Lessons learnt – *Clostridium difficile* ribotyping

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EVERYTHING SHOULD BE AS SIMPLE AS POSSIBLE,

BUT NOT SIMPLER.
**Clostridium difficile**

- The most common cause of healthcare associated diarrhoea in the developed world.
- Risk factors include antimicrobial chemotherapy as much as 3 months prior, age >65, proton pump inhibitors, co-morbidities.
- Vegetative form readily inactivated but spores persist in the environment for months.
- Contact precautions required for symptomatic hospital inpatients.
Hospital 1 - Medical ward

- 26 bed general and neurological medical ward
- Norovirus outbreak ended 1 week previously
- 3 patients developed symptoms (diarrhoea) within 2 day period of time.
- Stool samples collected on date of symptom onset in all cases
- Duration of symptoms 3 days to 7 days
- Laboratory confirmed *C. difficile* in all three. Norovirus negative.
- No staff affected
• Three patients in the same area of the same ward with symptom onset over a 2 day period.
• *Clostridium difficile* confirmed in all three. Norovirus negative.
Hospital 2 - Ward 1 elderly care unit

- 32 bed elderly care
- 1st case date of onset 10th July
- 4 further confirmed C. difficile cases
- Norovirus not identified on testing
- Duration of symptoms (diarrhoea) 3-12 days
- No staff affected
Hospital 2 - Ward 2 elderly care unit

- 24 bed elderly care unit
- 11 patients affected – date of onset 12\textsuperscript{th} July.
- Diarrhoea 10 of 11 - vomiting 3 of 11.
- 7 faecal specimens examined.
- 3 staff reported symptoms (diarrhoea and nausea)
- 3 patients’ samples Norovirus positive (only 1 of these was vomiting)
- 3 patients’ samples C.\textit{ difficile} positive (nausea but no vomiting)
- No patients had both C.\textit{ difficile} and Norovirus
A large number of patients developing gastrointestinal symptoms and confirmed *Clostridium difficile* in stool samples, linked in time and place (one hospital, two adjoining wards).
Outbreak management - principles

- Communication and notification
- Case definition
- Isolation and restrictions to patient movements
- Timely and accurate laboratory identification
- Education and support to staff, patients and visitors
- Hand hygiene
- Environmental and equipment cleaning and disinfection
  - Chlorine-releasing disinfection for *C. difficile*
- Antimicrobial stewardship
  - Essential for prevention and control of *C. difficile*
Environmental challenges

Age of facility

Lack of ensuite bathrooms to limited single rooms

Nightingale design, high proportion of cognitively impaired patients
Environmental challenges – solutions

• Increasing hotel services staffing to provide 12 hours per day service covering all ward areas and at least twice per day for bathrooms and toilets
• Use of combined detergent / chlorine-releasing disinfectant product facilitating effective environmental and equipment decontamination
• Cessation of staff practice of using ward 2 dirty utility as thoroughfare to ward 1
• Avoid storing cleaning equipment and products close to sluice hopper in dirty utility room
Ribotyping results – medical ward

- *C. difficile* unrelated strains
- Outbreak control measures prevented further transmission on this ward
### Ribotyping report Hospital 2

#### Ward 1 SA

|   | 5/07 | 6/07 | 7/07 | 8/07 | 9/07 | 10/07 | 11/07 | 12/07 | 13/07 | 14/07 | 15/07 | 16/07 | 17/07 | 18/07 | 19/07 | 20/07 | 21/07 | 22/07 | 23/07 | 24/07 | 25/07 | 26/07 | 27/07 | 28/07 | 29/07 | 30/07 | 31/07 | 1/08 | 2/08 | 3/08 | 4/08 | 5/08 | 6/08 | 7/08 | 8/08 | 9/08 | 10/08 | 11/08 | 12/08 | 13/08 | 14/08 | 15/08 | 16/08 | 17/08 | 18/08 | 19/08 |
|---|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 |      |      |      |      | 014  | 014   |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 2 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |       |       |       |
| 3 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |       |       |       |
| 4 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |       |       |       |
| 5 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |       |       |       |

#### Ward 2 R

|   | 5/07 | 6/07 | 7/07 | 8/07 | 9/07 | 10/07 | 11/07 | 12/07 | 13/07 | 14/07 | 15/07 | 16/07 | 17/07 | 18/07 | 19/07 | 20/07 | 21/07 | 22/07 | 23/07 | 24/07 | 25/07 | 26/07 | 27/07 | 28/07 | 29/07 | 30/07 | 31/07 | 1/08 | 2/08 | 3/08 | 4/08 | 5/08 | 6/08 | 7/08 | 8/08 | 9/08 | 10/08 | 11/08 | 12/08 | 13/08 | 14/08 | 15/08 | 16/08 | 17/08 | 18/08 | 19/08 |
|---|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |       |       |       |
| 2 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |       |       |       |
| 3 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |       |       |       |
| 4 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |       |       |       |
| 5 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |       |       |       |

- Evidence of transmission of 014 strain on ward 1
- Evidence of transmission of ce030 strain on ward 2
- Likelihood of transmission of these strains between the two wards
- 5 different strains in 10 different patients
Ribotyping summary

- PCR ribotyping identified 6 different strains in 15 different people.
- Ribotype 027 was not identified in these patients.
- The most commonly found strain matched ribotype 014 reference strains.
  - This ribotype has been previously identified as one of the three most prevalent strains in Australia (Ferguson et al 2011).
  - One of the community-acquired isolates was identified as 014, the other as a non-reference strain.
- The five other ribotypes identified in this study did not match any strains held in the laboratory reference collection.
- Ribotype 014 and one of these non-reference strains (arbitrarily named ce030) was transmitted between patients at Hospital 2.
Lessons learnt

• The importance of maintaining basic outbreak management principles
  – Education and support to staff, patients and visitors
  – Hand hygiene
    • Hand hygiene auditing
    • Hand hygiene wipes for patients
  – Environmental and equipment hygiene
    • Matching resources with need
    • Ensuring access to appropriate materials
  – Early identification, reporting and isolation of cases
  – Maintaining focus and morale
Lessons learnt

- Evidence of high prevalence of *C. difficile* colonisation, involving a large number of different ribotypes within adult hospital inpatients.

- Potential for Norovirus infection to enable *C. difficile* shedding in colonised people, precipitating *C. difficile* infection possibly through environmental contamination.
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References

• Ferguson, J. et. al. 2011 *Clostridium difficile* laboratory testing in Australia and New Zealand: national survey results and ASID recommendations for best practice. *Pathology* 43(5) 482-487.

• Fawley, W.N. et. al. 2007. Efficacy of Hospital Cleaning Agents and Germicides Against Epidemic Clostridium difficile Strains. *Infection Control and Hospital Epidemiology* 28(8) 920-925.

• Hensgens, M.P.M. et. al. 2012. Time interval of increased risk for *Clostridium difficile* infection after exposure to antibiotics. *J. Antimicrobial Chemotherapy* 67; 742-748.

• Riggs, M. et. al. 2007. Asymptomatic carriers are a potential source for transmission of epidemic and non-epidemic *Clostridium difficile* strains among long-term care facility residents. *Clinical Infectious Diseases* 45; 992-998.

Links


• http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1232006607827

• http://www.cdiff-support.co.uk/about.htm