Materials and Methods

Organisation of curtain sampling and setting

- All curtains sampled were located in single rooms in elderly care wards in Leeds Teaching Hospitals. Curtains at windows in the rooms of 4 symptomatic CDI patients and 4 control hospitalised patients were intensively sampled.
- Patients with CDI had been laboratory confirmed (stool testing) and had diarrhea at the time of sampling (Table 1).
- All curtains tested were approximately 100cm x 140cm (total surface area = 1400cm²), made from 40% cotton and 60% polyester and were hung on an overhead track at the window in single bedded side rooms.
- Curtain samples were from 200cm x 140cm curtains, sampled in the centre of the window, from both the front and back. A total of 16 curtains (72 from CDI case and 72 from control curtain segments).
- To ensure complete coverage of each curtain, the total surface area was split into 9 segments (Figure 2) on the front and back with each segment (approximately 160cm²) sampled separately. This yielded 18 samples per curtain, and a total of 166 samples (72 from CDI case and 72 from control curtain segments).

Sampling and processing

- Following sampling, Polywipe™ sponges were placed directly into Robertson’s cooked meat broth (REDO Laboratories,U.K.) and incubated aerobically, at 37°C for 48 hours.
- A 2% NaCl solution was removed and subcultured onto a C. difficile selective agar plate containing Brauer’s cycloserine-cefoxitin-egg yolk agar (Disconnections, U.K.) supplemented with 5 mg/ml lysostaphin (CCEY) plate and incubated aerobically at 37°C. Plates were examined for presence of C. difficile.

Curtain number % area positive
Front Back
1 2 3 4 5 6 7 8 9

Results

- C. difficile were isolated from every curtain sampled in rooms housing known CDI cases.
- No C. difficile was recovered from the curtains in the rooms housing patients without CDI.
- Figure 3 shows the percentage of each curtain that was positive based on the 18 segments per curtain sampled (on the front and on the back). For three of the four curtains sampled only the front or the back was positive; for the remaining two a whole curtain was recovered from both surfaces.
- The proportion of the total curtain surface area contaminated with C. difficile averaged 10% (range 1-55%).
- Random sampling of a single curtain surface area of 1600 cm² had an approximate 80% chance of missing true C. difficile contamination. This risk likely increases further if the surface area sampled is less than the large segment examined in this study (i.e. 1600cm²).
- When comparing the C. difficile-positive areas of each curtain we found no clear similarities. The areas of the curtain sampled to be handled most frequently, such as the inside edge at hand height, and therefore the most contaminated, were not always positive. However, curtain number 3 which had the highest percentage area positive for C. difficile (44.4% on the front and 55.5% on the back) was a single unfixed curtain across the whole window, which may have been handled more and moved on the track more often than typical fixed curtains.

Discussion

This study has demonstrated that hospital curtains in the vicinity of patients with symptomatic CDI are frequently contaminated with C. difficile. Strict adherence to environmental cleaning and disinfection policies including surfaces and equipment hygiene have been shown to be important in reducing spore contamination and CDI infection rates. Despite implementation of control measures, hospitals still experience CDI case clusters, prompting a search for ways to reduce and limit environmental contamination. Our data suggest that hospital curtains may have the potential to contribute to contamination of hands and environmental dissemination of C. difficile spores. As hands are considered to be a major source of transmission of C. difficile, hand hygiene immediately after touching curtains should therefore be considered.

The intensive sampling method used in this study has shown that only by sampling the entire curtain surface can an accurate representation of C. difficile contamination be ascertained. We found that the proportion of each curtain total surface area contaminated with CDI cases that was C. difficile contaminated averaged 10%. Previous studies which aimed to recover C. difficile from contaminated environmental surfaces were not always positive. However, curtain number 3 which had the highest percentage area positive for C. difficile (44.4% on the front and 55.5% on the back) was a single unfixed curtain across the whole window, which may have been handled more and moved on the track more often than typical fixed curtains.

Conclusions

- Our results emphasize the importance of sampling the entire curtain surface to detect C. difficile.
- Random sampling of a single curtain surface area, even using a relatively large sampling area (1600cm²) had an approximate 80% chance of missing true C. difficile contamination.
- Curtains in the vicinity of CDI cases appear to be very frequently contaminated by C. difficile, likely reflecting the aerosolisation of spores and hand transmission.
- Curtains may act as a reservoir for transmission of C. difficile. Hand hygiene should be encouraged immediately after touching curtains in the vicinity of CDI cases.

References


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