**Supplementary Materials**

**Treated, hospital-onset *Clostridiodes difficile* infection: an evaluation of predictors and feasibility of benchmarking comparing two risk-adjusted models among 265 hospitals**

Kalvin C. Yu MD1, Gang Ye PhD1, Jonathan R. Edwards MStat2, Raymund Dantes MD, MPH2,3, Vikas Gupta PharmD1, ChinEn Ai MPH1, Kristina Betz MD PhD2, Andrea L. Benin MD2

1Becton, Dickinson and Company, 1 Becton Drive, Franklin Lakes, New Jersey, USA

2Centers for Disease Control and Prevention, Atlanta, Georgia, USA

3Emory University School of Medicine, Atlanta, Georgia, USA

**Supplementary Table S1.** Regression Coefficients and Standard Errors for the Simple Model.

| **Parameter** | **Regression Coefficient (In Logarithm Scale)** | **Standard Error** |
| --- | --- | --- |
| **Intercept** | -4.450 | 0.137 |
| **Year** |  |  |
| 2015 | 0.366 | 0.079 |
| 2016 | 0.403 | 0.059 |
| 2017 | 0.354 | 0.058 |
| 2018 | 0.218 | 0.058 |
| 2019 | 0.046 | 0.058 |
| 2020 |  |  |
| **COCDI prevalence** | 1.039 | 0.035 |
| **Average LOS** | 0.189 | 0.012 |
| **Bed size** |  |  |
| 1-50 |  |  |
| 51-100 | 0.523 | 0.113 |
| 101-200 | 0.586 | 0.107 |
| 201-300 | 0.844 | 0.107 |
| 301-500 | 0.878 | 0.106 |
| 500+ | 0.783 | 0.110 |
| **% ICU admissions** |  |  |
| < 2nd quartile |  |  |
| 3rd quartile | 0.130 | 0.031 |
| 4th quartile | 0.169 | 0.032 |
| Not reported | 0.379 | 0.053 |
| **% patients aged 41-64 years** | 0.005 | 0.002 |
| **Urban/rural status** |  |  |
| Rural |  |  |
| Urban | 0.083 | 0.028 |

Note. COCDI, community-onset *C.*difficile infection; ICU, intensive care unit; LOS, length of stay.

**Supplementary Table S2.** Regression Coefficients and Standard Errors for the Complex Model.

| **Parameter** | **Regression Coefficient (In Logarithm Scale)** | **Standard Error** |
| --- | --- | --- |
| **Intercept** | -3.370 | 0.111 |
| **Year** |  |  |
| Years other than 2017 and 2018 |  |  |
| Year 2017 and 2018 | 0.078 | 0.020 |
| **COCDI prevalence** |  |  |
| 1st quartile |  |  |
| 2nd quartile | 0.489 | 0.037 |
| 3rd quartile | 0.847 | 0.037 |
| 4th quartile | 1.175 | 0.041 |
| **Average LOS** |  |  |
| ≤ 3rd quartile |  |  |
| 4th quartile | 0.106 | 0.026 |
| **Bed size** |  |  |
| 1-50 |  |  |
| 51-300 | 0.175 | 0.102 |
| 301+ | 0.212 | 0.101 |
| **HO testing intensity** |  |  |
| 1st quartile |  |  |
| 2nd quartile | 0.371 | 0.043 |
| 3rd quartile | 0.516 | 0.045 |
| 4th quartile | 0.709 | 0.048 |
| **CO testing intensity** |  |  |
| 1st quartile |  |  |
| 2nd quartile | -0.136 | 0.028 |
| 3rd quartile | -0.223 | 0.030 |
| 4th quartile | -0.349 | 0.035 |
| **HO testing prevalence** |  |  |
| 1st quartile |  |  |
| 2nd quartile | 0.227 | 0.043 |
| 3rd quartile | 0.403 | 0.043 |
| 4th quartile | 0.544 | 0.047 |
| **% Females** |  |  |
| 1st quartile |  |  |
| 2nd quartile | -0.088 | 0.027 |
| 3rd quartile | -0.077 | 0.029 |
| 4th quartile | -0.100 | 0.034 |
| **Teaching status (medical school affiliation)** |  |  |
| Non-teaching |  |  |
| Teaching | 0.083 | 0.024 |

Note. CO, community-onset; COCDI, community-onset *C.*difficile infection; HO, hospital-onset; LOS, length of stay.

**Supplementary Figure S1.** Goodness-of-fit: Decile Plot of Observed vs Predicted cHT-CDI (HOCDI) events (quarterly average).

Chart, line chart

Description automatically generated

Note: cHT-CDI, candidate definition for healthcare facility-onset, treated *C.*difficile infection; HOCDI, hospital-onset C. difficile infection).

The decile plot shows no systematic pattern of deviation for the model predicted cHT-CDI events from the ‘perfect fit’ (gray dashline), which indicates a well-specified model (i.e., a model that matches the data).

**Supplementary Figure S2.** Goodness-of-fit: Observed vs Predicted cHT-CDI Events (HOCDI) (per Quarter).

Chart, scatter chart

Description automatically generated

Note: cHT-CDI, candidate definition for healthcare facility-onset, treated *C.*difficile infection; HOCDI, hospital-onset C. difficile infection.

The random distribution of the scattered points of observed vs predicted events along the ‘perfect fit’ line indicates a well-specified model (i.e., a model that matches the data).

**Supplementary Figure S3**. Ranking change of hospitals for the top 25 percentile (4th quartile; worst performing) based on unadjusted observed cHT-CDI event rates (blue triangles) compared to the ranking based on the Complex Model SIR (orange diamonds). A more granular breakdown of these hospitals and the rank adjustment after applying Simple and Complex SIR is included in Figure S1.

Note: cHT-CDI, candidate definition for healthcare facility-onset, treated *C.*difficile infection; SIR, standardized infection ratio.

Among the 50 hospitals ranked in the 4th quartile of the unadjusted (observed) cHT-CDI rate, 19 hospitals (38%) remained in the same ranking category (4th quarter) of model-based (adjusted) SIR and 31 hospitals (62%) improved in ranking when using the Complex Model-based SIR ranking. Specifically, 21 hospitals (42%) improved their ranking to the 3rd quartile; 8 hospitals (16%) improved their ranking to the 2nd quartile; and 2 hospitals (4%) moved to the 1st quartile (from the worst-performing quartile to the best-performing quartile).