diff.* rates in the health system, and reversing negatively trending antibiograms.

Once formed, this interdisciplinary committee strived to get members of all departments out of their silos and working in partnership with each other to enact the greatest impact on antimicrobial stewardship. In addition to improving communications between these groups, the ASP:

- Implemented new system-wide computerized provider order entry (CPOE) sets for common infectious diseases, directing providers to the therapies that were not only the most appropriate, based on current guidelines and literature, but were also the most fiscally savvy
- Enacted a set of reserved antimicrobial agents, developing specific criteria to reduce provider orders of some of the broadest or most costly medications to only the most necessary cases
- Expanded the health system's list of medications to be automatically interchanged to include several more antimicrobials. This process was also applied to the policy allowing for automatic conversion from intravenous to oral antimicrobial
- Adapted the CPOE system to help providers stick to more appropriate lengths of therapy when ordering antimicrobials (while previously stop dates had all been set to 14 days, providers agreed to limit all antimicrobials to five days of therapy with the ability to extend the treatment course only when clinically necessary)
- Continued the pharmacy practice of renally adjusting medications and dosing all vancomycin and amino-glycosides based on pharmacokinetic parameters

In addition to the above expanded policies and procedures, one specific example of these practices showed great success: The group established a specialized policy and protocol for *C. diff.*—as outlined above, one of the key targets of the ASP—and its treatment, wherein, based on the patient's history, current lab values, and culture, pharmacists would automatically initiate appropriate therapy. This enhanced procedure also empowered nursing to automatically collect a stool culture from any patient admitted with diarrhea, the most common symptom of *C. diff.*, and expanded the role of the infection prevention and laboratory departments to raise the alarm to the core group when a patient was identified as *C. diff.*-positive (at which time they contacted nursing to isolate the patient and pharmacy to ensure that the patient began receiving appropriate treatment as soon as possible).

All new practices were accompanied with comprehensive education for providers, nurses, and other ancillary staff. In addition, the pharmacy staff underwent ASP-specific training every few weeks for an entire year to ensure they were comfortable going beyond the established policies and procedures—interacting directly with providers to make recommendations for narrowing or altering therapy based on culture and lab results, as well as the most current antimicrobial stewardship literature and data.

Results

Decreased overuse of broad-spectrum antimicrobials:

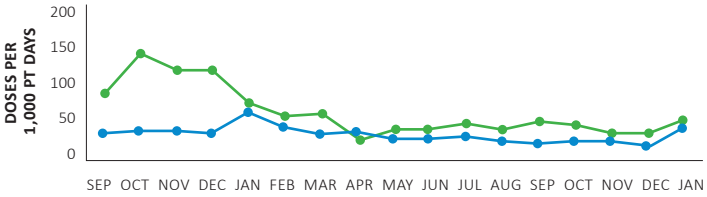
In conjunction with the Hospital Association of New York State (HANYS), the health system has monitored the use of several broad-spectrum including cefepime and meropenem antimicrobials. Over the course of the monitoring period, it has steadily reduced its use of those antimicrobials it uses, **(Figure 1)** as the ASP has sought to ensure appropriate empiric treatment and to utilize patient lab and microbiology data to narrow or discontinue antimicrobial therapy as quickly as clinically possible.

FIGURE 1

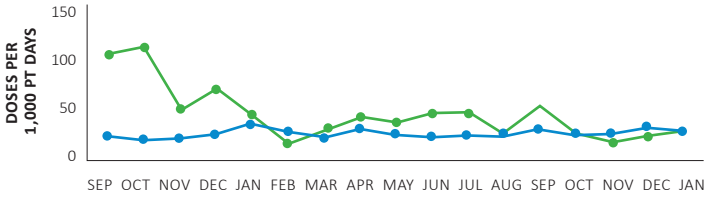
Figure 1. Antimicrobial Utilization (Doses / 1,000 Patient Days)

**Note—Green Line = Client Hospital, Blue Line = Avg. of HANYS Collaborative Participants*

CEFEPIME



MEROPENEM



Lowered *C. diff* rate:

As outlined above, prior to ASP implementation, the hospital-onset *C. diff.* rate was on the rise **(Figure 2)**; however, since full implementation of the multidisciplinary *C. diff.* policy/protocol portion of the ASP and education campaign hospital-onset *C. diff.* rate has been below the national benchmark every quarter and is now showing an overall decreasing trend **(Figure 3)**.

FIGURE 2

Hospital-Onset *C. diff.* rate
(cases /10,000 patient days)—Pre-ASP Implementation

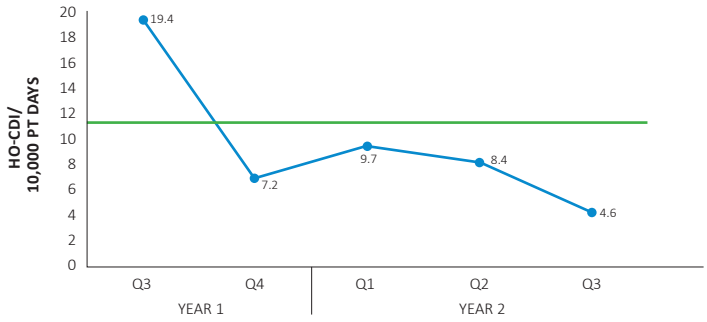
** Note—Orange Line denotes NHSN Benchmark of 11.3 cases /10,000 patient days*



FIGURE 3.

Hospital-Onset *C. diff.* rate
(cases /10,000 patient days)—Post-ASP Implementation

** Note—Blue Line denotes NHSN Benchmark of 11.3 cases /10,000 patient days*



Results

Corrected negatively trending antibiogram:

The health system has noted an overall downward trend in sensitivity of the bacteria monitored by their antibiogram to key antibiotics over the past decade. Thanks in large part to the ASPs encouragement of judicious use of antimicrobials, the most recent edition shows promising results for several clinical significant bacteria including E. coli **(Figure 4)** (n.b., data for antibiograms lag 12 months behind publication).

As part of the ASP, both the hospitals closely monitor the activities of its pharmacists with regard to several key initiatives **(Figures 5 and 6)**. They consistently beat benchmarks for the accuracy of our pharmacokinetic dosing, and their pharmacists perform hundreds of ASP-related interventions each month in areas including, but not limited to, renal dosing, IV to PO conversion, culture and sensitivity reviews, and antimicrobial recommendations. They are continuing to evolve the process by which we collect this data in order to standardize the methodology throughout the health system.

Perhaps most impressively, in partnership with CompleteRx, this small, rural health system without infectious disease services, not only implemented a formal Antimicrobial Stewardship Program, but has also already received recognition by industry peers for that program's excellence. For example, during its recent survey, TJC inspectors made a point to complement the ASP's impressive work and took copies of many documents in order to demonstrate to other hospitals around the country how a program should be properly run and monitored.

FIGURE 4

Trends in E. coli susceptibility to various antibiotics*

**Note—Data for each antibiogram is from the year prior*

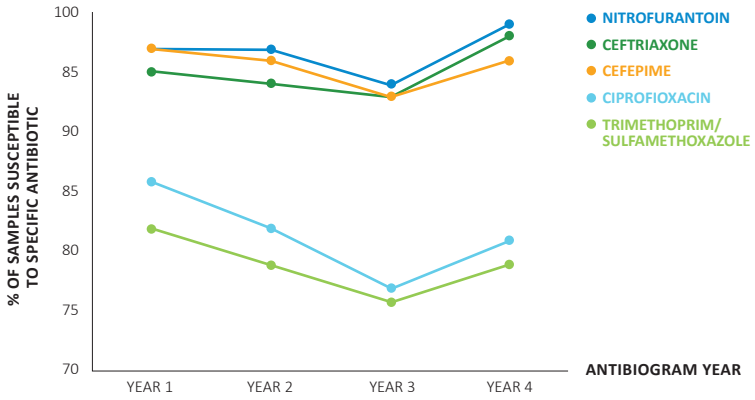


FIGURE 5

Pharmacist Antimicrobial Stewardship Interventions—
Client Hospital A (107-bed)

METRICS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	YTD
# Patient Days in a month that Pharmacy Manages Antibiotics	80	43	90	103	95	113	86	124	153	182	156	**1,225**
% of Therapeutic Trough Levels	80.6%	85.7%	83.3%	65.4%	57.1%	80.5%	42.9%	82.1%	87%	76.8%	71.5%	**73.9%**
# Pharmacokinetics Reviews	44	29	36	37	31	28	14	29	49	61	34	**392**
# IV to PO conversions	14	13	18	37	70	85	90	124	68	80	55	**654**
# Renal Dosing	566	410	405	497	447	416	392	520	566	530	455	**5,204**

FIGURE 6

Pharmacist Antimicrobial Stewardship Interventions—
Client Hospital B (186-bed)

METRICS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	YTD
# Patient Days in a month that Pharmacy Manages Antibiotics	423	486	447	365	434	469	335	278	401	384	392	**4,414**
% of Therapeutic Trough Levels	76.5%	82.4%	77.9%	81.5%	66.7%	76.1%	78.9%	81.7%	79.2%	76.2%	78.3%	**77.8%**
# Pharmacokinetics Reviews	170	216	237	146	210	204	162	191	162	153	159	**2,010**
# IV to PO conversions	420	384	463	352	336	282	253	251	217	197	223	**654**
# Renal Dosing	1,056	1,063	1,094	1,006	927	826	891	848	697	763	942	**10,113**



If you would like to discuss how an antimicrobial stewardship program might support your pharmacy facility, please contact Sheila Campbell, Business Development Coordinator.

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