Methods. We designed a simulation model of CDI among patients in a network of 10 short- and long-term acute care hospitals and nursing homes. Model calibration relied on published infection and carriage data and whole genome sequencing studies that estimated the fraction of CDI attributable to transmission from other CDI patients in healthcare settings. The modeled vaccine effectiveness for reducing the rate of prevention to CDI among carriers was set at 75% and achieved after completing a vaccine course. We then simulated initiation of this vaccine course to a random subset of patients at transfer or live discharge and tallied direct and indirect CDI-reduction effects per vaccinated patient over 5 years.

Results. Model calibration found that data are consistent with higher infectivity of CDI patients over other carriers by a factor of 30–85, depending on assumed rates of initial carriage importation. Vaccine simulations produced an average reduction of 36 CDI cases per 1,000 vaccinated patients, with 25 of those cases prevented among those vaccinated and 11 prevented among unvaccinated patients. These results were robust across transmission and carriage rates supported by data.

Conclusion. Our findings demonstrate potential for a vaccine against CDI to reduce transmissions in healthcare facilities, even if it does not decrease acquisition of carriage per exposure among those receiving it. The finding is robust to the remaining uncertainty around the relative prevalence and infectivity of CDI patients among all carriers. The vaccine will have maximal impact if received by individuals likely to experience future infections in settings where environmental contamination poses risk to others.

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519. Longer Length of Antibiotic Therapy for Community-Acquired Pneumonia and Risk of Clostridium difficile Infection
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Background. We previously observed a median 9.5 days length of antibiotic therapy (LOT) among patients with community-acquired pneumonia (CAP) requiring hospitalization (Clin Infect Dis. 2018;66:1333–41). Treatment guidelines for CAP, however, suggest LOT >7 days is rarely necessary. In this study, we evaluated the risk of Clostridium difficile infection (CDI) as a potential harm of longer LOT.

Methods. This retrospective cohort study included Medicare beneficiaries with parts A, B, and D coverage hospitalized for uncomplicated CAP in 2012–2013 for 2–10 days, home discharge, and no hospitalizations 30 days before or 3 days after index hospitalization. The main exposure was total LOT, represented by the sum of estimated inpatient and observed outpatient LOT, and defined as “longer” if >9.5 days and “shorter” if ≤9.5 days. The outcome, post-discharge CDI, was defined using ICD-9-CM diagnosis code 008.45 in inpatient, skilled nursing, or outpatient claims within 6 months after index hospitalization. CDI 12 months before or during index hospitalization was excluded. CDI risk was assessed through a multivariable logistic model stratified by outpatient antibiotic class and adjusted for confounders including comorbidities, severity via ICU status, demographics, and hospital characteristics.

Results. The cohort consisted of 99,883 patient records. Median total LOT was 9.5 days (IQR: 7.4–11.4). Antibiotics filled at discharge included quinolones (40%), none (20%), multiple (14%), cephalosporins (10%), macrolides (7%), and β-lactam/β-lactamase inhibitor combinations (5%). CDI risk was 1.2%. Overall adjusted risk among those with longer LOT was 1.2 (95% CI: 1.1–1.4) times that of those with shorter LOT. Increased risk was observed among those prescribed quinolones at discharge, for whom adjusted CDI risk for longer LOT was 1.4 (95% CI: 1.2–1.7) times the risk of those with shorter LOT. We observed no difference in risk between longer and shorter LOTs for other antibiotic categories.

Conclusion. These findings suggest that decreased LOT, which can be achieved with better adherence to current treatment guidelines, could reduce risk of subsequent CDI among patients hospitalized with CAP, particularly among those treated with fluoroquinolones at discharge.

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520. Reducing Inappropriate Clostridium difficile Testing by Empowering Nurses
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Background. Inappropriate testing for Clostridium difficile (CD) can result in over diagnosing, which may lead to overdose of antibiotics, increased length of stay and financial penalties under Center for Medicare and Medicaid’s Value Based Programs. To address unnecessary testing, a nurse-driven algorithm was developed and implemented at a tertiary teaching hospital in Detroit, Michigan. In this study, we evaluate the interventions’ impact on hospital acquired CD infections (HO-CDI) rates.

Methods. An algorithm for CD testing appropriateness was created by leadership and the Infection Prevention team. The algorithm emphasized that CD testing should not be performed on asymptomatic patients or those receiving laxatives and/or stool softeners. Risk of HO-CDI per 10,000 patient days were compared before and after the intervention and statistical significance was determined by an unpaired t-test. The hospital laboratory used PCR to detect CD throughout the study period.

Results. Before the algorithm was implemented, our hospital had an average of 8.2 HO-CDI per 10,000 patient days. After the intervention was established, the rate decreased to 4.6 HO-CDI per 10,000 patient days. This represents a statistically significant decrease in HO-CDI (P = 0.037). The rate of community-onset CD cases, defined as infection that are identified between calendar day 1 through 3, did not change significantly during the study (P = 0.65).

Conclusion. Empowering and educating nurses about CD testing guidelines proved to be an effective tactic to reduce unnecessary CD testing, and in turn, decrease our HO-CDI rates.

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521. Clostridium difficile Timeout: A Nurse-Driven Protocol to Optimize Testing Stewardship
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Background. There remains a challenge in distinguishing colonization vs. infection with Clostridium difficile associated diarrhea. At our institution, despite effective antimicrobial stewardship efforts, C. difficile tests and positive infections remained high identifying a need for C. difficile testing stewardship optimization.

Methods. This was an RRI approved study on a nursing driven algorithm for C. difficile Timeout (CDT). This included the number and shape of stools and absence of laxatives in the last 24 hours. Control and study groups were identified and a nurse
provided C. difficile education to the study group. Nursing utilized the CDT algorithm, and the C. difficile PCR was sent if criteria were met to optimize testing stewardship. The primary objective was to assess the positive and negative predictive values (PPV and NPV) associated with CDT. A subgroup analysis included total tests and positive tests per patient days between study vs. control groups. The secondary objective was to assess the positive/normal tests ordered and tests positive/10,000PD pre- and post-implementation of CDT.

Results. There were 87 patients who had CDT performed from June 2017 to February 2018. There were 72 patients tested for C. difficile PCR, and 15 were not tested. Baseline demographics were similar between both groups. Patients in the test group compared with control were more likely to meet the criteria for >3 loose BMs/day (88% vs. 40%, P = 0.002) and lack of new start on laxatives (7% vs. 33%, P = 0.012). Compared with the control group, there were fewer tests ordered for the study group (130 vs. 169 per 10,000PD, P = 0.10) and similar positive tests results (26 vs. 26 per 10,000PD). This led to a PPV of 83.7% and an NPV of 20.3%. Overall, the post-implementation group had low numbers of tests ordered (122 vs. 158 per 10,000PD) and positive tests (22 vs. 26 per 10,000PD). We noticed a consistent overall decline in HO-CDI/10,000PD from 2016 vs. 2017 (6.18 vs. 2.13 per 10,000PD, P = 0.13).

Conclusion. With CDT utilization, there was a decline in total number of C. difficile tests ordered. Through this nurse-initiated algorithm, testing stewardship for C. difficile was optimized and a PPV and an NPV was uncovered. With the use of CDT in conjunction with antimicrobial stewardship efforts, there was an overall decline in HO-CDI/10,000PD after implementation of this algorithm.

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522. Impact of a Multicomponent Intervention Bundle on Healthcare Facility-Onset Clostridium difficile Rates

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Background. Clostridium difficile is the most common cause of healthcare-associated infections in US hospitals. The National Healthcare Safety Network (NHSN) surveillance system tracks C. difficile infections (CDI), one of the measures used by Centers for Medicare and Medicaid Services (CMS) to determine a hospital’s total Hospital-Acquired Conditions (HAC) score and ranking among other hospitals. This is then used to calculate Value Based Purchasing pay for performance incentives payments, which may lead to significant reductions in a facility’s reimbursement if rates are too high. The objective of this study was to assess the effectiveness of a multicomponent intervention bundle in reducing our healthcare facility-onset (HO) CDI rates.

Methods. This was a pre-post quasi-experimental retrospective study comparing CDI rate per 1,000 patient days and Standardized Infection Ratio (SIR) in the pre-intervention period from January 1, 2017 to December 31, 2017 to the intervention period from January 1, 2018 to March 31, 2018 in a 319-bed teaching hospital in northwest Ohio. We implemented a testing algorithm to guide physicians and nurses, focusing on increasing early detection and decreasing inappropriate testing. We enforced re-testing criteria, which did not allow re-testing within 7 days and in those who were positive during the admission. Infection Preventionists provided staff education. A dedicated C. difficile isolation cart was created. Contact isolation, hand hygiene, enhanced environmental cleaning and disinfection were reinforced. Treatment guidelines were established and antimicrobial stewardship reviews were performed on all cases to discourage unnecessary medications, encourage judicious use of antimicrobials, and ensure appropriate treatment.

Results. Our C. difficile rate per 1,000 patient days decreased from 0.826 in the pre-intervention period to 0.495 in the postintervention period, which resulted in 60% reduction in HO-CDI rate. The SIR also decreased from 1.207 to 0.677, yielding a 55% reduction.

Conclusion. Implementing a C. difficile multicomponent intervention bundle that emphasizes early and appropriate testing may reduce HO-CDI rates.

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523. Use of Whole-Genome Sequencing to Guide a C. difficile Diagnostic Stewardship Program

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Background. Hospital-onset C. difficile infection (HO-CDI) has been problematic at our hospital, with rates almost 50% greater than predicted. C. difficile whole-genome sequencing (WGS) data were used to define the transmission pattern, followed by a diagnostic stewardship intervention.

Methods. Isolates from CDI cases were sequenced for strain relatedness and epidemiologically analyzed using a single nucleotide polymorphism (SNP)-based approach. In June 2017, a diagnostic stewardship intervention began which included provider education and a weekly review of CDI orders placed after hospital day 3 for the following indications: >3 stools/24 hours, the absence of laxative administration, the presence of fever/severe diarrhea or a history of inflammatory bowel disease. In November 2017, an EMR-based testing algorithm was introduced to supplement the review process. Orders not meeting testing criteria were discussed with the ordering provider, with a suggestion to cancel orders without appropriate indications.

Results. WGS assigned 36 isolates to 19 different multi-locus sequence types (ST). Including five assigned to ST-1, a sequence that encompasses the ribotype 027 clade (Figure 1), SNP-based analysis indicated closely related, but non-identical strains, consistent with nosocomial transmission. Six hundred forty-six CDI orders were reviewed, of which met criteria and 64 (15%) were positive. Two hundred twenty-five (35%) of orders were recommended for cancellation. The HO-CDI rate decreased from 11.67/10k in the 5-month baseline period to 7.13/10k in the 9-month intervention period (P = 0.0089) (Figure 2).

Conclusion. WGS revealed that nosocomial transmission of C. difficile was an unlikely cause for our elevated CO-CDI rate. A diagnostic stewardship intervention which focused on identifying community-acquired infection and avoiding over-testing was associated with a sustained decrease in the HO-CDI rate which has persisted for 9 months.

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524. The Journey to Implement a Computerized Clinical Decision Support (CDS) Tool to Improve Testing for Clostridium difficile Infection (CDI)

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Background. CDI guidelines recommend hospitals relying on Nucleic Acid Amplification Testing (NAAT) apply criteria for appropriate submission. CDS tools could improve test utilization.

Methods. A CDS Epic Best Practice Advisory was added to the electronic health record (EHR) on 24 non-academic centers on September 21, 2017. Hard stops were not available but the CDS prompted ordering NAAT with notification of cancellation if a prior negative/positive test was done within 7/14 days; recommendation to cancel for laxatives within 48 hours; and to reconsider if tube feeds were initiated within 24 hours. Two hundred fourty-five (45%) of orders were reviewed, of which 421 (65%) were deemed positive. Two hundred thirty-two (35%) of orders were recommended for cancellation. Testing appropriateness was assessed pre- and post-CDS, as well as how alerts were handled Phase 1 (9/21 to 11/15/17), and after CDS modifications in Phase 2 (11/16/17 to 1/18/18) and Phase 3 (1/19 to 3/13/18). Charts of patients with healthcare onset CDI (HO CDI) LabID Events were reviewed for symptoms of true

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Figure 1.

Figure 2.