Closstridium difficile Contamination in the Medical and Surgical Wards of a Community Hospital

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Introduction

• Research has indicated that the environment may play a significant role in the transmission of Clostridium difficile in the hospital.
• Several studies have been published surveying the environment in patient rooms2, 4, 5, 7, 9. However, information pertaining to C. difficile contamination in the general hospital environment is limited.
• No studies have investigated an association between C. difficile on specific hospital surfaces, longitudinally, during non-outbreak scenarios in community hospitals.
• Environmental factors that may be associated with C. difficile contamination have not been fully explored.
• Identifying these risk factors can be used by hospital personnel for surveillance purposes to improve infection control measures for reducing the contamination of the hospital environment with C. difficile.

Objectives

1) To determine the prevalence of C. difficile contamination in patient rooms and the general environment of a community hospital.
2) Compare C. difficile strains between patients with C. difficile infection (CDI) and those without CDI and the environment using PCR ribotyping.
3) To determine what environmental surfaces are most likely contaminated with C. difficile.
4) Identify factors associated with C. difficile contamination in patient rooms and the general hospital environment.

Methods

• The participating healthcare facility is a 300-bed community hospital in southern Ontario, Canada that serves a mixed urban and rural population. No C. difficile outbreaks occurred during the study period.
• Environmental sampling of patient rooms and the general hospital environment of one surgical ward and one medicine ward was conducted during six visits over a 15 week period. Sampling was conducted once a week for three consecutive weeks during weeks 1-3 (visit 1-3) and weeks 13-15 (visits 4-6).
• For patient rooms, sampling was conducted in exposed rooms (rooms housing a patient not under isolation precautions) and unexposed rooms (rooms housing a patient not under isolation precautions).
• For the general environment, surfaces sampled were distributed over the ward and located in nursing and physician work areas, hallways, and visiting rooms.
• A dry sterile electrostatic cloth was wiped over the surface to be sampled up to a maximum area of 200cm x 200cm. Cloths were placed in individual sterilized bags. Information collected for each sample included: date, ward, location within the ward, surface material, and the type of surface.
• Stool samples for C. difficile isolation were obtained from patients diagnosed with CDI via EIA that were hospitalized in the medicine and surgical wards during the study period.
• Selective culture for C. difficile was performed5. All isolates were investigated for the presence of toxin A (tcdA), toxin B (tcdB), and the binary toxin (tcdA-tcdB) genes using PCR.
• PCR ribotyping was performed. When a ribotype pattern was identified as an international ribotype based on comparison to reference strains, the appropriate numerical designation (e.g., 078) was assigned. Alternatively, an internal laboratory designation was assigned.
• Toxinotyping was conducted on a representative of each toxigenic ribotype.
• Data were analyzed using exact logistic regression due to the small number of contaminated sites. The dependent variable was the presence or absence of C. difficile. Independent variables investigated included: visit number (general environment), ward, type of patient room, surface material, surface location (general environment), and type of surface sampled. Only univariable models were constructed.
• All tests were two-sided and statistical significance was based on an α of 0.05. Odds ratios (OR) and 95% confidence intervals (CI) were reported.

Results

PATIENT ROOMS

• A total of 218 surfaces were sampled from 26 exposed rooms and 13 unexposed rooms with a total of 148 sampled positive sites.
• Overall, 6.4% (n=14) of surfaces were contaminated with C. difficile.
• Results from the univariable exact logistic regression models are presented in Table 1. Contributing factors to CDI were analyzed to assess the impact of the presence of toxin A (tcdA), toxin B (tcdB), and the binary toxin (tcdA-tcdB) genes on CDI.
• Nine different ribotypes were identified, with ribotype 078 being the most prevalent (Table 2).

Conclusion

• In exposed and unexposed patient rooms, surf areas, which were attributed to bulletin boards, were associated with an increased risk for C. difficile contamination. Toxin typing for C. difficile strains isolated from bulletin boards is in a similar pattern, which may indicate the potential role of bulletin boards as a source of C. difficile transmission.
• Over the study period, 53 different surfaces, for a total of 263 samples, were tested. Overall, 6.1% (n=16) of the surfaces were contaminated with C. difficile.
• Nine different ribotypes were identified among the 16 isolates recovered with ribotype 078 the most prevalent (Table 2).

PATIENT ISOLATES

• A total of 21 patient isolates were collected during the study period. Overall, 11 ribotypes were identified, with 027 the most prevalent in the patient population (Table 2).

Table 1. Univariable exact logistic regression models of variables associated with C. difficile contamination in patient rooms.

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<th>Variable</th>
<th>OR (95% CI)</th>
<th>P-value</th>
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<tr>
<td>Ward: Medicine A</td>
<td>1.03 (0.07 – 14.88)</td>
<td>0.994</td>
</tr>
<tr>
<td></td>
<td>1.29 (0.33 – 4.99)</td>
<td>0.742</td>
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<tr>
<td></td>
<td>0.999</td>
<td>0.594</td>
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<td></td>
<td>0.243</td>
<td>0.245</td>
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<td></td>
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<td>0.389</td>
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References


Acknowledgements

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Table 2. Patient isolates recovered from patient specimens during the study period.

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<tr>
<th>PATIENT ISOLATES</th>
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<th>P-value</th>
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