Which interventions are most fruitful in controlling endemic *C. difficile* infections in gastroenterology patients including a ribotype 027 outbreak?

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C. difficile infections in gastroenterology

- Generally gastroenterology patients high risk population for developing C. difficile infections:
  - Hepatological diseases 3-fold increased risk
  - Inflammatory bowel disease 4.8-fold increased risk
  - Increased exposure to factors known to be associated with increased risk:
    - Advanced age
    - Antibiotic exposure
    - Use of proton pump inhibitors
    - Hospitalisation
- C. difficile infection incidence identified as recurring problem within gastroenterology at The Pennine Acute Hospitals NHS Trust:
  - More evident with centralisation of service
  - Accounted for 12.5% Trust total in 2015/16
C. difficile PCR ribotype 027

• Earliest recorded isolate in Parisian Hospital 1985
• Major outbreak in USA 2003
• Sharp rise in incidence in UK between 2005 and 2008
• At The Pennine Acute Hospitals NHS Trust:
  • Observed sporadically before 2014
  • In 2014 noted that an outbreak had occurred
    • Involved gastroenterology ward
    • Index patient treated in USA hospital
    • MVLA found 7 samples analysed to be “indistinguishable” termed “Oldham 027 lineage”
      • Unable to confirm association with USA 027 lineage
      • This lineage only observed on two other occasions in UK
Interventions

• Intensive phase April to July 2016
  • Deep clean of ward
  • Introduction of weekly multidisciplinary meetings

• Continued phase April 2016 to March 2017:
  • Infection control interventions:
    • Increased ward cleaning frequency and intensity
    • Increased infection control monitoring and auditing
    • Introduction of *C. difficile* risk assessment form
  • Pharmacy and microbiology interventions:
    • Daily clinical pharmacy services provided to the ward by the site’s antimicrobial pharmacist
    • Increased auditing of antibiotic prescribing compliance
    • Introduction of a ward specific antibiotic prescribing guideline
Impact of interventions on *C. difficile* rates

<table>
<thead>
<tr>
<th></th>
<th>2014/15</th>
<th>2015/16</th>
<th>2016/17</th>
<th>Q1 2017/18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases attributed to ward G2</td>
<td>6</td>
<td>7</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Number of ribotype 027 cases</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>attributed to ward G2</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage contribution to</td>
<td>8.3</td>
<td>12.5</td>
<td>3.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Trust total</td>
<td></td>
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</table>
Impact of interventions on *C. difficile* rates

![Bar chart showing number of *C. difficile* cases from 2014-15 to Q1 2017-18 with two categories: 027 ribotype and other ribotypes.](chart.png)
Impact of interventions on C. difficile rates

![Bar chart showing the impact of interventions on C. difficile rates from 2014-15 to Q1 2017-18. The chart includes data for All other Trust cases and Cases attributed to Ward G2.](image-url)
## Potential fruitful interventions: Infection Control

<table>
<thead>
<tr>
<th>Year</th>
<th>Commode cleanliness compliance (%)</th>
<th>Visual infusion phlebitis procedure compliance (%)</th>
<th>Catheter care procedure compliance (%)</th>
<th>Personal protective equipment procedure compliance (%)</th>
<th>Hand hygiene procedure compliance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015/16</td>
<td>41.7</td>
<td>66.6</td>
<td>61.8</td>
<td>72.7</td>
<td>62.9</td>
</tr>
<tr>
<td>2016/17</td>
<td>95.8</td>
<td>86.9</td>
<td>80.2</td>
<td>84.7</td>
<td>84.3</td>
</tr>
<tr>
<td>2016/17</td>
<td><strong>↑ 54.1</strong></td>
<td><strong>↑ 20.3</strong></td>
<td><strong>↑ 18.4</strong></td>
<td><strong>↑ 12.0</strong></td>
<td><strong>↑ 21.4</strong></td>
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<tr>
<td>Q1 2017/18</td>
<td>66.7</td>
<td>97.0</td>
<td>87.7</td>
<td>89.3</td>
<td>94.0</td>
</tr>
<tr>
<td>Q1 2017/18</td>
<td>29.1 ↓</td>
<td>10.1 ↑</td>
<td>7.5 ↑</td>
<td>4.6 ↑</td>
<td>9.7 ↑</td>
</tr>
</tbody>
</table>

Percentage change

- Commode cleanliness: ↓29.1
- Visual infusion phlebitis: ↑10.1
- Catheter care: ↑7.5
- Personal protective equipment: ↑4.6
- Hand hygiene: ↑9.7
Potential fruitful interventions: Pharmacy and microbiology

<table>
<thead>
<tr>
<th>Year</th>
<th>All antibiotics*</th>
<th>Piperacillin/tazobactam*</th>
<th>Carbapenems*</th>
<th>“High risk antibiotics”*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015/16</td>
<td>790.78</td>
<td>109.98</td>
<td>42.76</td>
<td>189.49</td>
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<tr>
<td>2016/17</td>
<td>652.64</td>
<td>146.23</td>
<td>31.81</td>
<td>102.53</td>
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<tr>
<td>2016/17</td>
<td>↓ 17.5%</td>
<td>↑ 33.0%</td>
<td>↓ 25.6%</td>
<td>↓ 45.9%</td>
</tr>
</tbody>
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*Expressed as daily defined dose per 1000 bed days occupied

“High risk antibiotics” include: Cephalosporins, quinolones, co-amoxiclav and clindamycin
## Potential fruitful interventions: Pharmacy and microbiology

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<tr>
<td>Q1 2017/18</td>
<td>678.11</td>
<td>143.24</td>
<td>16.06</td>
<td>173.54</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage change</td>
<td>3.9%</td>
<td>2.0%</td>
<td>49.5%</td>
<td>69.3%</td>
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“High risk antibiotics” include: Cephalosporins, quinolones, co-amoxiclav and clindamycin
Potential fruitful interventions: Pharmacy and microbiology
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Conclusions

• Endemic *C. difficile* infections in gastroenterology patients including a ribotype 027 outbreak have been controlled.
• Number of interventions introduced concurrently therefore difficult to conclude which is most fruitful.
• Findings indicate that the following facilitate:
  • Improved compliance with infection control procedures
  • Reduction in total antibiotic consumption
  • Reduction in consumption of high risk antibiotics
  • High impact multidisciplinary support essential
• Interventions were non-specific to gastroenterology patients or *C. difficile* PCR ribotype 027 therefore should be applicable to all other specialities moving forward.
Acknowledgements

• At The Pennine Acute Hospitals NHS Trust:
  • Gastroenterology team:
    • X. McFarlane, L. Clucas and S. Thomas
  • Microbiology team:
    • Z. Fang, M. Przybylo, J. Paul and I. Cartmill
  • Infection control team:
    • C. Doggett and C. Chadwick

• Dr A. Birtles: PHE CDRN Laboratory, Manchester Royal Infirmary.

• Dr W. Fawley: MVLA at Microbiology, The General Infirmary at Leeds
References


• National Institute for Health and Care Excellence (2015). Clostridium difficile infection: risk with broad-spectrum antibiotics. NICE evidence summary (ESMPB1).
