Impact of an Antimicrobial Stewardship Program (ASP) on Antimicrobial Usage and Incidence of *Clostridium difficile* Infections (CDI) at a Teaching Hospital

Jennifer Anthone, PharmD; Renuga Vivekanandan, MD; Cezarina Mindru, MD; Karim Ali, MD; Mir Ali, MD; Edward Horowitz, MD; Marvin Bittner, MD; Gary Gorby, MD; Chris Destache, PharmD; Laurel Preheim, MD

Correspondence:
Jennifer Anthone, PharmD, BCPS
Creighton University Medical Center
Inpatient Pharmacy Department
601 North 30th Street, Omaha, NE 68131
jennifer.anthone@alegent.org

I. BACKGROUND

CDI is a leading cause of healthcare-associated infections in the United States, and its incidence has increased to record highs.[1]

Evidence-based guidelines have been published for CDI and include recommendations for prevention of CDIs in hospitals.[2] Although there are multiple risk factors for CDI, the most important modifiable risk factor is exposure to antimicrobial agents.[2]

The primary goal of an ASP is to optimize clinical outcomes while minimizing unintended consequences of antimicrobial use, including toxicity, selection for pathogenic organisms (i.e. *Clostridium difficile*) and emergence of resistance.[3] A secondary goal of antimicrobial stewardship is to reduce health care costs without adversely affecting quality of care.

Because only a few reports describe ASP impact on CDI rates, a comparison was performed on the incidence of new onset CDIs at our hospital (>48 h after admission) before and after initiation of an ASP. We also sought to determine if our ASP affected the number of vancomycin levels performed and pharmacy antimicrobial costs.

II. METHODS

• The ASP team (clinical pharmacist, infectious diseases [ID] attending, ID fellow) established criteria for targeted intervention. A secure, web-based program (Sentri7) was used to identify patients receiving selected antimicrobials.

• The ASP team reviewed the medical records and microbiology lab findings for each identified patient. If intervention was warranted the ASP team contacted the prescriber to convey its recommendation(s).

• Data was collected prospectively during ASP implementation (ASP) (Oct 2011-Sept 2012) and retrospectively for the pre-ASP comparative interval (pre-ASP) (Oct 2010-Sept 2011).

• There were no differences in infection control policies or procedures between the two study intervals. This project was IRB approved. Data was analyzed using SPSS-PC (ver. 20, SPSS Chicago, IL).

III. RESULTS

• Nosocomial CDI case rates per 1000 patient days (pre-ASP vs. ASP) declined significantly (0.78 vs. 0.25; p=0.029). (See Figure 1)

• During ASP implementation, 579/634 recommended interventions (91%) were accepted. Of the accepted changes, IV to PO (48%), de-escalation (23%), bug-drug mismatch (12%), and discontinuing duplicate therapy (6%), accounted for the majority of recommendations. The most common recommendation rejected was for de-escalation. (See Table 1 and Figure 2)

• Acceptance rates did not differ significantly among medicine, surgery, OB-GYN, or family medicine providers. (See Figure 3)

• The rate per 1000 patient days of vancomycin level determinations also decreased (23.48 vs. 21.2; p>0.05).

• Cost savings for reduced antimicrobial usage and fewer vancomycin levels totaled $179,000.

Figure 1. CDI Rates per 1,000 patient days

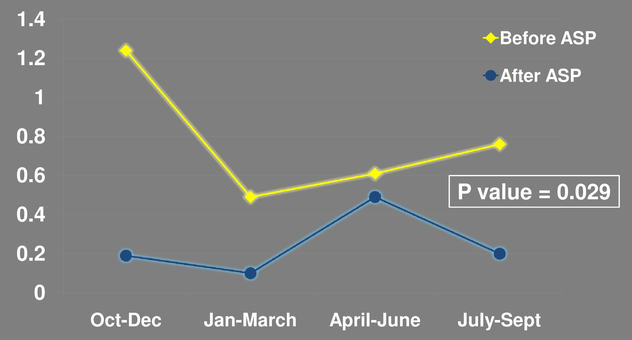


Table 1. Intervention Totals by Type

Type of Intervention	Accepted (n = 579)	Rejected (n = 55)	Total (n = 634)
IV to PO	273	12	285
De-Escalate Based on Culture Results	137	26	163
Bug-Drug Mismatch	71	4	75
Duplicate Therapy	37	6	43
Dose Change	19	1	20
Alternate Therapy	17	3	20
D/C Therapy	17	2	19
Oral Antibiotic Recommendation	4	1	5
ID Consult	2	0	2
Other	2	0	2

Figure 2. Accepted Interventions by Type

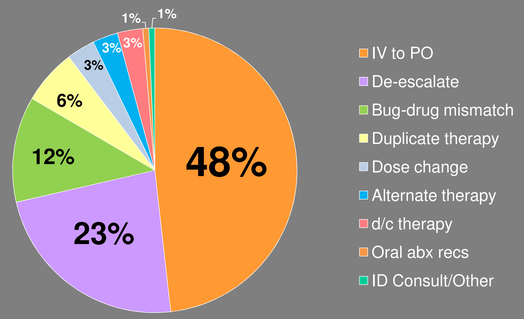
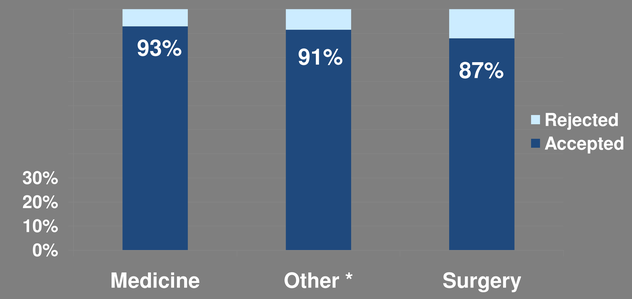


Figure 3. Acceptance Rates by Service



* Other = OB/GYN, Family Medicine

IV. CONCLUSION

ASP teams can achieve high acceptance rates for suggested antimicrobial changes made to prescribing hospital physicians. This can help reduce the incidence of nosocomial CDIs, the use of expensive and/or unneeded diagnostic tests, and the cost of treating infections in hospitalized patients.

V. REFERENCES

1. Lucado J, Gould C, Elixhauser A. *Clostridium difficile* infections (CDI) in hospital stays, 2009. HCUP statistical brief no. 124. Rockville, MD: US Department of Health and Human Services, Agency for Healthcare Research and Quality; 2011. Available at http://www.hcup-us.ahrq.gov/reports/statbriefs/sb124.pdf. Accessed August 25, 2013.
2. Cohen SH, Gerding DN, Johnson S, *et al.* Clinical Practice Guidelines for *Clostridium difficile* Infection in Adults: 2010 Update by the Society for Healthcare Epidemiology of America (SHEA) and the Infectious Diseases Society of America (IDSA). *Infect Control Hosp Epidemiol* 2010; 31(5):431-455.
3. Dellit TH, Owens RC, McGowan JE, *et al.* Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship. *Clinical Infectious Diseases* 2007; 44:159-177.