Can *C. difficile* Infection Rates Be Used to Judge Prevention Success for Hospitals?

David P. Calfee, MD, MS
Associate Professor of Medicine and Public Health
Chief Hospital Epidemiologist, NewYork-Presbyterian/Weill Cornell
Objectives

• Understand the epidemiology of *C. difficile* infection (CDI) and the impact of preventive measures
• Describe pros and cons of currently available metrics for measurement of CDI rates
• Discuss challenges and opportunities related to public reporting of CDI rates

No conflicts of interest.
The Epidemiology of CDI

• Exposure to and acquisition of *C. difficile*
• Progression to symptomatic *C. difficile* infection
  – Disruption of normal colonic flora
    • Antibiotics (inappropriately or appropriately used)
    • Other drugs (e.g., chemotherapy, gastric acid suppressants)
  – Poor antibody response to *C. difficile*
  – Older age
  – Other factors
Environmental Interventions for CDI

Percentage of environmental cultures positive for *C. difficile* before and after housekeeping cleaning and after research team disinfection with 10% bleach. (n=9)

Eckstein et al. *BMC Infect Dis* 2007 7:61
Cultures of 3 high-touch surfaces experimentally contaminated with non-toxigenic C. difficile.
Environmental Interventions for CDI

- Intervention 1
  - Facility-wide fluorescent marker

- Intervention 2
  - Adjunctive UV device for CDI rooms

- Intervention 3
  - Enhanced daily and terminal disinfection of CDI rooms by dedicated staff, direct observation, ATP detection

Sitzlar B. Infect Control Hosp Epidemiol 2013;34:459-65
Regional Interventions to Prevent CDI

<table>
<thead>
<tr>
<th>State</th>
<th>Period</th>
<th>Patient days</th>
<th>Rate</th>
<th>(95% CI*)</th>
<th>Rate ratio</th>
<th>(95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinois</td>
<td>Mar 2010–Oct 2010</td>
<td>637,135</td>
<td>11.6</td>
<td>(10.3–13.0)</td>
<td>0.84</td>
<td>(0.70–1.00)</td>
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<tr>
<td></td>
<td>Mar 2011–Oct 2011</td>
<td>578,121</td>
<td>9.9</td>
<td>(8.4–11.4)</td>
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</tr>
<tr>
<td>Massachusetts</td>
<td>Feb 2010–Sep 2010</td>
<td>823,939</td>
<td>7.6</td>
<td>(6.7–8.5)</td>
<td>0.75</td>
<td>(0.63–0.90)</td>
</tr>
<tr>
<td></td>
<td>Feb 2011–Sep 2011</td>
<td>830,023</td>
<td>5.7</td>
<td>(4.9–6.5)</td>
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<tr>
<td>New York</td>
<td>May 2008–Dec 2008</td>
<td>2,607,464</td>
<td>9.2</td>
<td>(8.5–9.9)</td>
<td>0.81</td>
<td>(0.73–0.89)</td>
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<tr>
<td></td>
<td>May 2009–Dec 2009</td>
<td>2,575,514</td>
<td>7.5</td>
<td>(7.0–8.0)</td>
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<tr>
<td>Overall</td>
<td>Pooled baseline</td>
<td>4,068,538</td>
<td>9.3</td>
<td>(8.7–9.8)</td>
<td><strong>0.80</strong></td>
<td>(0.73–0.86)</td>
</tr>
<tr>
<td></td>
<td>Pooled post</td>
<td>3,983,658</td>
<td>7.5</td>
<td>(7.0–7.9)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviation: CI = confidence interval.

* Study periods vary by state.

CDC. MMWR 2012;61(9):157-62
The Greater New York
*C. difficile* Prevention Collaborative

- Central steering committee
- Interdisciplinary teams at each hospital
- Standardized definitions and data collection tools
  - Environmental cleaning protocol
  - Infection Prevention interventions
- Monthly teleconference to discuss challenges and best practices
- Monthly data reports for intra- and inter-facility comparison

Koll BS. *J Healthc Qual.* Epub January 7, 2013
### The Greater New York C. difficile Prevention Collaborative

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>21.4</td>
<td>18.8*</td>
</tr>
<tr>
<td>Hospital-Onset</td>
<td>10.7</td>
<td>8.6*</td>
</tr>
<tr>
<td>NHA</td>
<td>7.8</td>
<td>7.5</td>
</tr>
<tr>
<td>CO-HA</td>
<td>3.0</td>
<td>2.8</td>
</tr>
</tbody>
</table>

* *p* < 0.001

Reduction in Antimicrobial Use

- ICU patients reviewed on day 3 and 10 of broad-spectrum antibiotic therapy
  - Significantly reduced antibiotic use (p<0.0001)
  - 31% reduction in nosocomial CDI in ICUs (as compared to a 33% increase in non-intervention units, p=0.04).

Elligsen M. *Infect Control Hosp Epidemiol* 2012;33:354-61
Objective

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• **Describe pros and cons of currently available metrics for measurement of CDI rates**

• Discuss challenges and opportunities related to public reporting of CDI rates
Administrative vs Surveillance Data

• Similar to other HAIs, ICD-9 codes assigned at discharge have been found to be suboptimal for *C. difficile* measurement and reporting.
  – Some studies have found that ICD-9 codes identify higher rates of CDI while others have found ICD-9 codes to have significantly lower sensitivity than laboratory and clinical surveillance data.

Chan M. *PLosOne* 2011;6:e15603
Dubberke ER. *Emerg Infect Dis* 2006;12:1576-9
National Healthcare Safety Network (NHSN) Surveillance Definitions

• Clinical Surveillance
  – Cases of CDI (i.e., *C. difficile* identified with a positive lab test that meet clinical criteria for a healthcare-associated infection (e.g., gastroenteritis (GI-GE) or gastrointestinal tract (GI-GIT) infection).
    • All criteria for infection must be first present together on or after the third calendar day.
National Healthcare Safety Network (NHSN) Surveillance Definitions

• Laboratory Identified Event (LabID) surveillance
  – Includes all non-duplicate, positive laboratory test results for *C. difficile* toxin A and/or B.
    • Healthcare facility-onset (HO): LabID events collected >3 calendar days after admission
      – The denominator is patient-days.
    • CO-HFA: LabID Event collected from a patient discharged from the facility ≤4 weeks prior to current date of stool specimen collection
    • CO: LabID Event collected as an outpatient or an inpatient ≤3 days after admission to the facility

Duplicate: A positive laboratory result from the same patient and location within 14 days of a previous positive. Recurrent: positive test obtained >2 weeks and ≤8 weeks after the most recent CDI LabID Event.
LabID vs Clinical Surveillance

- HO LabID CDI rate was 29% higher than clinical surveillance rate.

- Reasons for discordance:
  - Symptom onset $\leq$ 48 hours after admission but specimen collected on day 4 or later (54.9%)
  - Availability of results from other facilities (15.2%)
  - No diarrhea (14.6%)

Gase KA. Infect Control Hosp Epidemiol 2013;34:284-90
What’s measured improves.

– Peter Drucker
Mechanisms by Which Reporting *Could* Reduce CDI Rates

- Hospitals make interventions to reduce the risk of *C. difficile* within their facilities
  - Identification of previously unrecognized opportunities for improvement
  - Hospitals act to avoid poor publicity*
- Hospitals change their reporting practices
  - Enhanced quality control of reported data
  - “Gaming” the system*
- Patients seek care in higher performing facilities*

*relevant to external/public reporting only
Assessment of Individual Hospital Prevention Success

• Factors that can limit the ability to make direct comparisons between hospitals are often less problematic when using data for internal comparisons
  – Practices are relatively constant
  – Patient population is relatively stable
  – Confounding factors may be more easily identified, acknowledged, and addressed.
    • Changes in diagnostic test methods
    • Changes in practice patterns
Introduction of antibiotic guidelines and an antimicrobial stewardship team was associated with a 66% reduction in CDI (p<0.0001).

OBD=occupied bed-days

The Greater New York C. difficile Prevention Collaborative

Koll BS. J Healthc Qual 201. Epub January 7, 2013
The Epidemiology of CDI is Complex

• Exposure to and acquisition of *C. difficile*
  – Healthcare facility
    • Your healthcare facility
    • Another healthcare facility
  – Community

• Progression to symptomatic *C. difficile* infection
  – Disruption of normal colonic flora
    • Antibiotics (inappropriately or appropriately used)
    • Other drugs (e.g., chemotherapy, gastric acid suppressants)
  – Poor antibody response to *C. difficile*
  – Older age
  – Other factors
Asymptomatic Carriage of \textit{C. difficile} at the Time of Hospital Admission

- Prospective PCR testing of stool samples from asymptomatic patients at the time of hospital admission found that 9.7\% of patients were \textit{C. difficile}-positive at the time of admission.

Leekha S. \textit{Am J Infect Control} 2013;41:390-3
Healthcare is a Complex Social Network

- Hospitalized patients in a large metropolitan area*
  - 29% of patients had >1 admission
  - 75% of those with >1 admission were admitted to >1 facility
  - 25% of patients with post-discharge CDI were admitted to another hospital.

*Orange County, CA

Huang SS. Infect Control Hosp Epidemiol 2010; 31:1160-9
Murphy CR. Infect Control Hosp Epidemiol 2012;33:20-8

A. Direct transfers
B. Direct and indirect within 30 days
C. Direct and indirect within 365 days
94% of CDI cases had previous healthcare exposure.

- About two-thirds had only inpatient exposure
  - Only ~23% of cases were HO
  - 67% of nursing home (NH)-onset cases had a recent hospital admission
- 20% of HO-CDI cases had recent NH exposure.

CDC. MMWR Wkly Rpt 2012; 61:157-62
Impact of Case Definition: LabID vs Clinical Surveillance

- HO LabID CDI rate was 29% higher than the clinical surveillance rate.
- The relative difference between LabID and surveillance rates varied substantially among hospitals.

Gase KA. *Infect Control Hosp Epidemiol* 2013;34:284-90
LabID vs Clinical Surveillance

- With one exception, rank order was the same for LabID and clinical CDI events.
- Hospital E with the highest rate of CDI, had the third lowest LabID rate.

What is the Role of Data Validation?


<table>
<thead>
<tr>
<th>State</th>
<th>No. of Facilities Reporting</th>
<th>Observed</th>
<th>Predicted</th>
<th>SIR</th>
<th>Lower</th>
<th>Upper</th>
<th>0</th>
<th>1.0</th>
<th>2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>50</td>
<td>64</td>
<td>94.25</td>
<td>0.68</td>
<td>0.52</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connecticut</td>
<td>30</td>
<td>65</td>
<td>69.46</td>
<td>0.94</td>
<td>0.72</td>
<td>1.19</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Delaware</td>
<td>8</td>
<td>20</td>
<td>33.84</td>
<td>0.59</td>
<td>0.36</td>
<td>0.91</td>
<td></td>
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<td></td>
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<tr>
<td>Illinois</td>
<td>140</td>
<td>301</td>
<td>333.46</td>
<td>0.90</td>
<td>0.80</td>
<td>1.01</td>
<td></td>
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<tr>
<td>Maryland</td>
<td>48</td>
<td>234</td>
<td>179.95</td>
<td>1.30</td>
<td>1.14</td>
<td>1.48</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Massachusetts</td>
<td>70</td>
<td>124</td>
<td>211.44</td>
<td>0.59</td>
<td>0.49</td>
<td>0.70</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>New Hampshire</td>
<td>24</td>
<td>13</td>
<td>22.93</td>
<td>0.57</td>
<td>0.34</td>
<td>0.90</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Jersey</td>
<td>72</td>
<td>183</td>
<td>222.97</td>
<td>0.82</td>
<td>0.71</td>
<td>0.95</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>New York</td>
<td>182</td>
<td>604</td>
<td>610.22</td>
<td>0.99</td>
<td>0.91</td>
<td>1.04</td>
<td></td>
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<tr>
<td>Oklahoma</td>
<td>48</td>
<td>59</td>
<td>118.95</td>
<td>0.50</td>
<td>0.38</td>
<td>0.72</td>
<td></td>
<td></td>
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<tr>
<td>Oregon</td>
<td>37</td>
<td>50</td>
<td>82.21</td>
<td>0.61</td>
<td>0.45</td>
<td>0.85</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>204</td>
<td>818</td>
<td>1,176.83</td>
<td>0.70</td>
<td>0.65</td>
<td>0.75</td>
<td></td>
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</tr>
<tr>
<td>South Carolina</td>
<td>63</td>
<td>183</td>
<td>158.11</td>
<td>1.16</td>
<td>1.00</td>
<td>1.31</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tennessee</td>
<td>72</td>
<td>282</td>
<td>245.99</td>
<td>1.15</td>
<td>1.02</td>
<td>1.29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vermont</td>
<td>8</td>
<td>3</td>
<td>10.99</td>
<td>0.27</td>
<td>0.17</td>
<td>0.51</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virginia</td>
<td>76</td>
<td>161</td>
<td>193.81</td>
<td>0.83</td>
<td>0.71</td>
<td>0.97</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washington</td>
<td>62</td>
<td>86</td>
<td>148.07</td>
<td>0.58</td>
<td>0.47</td>
<td>0.71</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>US-all</td>
<td>1,538</td>
<td>4,615</td>
<td>5,618.75</td>
<td>0.82</td>
<td>0.80</td>
<td>0.84</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Presence of mandate to report SIR to the state health department using NHSN 3 or June 30, 2009.

† Solid diamond=SIR < 1.0, solid X=SIR > 1.0, open circle=SIR not different than 1.0.

State health department self-reported the completion of any validation study of NHSN data (studies conducted on 2008 data).

“State health department self-reported the completion of any validation study of NHSN data”
HAI Data Validation

- Substantial variability in individuals’ application of standardized definitions for surveillance of HAIs has been observed.
- Validation studies conducted as part of mandated reporting programs have reported similar findings.
  - In one study, only 48% of CLABSI that met NHSN criteria had been reported.
- In a validation of mandatory *C. difficile* LabID reporting, 98% of cases had been appropriately reported.

Worth LJ. *Am J Infect Control* 2009;37:643-8
Mayer J. *Clin Infect Dis* 2012;55:364-70
Oh JY. *Infect Control Hosp Epidemiol* 2012;33:439-55
Lin MY. *JAMA* 2010;304:2035-41
Backman LA. *Am J Infect Control* 2010;38:832-8
Gase KA. *Infect Control Hosp Epidemiol* 2013;34:284-90
## Diagnostic Testing for *C. difficile*

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Availability</th>
<th>Expense</th>
<th>Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>C. difficile</em> culture</td>
<td>Low</td>
<td>Moderate</td>
<td>Limited</td>
<td>$5–10</td>
<td>No diagnostic use; only toxigenic organisms cause disease</td>
</tr>
<tr>
<td>Toxigenic culture</td>
<td>High</td>
<td>High</td>
<td>Limited</td>
<td>$10–30</td>
<td>Reference method Epidemiologic tool Limited diagnostic use</td>
</tr>
<tr>
<td>CCNA</td>
<td>High</td>
<td>High</td>
<td>Limited</td>
<td>$15–25</td>
<td>Reference method Limited diagnostic use</td>
</tr>
<tr>
<td>GDH</td>
<td>High</td>
<td>Low</td>
<td>Widely</td>
<td>$5–15</td>
<td>Diagnostically as a screening test; must be confirmed</td>
</tr>
<tr>
<td>Toxin EIA tests</td>
<td>Low</td>
<td>High</td>
<td>Widely</td>
<td>$5–15</td>
<td>Must detect toxins A+B; inferior sensitivity</td>
</tr>
<tr>
<td>NAATs</td>
<td>High</td>
<td>High</td>
<td>Widely</td>
<td>$20–50</td>
<td>Use only in acute disease; false positives of concern</td>
</tr>
</tbody>
</table>

CCNA, *C. difficile* cytotoxin neutralization assay; GDH, glutamate dehydrogenase; EIA, enzyme immunoassay; NAAT, nucleic acid amplification tests.

Impact of Testing Method on CDI Rates

• The increased sensitivity of molecular diagnostic tests leads to increased CDI rates after conversion from toxin EIA tests
  – Individual hospitals: rate increases of >50%
  – 10 network hospitals: 56% increase in HO-CDI (95% CI 28%-90%)
  – State-mandated reporting program: average 50% increase in HO-CDI in hospitals that switched from EIA to PCR

• False-positives may occur when molecular test performed in the absence of clinical disease.

Fong KS. Infect Control Hosp Epidemiol 2011;32: 932-3
Kaltsas A. J Clin Microbiol 2012;50:1303-7
Goldenberg SD. J Infect 2011;62:363-70
Moehring RW. Infect Control Hosp Epidemiol 2013;34:1055-61
NY State Department of Health 2012
Impact of Diagnostic Testing Method on *C. difficile* Rates

<table>
<thead>
<tr>
<th></th>
<th>EIA</th>
<th>PCR</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of lab specimens</td>
<td>2,579</td>
<td>2,534</td>
<td></td>
</tr>
<tr>
<td>Mean no. (%) positive</td>
<td>167 (6.5)</td>
<td>382 (15.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CDI rates</td>
<td>4.9</td>
<td>10.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>(cases per 10,000 pt-days)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fong KS. *Infect Control Hosp Epidemiol* 2011;32:932-3
Kaltsas A. *J Clin Microbiol* 2012;50:1303-7
Risk Model for Calculation of Expected Number of *C. difficile* LabID Events

Number of predicted (expected) HO CDI LabID events = \( \exp \left[ -7.8983 + 0.3850(\text{CDI test type} = \text{NAAT}) + 0.1606(\text{CDI test type} = \text{EIA}) + 0.3338(\text{CO CDI prevalence rate}) + 0.2164(\text{bedsize} > 245) + 0.0935(\text{bedsize} = 101-245 \text{ beds}) + 0.1870(\text{medical school affiliation} = \text{major}) + 0.0918(\text{medical school affiliation} = \text{graduate}) \right] \times \text{pt-days} \)

Impact of Denominator: Patient-Days

• **Hospital A**
  - Hospital onset CDI: 10
  - Patient-days: 10,000
  - CDI rate: 10 per 10,000 pt-days
  - Average LOS: 7 days
  - Days-at-risk:* 5,714
  - CDI rate: 17.5 per 10,000 days-at-risk

• **Hospital B**
  - Hospital onset CDI: 5
  - Patient-days: 10,000
  - CDI rate: 5 per 10,000 pt-days
  - Average LOS: 4 days
  - Days-at-risk:* 2,500
  - CDI rate: 20 per 10,000 days-at-risk

*Simplified for illustration purposes: assumes all patients' LOS = average LOS, excludes first three hospital days of all admissions, does not exclude patient-days after CDI diagnosis from estimate of days-at-risk.
Impact of Treatment on Test Result

Results were more likely to remain positive among older patients and those with NAP1 infection.

Day 1: 14% negative
Day 2: 35% negative
Day 3: 45% negative

Sunkesula VCK. *Clin Infect Dis* 2013;57:494-500
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• **Discuss challenges and opportunities related to public reporting of CDI rates**

No relevant conflicts of interest to disclose.
<table>
<thead>
<tr>
<th></th>
<th>Voluntary, confidential, outcome</th>
<th>Mandatory, confidential, outcome</th>
<th>Mandatory, public, outcome</th>
<th>Mandatory, public, process and structure</th>
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</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strength of published evidence for benefit</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Relevance and intelligibility of indicators</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Data representativeness, completeness</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Increase commitment of hospital leadership to combat HAI</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Provision of external reinforcement for organizational change</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Satisfaction of the public's and patients' demands</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Variable</td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workload</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Risk of skewing of priorities</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Risk of misinterpretation by public and the media</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Risk of under-reporting and gaming</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

Public Reporting Toolkit, 2012

• Reporting
  – Data validation
• Financial support
• Advisory councils
• Financial incentives
  – Promote improvement and continued success, target poor performers for assistance
• Licensure
• Training
• Financial disincentives

Does Public Reporting Prevent HAI?

• Some data and expert opinion suggest that mandated public reporting and non-payment programs do not result in improved HAI-related processes or outcomes.

Pakyz AL. Infect Control Hosp Epidemiol 2013;34:780-4
Meddings JA. Ann Intern Med 2012;157:305-12
Linkin DR. Infect Control Hosp Epidemiol 2013;34:844-6
CDI Reporting Requirements in the US

• State requirements
  – Several states have mandatory CDI reporting.
  – As of April 2012, California, Illinois, New York, Tennessee were reporting via NHSN.

• Federal
  – CMS Hospital Inpatient Quality Reporting (IQR) Program requires reporting via NHSN (January 2013).
    • Public reporting: data to be posted on Hospital Compare website
    • Inclusion of *C. difficile* rate in FY 2017 HAC Reduction Program

Lessa FC. *Clin Infect Dis* 2012;55(S2):S65-70
The England Experience

- Mandatory Reporting
- Government HAI program
- Statutory Code of IP &C Practices for hospitals
- C. difficile bundle and Ribotyping Network
- National target, shared responsibility
- Code of Practices extended to all health and care facilities

Duerden Bl. *Anaerobe* 2011;17:175-9
Wilcox MH. *Clin Infect Dis* 2012;55:1056-63
The Ontario Experience

- Increased attention to CDI and preventive measures?
  - Guidelines were distributed to all hospitals
  - Anticipation of decreased reimbursement and executive compensation?
- Unrecognized influences and confounders?

Public Reporting of CDI Rates: Challenges

- Appropriate inter-facility comparisons
  - Complex epidemiology of CDI
  - Sensitivity and specificity of case definitions
  - Data validation
  - Risk adjustment
    - Multiple testing methods with differing performance characteristics
    - Patient populations with differences in CDI risk
  - Differences in clinical and diagnostic practices

- Absence of coordinated interventions across facilities

- Potential for unintended consequences
Public Reporting of CDI Rates: Opportunities

- Availability of local data
- Increased attention
- Additional resources
- Implementation of interventions with subsequent reduction in CDI rates
  - Optimize clinical diagnostic practices
  - Improve basic infection control and environmental cleaning and disinfection practices
  - Optimize antimicrobial use
- Incentive to collaborate with other healthcare facilities