Implementation of a probiotic for the primary prevention of hospital-onset *Clostridium difficile* infection

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Background

- Hospital-onset *Clostridium difficile* infection (HO-CDI) affects over 100,000 patients in the U.S. each year.
- Due to a rising rate of HO-CDI at Denver Health, a multifaceted CDI prevention plan was implemented which included a probiotic intervention. Other components of the CDI prevention plan included electronic hand hygiene monitoring, enhanced environmental cleaning, and prospective review of patients with CDI.

Purpose

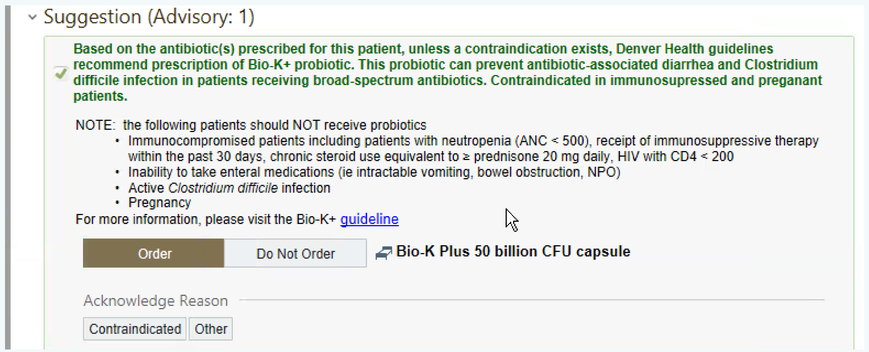
- The purpose of this study is to describe the implementation and uptake of the probiotic intervention.

Methods

- Retrospective chart review
- Adult, inpatients who received antibiotics considered high-risk for the development of CDI from March 2017 – March 2018. Table of high-risk antibiotics below.

Cephalosporins (≥3rd generation)	Ceftriaxone	Cefdinir	Ceftazidime	Cefepime	Ceftaroline
B-lactam/β-lactamase inhibitors	Amox/clav	Amp/sulb	Pip/tazo		
Carbapenems	Ertapenem	Imipenem	Meropenem		
Other	Levofloxacin	Ciprofloxacin	Moxifloxacin	Clindamycin	

- In March 2017, a Best Practice Advisory (BPA) was implemented to advise providers to order Bio-K+ (*L. acidophilus, L. casei,* and *L. rhamnosus*) when they signed an order for a high-risk antibiotic.
- The BPA was suppressed in patients who were pregnant, immunocompromised, unable to take oral medications, or had active CDI.
- The primary outcome was the proportion of patients for whom the probiotic was prescribed when the BPA fired in the first year.
- Secondary outcomes include CDI rates before and after the intervention and adverse events defined as a positive Lactobacillus culture.

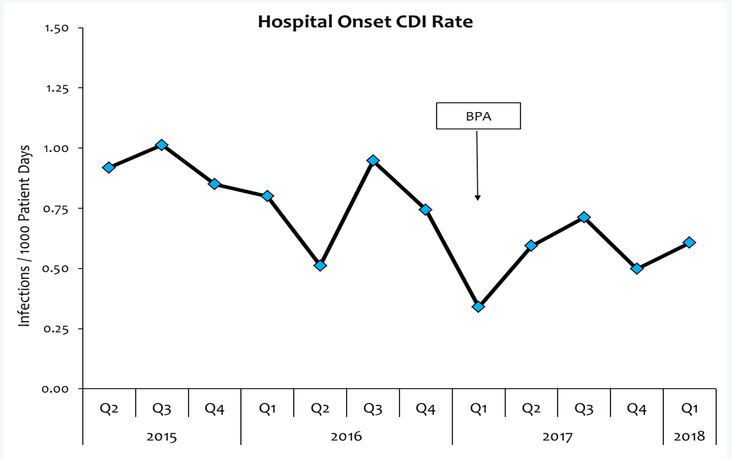


Results

- **The BPA fired in 3,840 cases, and Bio-K+ was ordered in 94.8% of cases.**
- Below are demographics for patients who received a high-risk antibiotic for ≥24 hrs

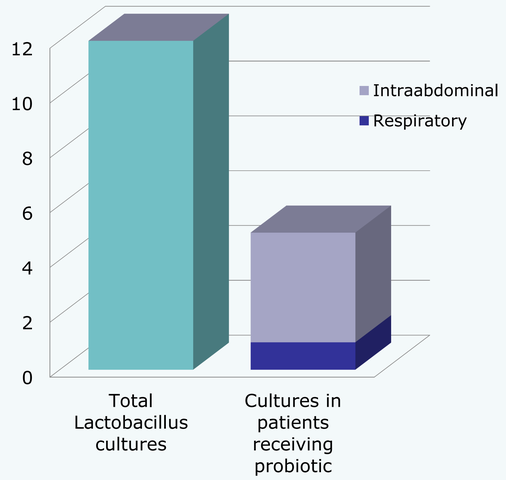
Demographics	N=2,636 courses of Bio-K+
Male, n (%)	1,517 (58)
Age, median (IQR)	61 (41-66)
Length of stay, median days (IQR)	5 (3-9)
Days of Bio-K+, median (IQR)	3 (2-6)
Courses of high risk antibiotics	
Ceftriaxone	1,185 (45)
Cefepime	516 (20)
Piperacillin/tazobactam	279 (11)
Ampicillin/sulbactam	260 (10)
Clindamycin	250 (9)
Levofloxacin	217 (8)
Other	176 (7)

- The HO-CDI rates for one year pre and post intervention were 0.75 and 0.60 cases per 1000 patient days, respectively (p=0.16).



- During the study period, Lactobacillus was cultured in 11 patients (12 cultures). The proportion of patients who received a course of Bio-K+ and subsequently had a positive culture with Lactobacillus was 0.4%.

Lactobacillus cultures during study period



- After review of the medical record, the 5 positive Lactobacillus cultures from patients receiving the probiotic were all polymicrobial cultures and not thought to be due to the probiotic.

Conclusions

- A probiotic intervention for the prevention of CDI implemented via BPA had excellent provider uptake.
- As part of a multifaceted CDI action plan, a probiotic intervention had a low risk of serious adverse events.

Future direction:

- Compare the incidence of CDI in patients who received the probiotic vs those who received the same high-risk antibiotics without the probiotic
- Perform a cost analysis on the probiotic intervention