534. *Clostridium difficile* Reduction: An Agent-Based Simulation Modeling Approach to Evaluating Intervention Comparative Effectiveness at Pediatric Hospitals

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Session: 59. Healthcare Epidemiology: Updates in *C. difficile*

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**Background.** *Clostridium difficile* surveillance data are lacking from pediatric facilities and there are few pediatric-centered guidelines or studies evaluating *C. difficile* targeted pediatric interventions. Compared with the adult setting, *C. difficile* control in pediatric healthcare facilities is also further complicated by epidemiologic variability across age spectrum and increased patient-to-patient and patient-to-family interactions.

**Methods.** We constructed an agent-based simulation model of *C. difficile* transmission at a freestanding children’s hospital. The 80-bed hospital model included interactions between the physical environment, patients, visitors, family caregivers, nurses, and physicians. The model was then used to evaluate the comparative effectiveness of nine infection control interventions and six multiple-intervention bundles at reducing hospital-onset *C. difficile* infections and asymptomatic *C. difficile* colonization.

**Results.** The most effective two-intervention bundle, composed of daily cleaning with sporicidal disinfectant and an asymptomatic *C. difficile* screening protocol, reduced hospital-onset *C. difficile* infection by 62.0% and asymptomatic colonization by 88.4%. Six of the nine single-intervention strategies also significantly reduced both outcomes, including daily and terminal cleaning, asymptomatic *C. difficile* screening, healthcare worker and patient hand hygiene, and reducing room transfers. The remaining three single-intervention strategies, visitor hand hygiene and visitor and healthcare worker contact precautions, did not significantly reduce either measure.

**Conclusion.** This is the first mathematical model to evaluate pediatric *C. difficile* transmission. Hospitals can achieve a high rate of reduction for hospital-onset *C. difficile* infections by prioritizing implementation of a small number of interventions with high fidelity.

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535. Transmission of *Clostridium difficile* (CD) From Patients ≥2 Years of Age in a Pediatric Oncology Setting

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**Background.** Testing for *Clostridium difficile* (CD) is not recommended in patients under 2 years old because of CD endemicity in young children and absence of associated disease. These patients may, however, represent a reservoir for CD transmission to other high-risk pediatric patients. We describe the strain relatedness of CD isolates among a cohort of pediatric oncology patients by multilocus sequence type (MLST) and interrogate putative transmission events originating from donors ≥2 years of age with whole-genome sequencing (WGS).

**Methods.** Demographic and epidemiologic information was extracted from our infection control database for all laboratory-identified CD cases in pediatric patients from October 2014 to December 2017. Patients ≥2 year old were identified as potential CD donors in a temporal–spatial model of transmission based on initial MLST

**Results.** CD donors in a temporal–spatial model of transmission based on initial MLST and asymptomatic *C. difficile* infection (CA-CDI) in adults. Contact with infants, a population known to be asymptptomatically colonized by *C. difficile* (CD), has been identified as a risk factor for CA-CDI, rendering it vital to explore the epidemiology and determinants of acquisition in babies.

**Methods.** In this prospective cohort study, healthy infants attending a demographically diverse suburban pediatric practice were enrolled at birth and followed through their 2-month, 6-month, and 12-month well child visit. At each visit, stool samples were collected, and questionnaires including interim exposure to potential risk factors for CD acquisition were administered. Stool was inoculated on pre-reduced CFA/I agar and grown on a TSB plate.

**Results.** Five stool samples harbored >4.5 log cfu of toxigenic CD/g of stool. Proportions of CD+ vs. CD− subjects, respectively, with interim exposure to selected CD risk factors at each visit were as follows: infant healthcare visit 45% vs. 42%; household member healthcare visit 17% vs. 23%; household member with diarrhea 14% vs. 29%; antibiotic exposure 5% vs. 4%; and antacid exposure 7% vs. 3%, all P > 0.05. Regarding risks for acquisition of enteric pathogens in general: breast-milk-including nutrition 57% vs. 73% (P < 0.05 only at 2-month visit), 48% CD+ infants had intermittent diarrhea attendance vs. 25% CD− (but P > 0.05 at each visit).

**Conclusion.** Asymptomatic carriage of toxigenic CD occurred in over half of healthy infants during the first year of life, and several had a high organism burden that could increase the risk for transmission. While daycare attendance was more common among colonized infants, the majority of infants who were CD+ had no daycare exposure.

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536. *Clostridium difficile* Colonization in the First Year of Life

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**Background.** Recent years have witnessed an explosive increase in communi-

**Results.** Fifteen were infants; 90% of samples and questionnaires identified as potential donors to 48 pediatric patients; 40 samples were recoverable on concordant strain type on initial MLST, 27 (69%) patients ≤2 years of age were the dominant strains (32% total). ST-11 was not isolated among ≤2 years group and strains and frequency among patients ≤2 years is shown in Figure 1. ST-2 and 42 were unique pediatric patients. Thirty-nine were ≤2 years. Overall MLST distribution of events by epidemiologic links and MLST.

**Conclusion.** In a pediatric oncology unit, hospitalized children ≤2 years of age are not a substantial reservoir for hypervirulent or epidemic strains and an infrequent source of transmission to others with spatial proximity.

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537. Engaging the Bedside Nurse in Reducing *Clostridium difficile* Infection Through an Innovative Patient Care Rounding Program

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**Background.** Bedside nurses comprise the largest personnel group in a hospital and are intimately familiar with a patient’s day to day clinical status. They can be an effective group to engage and empower to assist with hospital-wide *Clostridium difficile* infection (CDI) reduction efforts. The objective of this study was to evaluate the impact of a nursing driven intervention bundle on CDI rates at a 365-bed community hospital.

**Methods.** Daily nursing led CDI and invasive line assessment rounds were implemented in April 2017. Nurses were empowered through a pre-approved protocol to place symptomatic patients in isolation and order a test for *C. difficile*. Additionally, patient care rounds that included nursing leadership, the antibiotic stewardship program physician director, infection preventionist and bedside nurses

**Results.** Testing for *C. difficile* is not recommended in patients under 2 years old because of CD endemicity in young children and absence of associated disease. These patients may, however, represent a reservoir for CD transmission to other high-risk pediatric patients. We describe the strain relatedness of CD isolates among a cohort of pediatric oncology patients by multilocus sequence type (MLST) and interrogate putative transmission events originating from donors ≥2 years of age with whole-genome sequencing (WGS).

**Methods.** Demographic and epidemiologic information was extracted from our infection control database for all laboratory-identified CD cases in pediatric patients from October 2014 to December 2017. Patients ≥2 year old were identified as potential CD donors in a temporal–spatial model of transmission based on initial MLST analysis. CD recipients were identified as any patient with overlapping hospitalization within 12 weeks of the donor, regardless of recipient’s age. Donor–recipient pairs were further characterized with WGS to investigate the validity of presumed transmission events by epidemiologic links and MLST.

**Results.** During the study period CD infection (CDI) was diagnosed in 179 unique pediatric patients. Thirty-nine were ≥2 years. Overall MLST distribution of strains and frequency among patients ≥2 years is shown in Figure 1. ST-2 and 42 were the dominant strains (32%). ST-11 was not isolated among ≥2 years group and only two ST-1 were identified without any related identified recipient cases. Based on concordant strain type on initial MLST, 27 (69%) patients ≥2 years of age were identified as potential donors to 48 pediatric patients; 40 samples were recoverable for WGS representing seven donors and 33 recipients. Despite the high concordance on MLST, WGS revealed only one pair of related CD isolates among these based on a single nucleotide polymorphism (SNP) difference of 1. Retrospective review revealed that these patients were in adjoining rooms during an overlapping admission but were diagnosed with CDI 7 days apart.

**Conclusion.** In a pediatric oncology unit, hospitalized children ≤2 years of age are not a substantial reservoir for hypervirulent or epidemic strains and an infrequent source of transmission to others with spatial proximity.

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were conducted three times weekly. During these rounds, all Foley catheters, central lines, and CDI cases were discussed and a root cause analysis was performed for healthcare-associated infections (HAI’s). CDI standardized infection ratio (SIR) was the primary metric tracked to assess outcome and trends by quarter over a two year period were evaluated.

Results. CDI SIR rates for the two full quarter after program implementation (July to September 2017 and October to December 2017) declined by 27.8% and 51%, respectively when compared with matching quarters from 2016 (Figure 1). Overall calendar year 2016 rates were similar to 2017 rates, but this was due to a significant increase in CDI incidence in first quarter 2017.

Conclusion. A formalized program for CDI reduction that incorporated the bedside nurse, nursing leadership, infection prevention, and the ASP team was effective in reducing CDI rates as measured by SIRs for the two quarters after full program implementation when compared with 2016 baseline rates.

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538. Integrase Inhibitor-Based HAART Is Associated with Greater BMI Gains in Blacks, Hispanics, and Women
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Background. While older protease inhibitors (PI) were more likely to lead to isolated central fat accumulation, progressive increases in generalized obesity in HIV-infected patients following HAART initiation have been observed with most modern regimens, with greater increases in body mass index (BMI) reported in women and with integrase inhibitors (INSTI) use. We sought to analyze changes in BMI following initiation of HAART in a large urban HIV clinic and identify predictors of BMI changes.

Methods. All patients initiating HAART at the clinic from 2009 to 2017 were included in the analysis. Exposure to HAART was defined as concurrent receipt of at least two nucleoside reverse transcriptase inhibitors (NRTI) plus at least one PI, non-nucleoside reverse transcriptase inhibitor (NNRTI) or INSTI. The effects of sex, race, and ethnicity on changes in BMI (kg/m²) per year on HAART were examined using mixed-effects random regression.

Results. Among the 4,048 patients initiating HAART, 69% were male, 53% Black (B), 28% Hispanic (H), and 16% non-Hispanic Whites (NHW). Mean age was 46.3 years (SD 11.9) and mean BMI was 27.0 (6.4). Median follow-up time on HAART was 6.7 years. Cumulative exposure to NNRTI, PI, and INSTI-based HAART were 3,546, 6,184, and 3,090 person-years respectively. The BMI slope per year of HAART exposure by regimen type, sex, race, and ethnicity are presented in Table 1 and Figure 1. There was no significant interaction between sex and race/ethnicity on BMI. Proportion of overweight/obese (BMI ≥ 25) increased from 51% at HAART initiation to 65% at year 3 (P < 0.001) (Figure 2).

Conclusion. INSTI-based HAART is associated with greater increases in BMI in Blacks and Hispanics. Women had greater BMI gains than men on both PI- and INSTI-based HAART. The mechanisms of these differential effects by sex and race/ethnicity should be examined in prospective studies.

Table 1: BMI Slopes by Year on HAART

|          | All Patients | By Race/Ethnicity | By Sex |
|----------|--------------|-------------------|--------|
|          | N            | Slope             | B      | H    | NHW | P value | Men | Women | P value |
| All      | 4048         | 0.26              | 0.28   | 0.26 | 0.19 | 0.03    | 0.23 | 0.30  | 0.008   |
| NNRTI    | 1364         | 0.21              | 0.20   | 0.21 | 0.12 | 0.02    | 0.24 | 0.15  | 0.07    |
| PI       | 2087         | 0.24              | 0.20   | 0.20 | 0.12 | 0.03    | 0.19 | 0.33  | 0.0004  |
| INSTI    | 2264         | 0.32              | 0.33   | 0.33 | 0.16 | 0.008   | 0.25 | 0.43  | 0.005   |

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539. GS-CA2: A Novel, Potent, and Selective First-In-class Inhibitor of HIV-1 Capsid Function Displays Nonclinical Pharmacokinetics Supporting Long-Acting Potential in Humans
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