Retrospective Evaluation of *Clostridium difficile* Infection Risk Factors and Management at a University Teaching Hospital in Northern BC.

Katie Bellefeuille, BSc(Pharm), ACPR
Alicia Rahier, BSc(Pharm), ACPR
Amy Nunley, BSc(Pharm), ACPR

University Hospital of Northern British Columbia (UHNBC)
Prince George, BC
Disclosure

I, or any of the primary researchers, have no actual or potential conflict of interest in relation to this presentation
Background

• *Clostridium difficile (C. diff)* is the primary cause of healthcare associated diarrhea
  • Major threat to patient safety worldwide
  • Often preventable
Background

• **Risk factors for developing CDI:**
  - Antimicrobial therapy *
    • broad spectrum, long duration
  - Advanced age (>65 years)
  - Extended hospital stay
  - Poor infection control in healthcare facilities*
  - Cancer chemotherapy
  - Gastrointestinal surgery or manipulation of gastrointestinal tract
  - Proton pump inhibitors (PPIs) and to a lesser extent histamine-2 receptor antagonists (H2RAs)*
Background

• *Reducing the rate of CDI requires a multifaceted approach involving:*
  • Infection prevention and control measures to minimize transmission of infection
  • Minimizing modifiable risk factors
  • Antimicrobial stewardship measures to eliminate unnecessary or prolonged antimicrobial exposure
Background

- In 2013 the Provincial Infection Control Network of British Columbia (PICNet) developed an evidence based toolkit for CDI that included treatment algorithms.

- In 2014 Brown et al. found that guideline concordant therapy for CDI management was associated with a significant reduction in complications.
Background

- During the 2013/2014 fiscal year the rate of hospital-associated CDI acquired at the UHNBC increased by 35% from the year previous.

- No standard of policy or protocol for treatment of CDI at UHNBC (or within Northern Health entirely).
Primary:

Determine if the management of CDI at UHNBC complies with provincial and national standards in the absence of a standard policy.
Objectives

Secondary:

- Identify the proportion of CDI patients who had potentially modifiable pharmacological risk factors for CDI
  - Includes antimicrobials, PPI, H2RA

- Identify patient outcomes including length of hospital stay, mortality rate and recurrence rate.
## Methods

<table>
<thead>
<tr>
<th>Study Design</th>
<th>Retrospective, observational chart review</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Period</td>
<td>April 1(^{st}), 2010 to March 31(^{st}), 2016</td>
</tr>
<tr>
<td>Population</td>
<td><strong>Inclusion criteria:</strong></td>
</tr>
<tr>
<td></td>
<td>• Diagnosis of health-care associated CDI at UHNBC</td>
</tr>
</tbody>
</table>

*Definition:*

*Patients with positive stool sample collected >72 hours after admission*

*OR*

*Patients with positive stool sample collected < 72 hours after admission but with a recent discharge from UHNBC within the previous 4 weeks*

**Exclusion criteria:**

• Children < 18 years old
Methods: Comparator Treatment Guidelines

Clinical Practice Guidelines for *Clostridium difficile* Infection in Adults: 2010 Update by the Society for Healthcare Epidemiology of America (SHEA) and the Infectious Diseases Society of America (IDSA) 2010

Stuart H. Cohen, MD; Dale N. Gerdin, MD; Stuart Johnson, MD; Ciaran P. Kelly, MD; Vivian G. Loo, MD; L. Clifford McDonald, MD; Jacques Pepin, MD; Mark H. Wilcox, MD

European Society of Clinical Microbiology and Infectious Diseases: update of the treatment guidance document for *Clostridium difficile* infection 2014

S. B. Debast¹, M. P. Bauer², E. J. Kuijper³, on behalf of the Committee*

1) Department of Medical Microbiology, Radboud University Medical Center, Nijmegen, Departments of 2) Infectious Diseases and 3) Medical Microbiology, Centre for Infectious Diseases, Leiden University Medical Centre, Leiden, the Netherlands

- Acceptable compliance rate was defined as 80%
Results: Inclusion and Exclusion

257 Identified Patients

178 Included Patients

79 Excluded Patients

- 72 Pos. stool < 72 hours since admit with NO admission in last 4 wks
- 2 < 8 weeks since previous C. diff test which was community acquired and stool positive less than 72 hours after admission
- 2 Pos. stool < 72 hr and but different facility within previous 4 wks
- 1 Pediatric (< 18 years old)
- 1 No C. difficile test
- 1 Paper chart not available

178 Included Patients

79 Excluded Patients

- 72 Pos. stool < 72 hours since admit with NO admission in last 4 wks
- 2 < 8 weeks since previous C. diff test which was community acquired and stool positive less than 72 hours after admission
- 2 Pos. stool < 72 hr and but different facility within previous 4 wks
- 1 Pediatric (< 18 years old)
- 1 No C. difficile test
- 1 Paper chart not available
## Results: Baseline Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number (%) (n = 178)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>87 (49)</td>
</tr>
<tr>
<td>Age &gt;65</td>
<td>89 (50)</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>2 (1)</td>
</tr>
<tr>
<td>Chronic GI Co-morbidities</td>
<td>55 (31)</td>
</tr>
<tr>
<td>Concurrent Infection on admission</td>
<td>58 (33)</td>
</tr>
<tr>
<td>Previous C. difficile infection</td>
<td>25 (14)</td>
</tr>
<tr>
<td>Antibiotics within 30 days PTA</td>
<td>67 (38)</td>
</tr>
<tr>
<td>PPI or H2RA prior to admission</td>
<td>62 (35)</td>
</tr>
<tr>
<td>Patient with recorded antibiotic allergy</td>
<td>51 (29)*</td>
</tr>
<tr>
<td><em>patients with allergy to metronidazole or vancomycin = 4</em></td>
<td></td>
</tr>
</tbody>
</table>

### Severity of disease

- Mild/Moderate: 117 (66)
- Severe: 49 (28)
- Fulminant: 11 (6)
- Insufficient data: 1
## Results: Compliance with Guidelines

<table>
<thead>
<tr>
<th>CDI Treatment Assessment</th>
<th>Number (%) (n=178)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appropriate treatment</strong></td>
<td>57 (32)</td>
</tr>
<tr>
<td><strong>Inappropriate treatment</strong>*</td>
<td>116 (65.2)</td>
</tr>
<tr>
<td>*No treatment received</td>
<td>17 (9.6)</td>
</tr>
<tr>
<td><strong>Insufficient data</strong></td>
<td>5 (2.8)</td>
</tr>
</tbody>
</table>
## Results: Modifiable Risk Factors

<table>
<thead>
<tr>
<th>Modifiable Risk Factors</th>
<th>Number (%)</th>
<th>(n=178)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antibiotics during admission</td>
<td>149 (84)</td>
<td></td>
</tr>
<tr>
<td>More than 1 antibiotic</td>
<td>142 (80)</td>
<td></td>
</tr>
<tr>
<td>PPI during admission</td>
<td>114 (64)</td>
<td></td>
</tr>
<tr>
<td>H$_2$RA during admission</td>
<td>29 (47)</td>
<td></td>
</tr>
<tr>
<td>Both PPI and H$_2$RA during admission</td>
<td>15 (8.4)</td>
<td></td>
</tr>
</tbody>
</table>

- 66% of antibiotic courses “broad-spectrum”
- Average duration of antibiotic course: 9.7 days (range 1 to 131)
Results Summary

● Primary Outcome: Compliance with guidelines
  – 32% compliance rate with provincial and national standards

● Secondary Outcomes:
  – **Modifiable Risk Factors**: 96% of patients had at least 1 modifiable risk factor
  – **Patient outcomes**:
    ● Average length of stay: 9.7 days (median 23 days)
    ● Recurrence rate: 13% recurrence after the study episode
    ● Mortality: 14%
Conclusions

• Compliance rate with provincial and national standards below the pre-determine acceptable rate of 80%

• Modifiable risk factors were identified for almost all patients

• Future studies with more robust design are required to determine if modifiable risk factors affect length of hospital stay, recurrence rates and mortality rates
Considerations for the Future

- The results from this study support development and implementation of a CDI management protocol and order set at UHNBC

- Further research
  - Effect of order set implementation on compliance with treatment standards
  - Correlation of AMS program implementation and rates of *C. difficile*
Questions?
References

2. Clinical Practice Guidelines for Clostridium difficile Infection in Adults: 2010 Update by the Society for Healthcare Epidemiology of America (SHEA) and the Infectious Diseases Society of America (IDSA). Infection Control and Hospital Epidemiology, Vol. 31, No. 5 (May 2010), pp. 431-455