Comparison of Perirectal versus Rectal Swabs for Detection of Asymptomatic Carriers of Toxigenic *Clostridium difficile*

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For long-term care and spinal cord injury patients, the sensitivity, specificity, and positive and negative predictive values of perirectal versus rectal cultures for detection of asymptomatic carriers of *Clostridium difficile* were 95%, 100%, 100%, and 97%, respectively. Perirectal cultures provide an accurate method to detect asymptomatic carriers of *C. difficile*.

Clostridium difficile is the most important cause of health care-associated infectious diarrhea. Asymptomatic carriage of toxigenic *C. difficile* is also common in hospitals and long-term-care facilities (LTCF) (1–4). Although the presence of patients with *C. difficile* infection (CDI) is considered the major risk for transmission, asymptomatic carriers also have the potential to shed spores and contribute to transmission (1, 2, 4). Rectal or perirectal swab cultures are commonly used for the detection of carriers of health care-associated pathogens. Because rectal swabs may cause discomfort for patients and are contraindicated in the setting of neutropenia to avoid the risk of infection with skin and mucosal breakdown (5), perirectal swabs may be preferred. Perirectal swabs have been shown to be equivalent to rectal swab specimens for the detection of other health care-associated pathogens (6, 7), but no previous studies have compared the two methods for the detection of carriers of *C. difficile*. We have previously shown that perirectal swabs provide excellent sensitivity in comparison to stool samples for the detection of patients with CDI (8); however, CDI patients typically have much higher levels of *C. difficile* in stool than asymptomatic carriers (1, 8). Here, we tested the hypothesis that the collection of perirectal swab cultures would provide an accurate but less invasive diagnostic strategy for the detection of asymptomatic carriers of toxigenic *C. difficile*.

The study was conducted at the Cleveland VA Medical Center. All residents on two LTCF wards and on a spinal cord injury unit who were available and without abdominal pain or unformed stool were approached for enrollment; these groups were chosen for study because we have previously demonstrated relatively frequent asymptomatic carriage of *C. difficile* in these patient populations (1, 9). Subjects with unformed stool or abdominal pain were excluded from participation. Using BD BBL CultureSwabs (Becton, Dickinson, Cockeysville, MD), cultures were first obtained from the perirectal area. A second swab was then used to collect rectal cultures through insertion into the rectum. The perirectal swab was collected first to avoid the potential for contamination of the perirectal area during collection of the rectal swab. It was noted whether the swabs had evidence of fecal staining, but all swabs were processed. The swabs were transferred to a Whitley MG1000 anaerobic workstation (Microbiology International, Frederick, MD) and cultured for *C. difficile* on prereduced cycloserine-cefoxitin-brucella agar containing 0.1% taurocholic acid and lysozyme at 5 mg/ml (CDBA) as previously described (10). The number of colonies was counted. Isolates were confirmed as *C. difficile* on the basis of typical odor and appearance of colonies and by a positive reaction using *C. difficile* latex agglutination (Microgen Bioproducts, Camberly, United Kingdom). The *C. difficile* isolates were tested for *in vitro* cytotoxin production with the *C. difficile* Tox A/B II assay (Wampole Laboratories), and isolates that did not produce toxin were excluded from the analysis.

The sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of perirectal swabs in comparison to rectal swabs were calculated. The numbers of colonies recovered from perirectal and rectal swabs were compared using Student's *t* test. Data were analyzed with the use of SPSS statistical software, version 10.0 (SPSS, Inc., Chicago, IL).

Of 60 potential subjects with no abdominal pain or unformed stool, 10 declined to participate. Of the 50 subjects enrolled, 32 (64%) were LTCF residents and 18 (36%) were spinal cord injury unit patients. Of the 50 subjects, 32 (64%) had visible fecal staining on the rectal swab and perirectal swab, 16 (32%) did not have visible fecal staining on either swab, and 2 (4%) had visible fecal staining on the rectal swab but not on the perirectal swab. Twenty (40%) subjects were culture positive for toxigenic *C. difficile* via rectal swab, including 9 of 18 (50%) spinal cord injury patients and 11 of 32 (34%) LTCF residents. Three of the 20 (15%) subjects with positive cultures for toxigenic *C. difficile* did not have visible fecal staining on their rectal or perirectal swabs. Two (10%) subjects with positive cultures had previous CDI within the 3 months prior to the study. None of the study subjects had positive cultures for nontoxigenic *C. difficile*.

Nineteen of the 20 patients with positive rectal swab cultures had positive perirectal swab cultures, and all 30 patients with negative rectal swab cultures had negative perirectal swab cultures. The sensitivity of perirectal swab cultures in comparison to rectal swab cultures was 95% (95% confidence interval [95% CI], 73.1 to 99.7), and the specificity was 100% (95% CI, 85.9 to 100). The PPV was 100% (95% CI, 79.1 to 100), and the NPV was 96.7% (95% CI, 81.5 to 99.8) For rectal swabs, the number of colonies of *C. difficile* recovered was >100 for 10 subjects, 10 to 100 for 7

subjects, and <10 for 3 subjects. The one patient with a negative perirectal but positive rectal culture result had 6 colonies recovered from the rectal swab culture. There was no significant difference between the mean numbers of colonies recovered from perirectal and rectal swabs (66 versus 59, respectively; $P = 0.50$).

Our findings demonstrate that perirectal cultures are comparable to rectal cultures for the detection of asymptomatic carriers of toxigenic *C. difficile*. Notably, none of the carriers in our study were colonized with nontoxigenic *C. difficile*, which may protect against colonization with toxigenic strains (11). Because perirectal swabs are less invasive and may be more acceptable to patients, our data provide support for the use of perirectal swabs as the preferred method for the detection of carriers. Our findings are consistent with previous studies demonstrating that perirectal swabs are equivalent to rectal swabs for the detection of rectal carriers of vancomycin-resistant enterococci and fluoroquinolone-resistant *Escherichia coli* (6, 7).

Current Infectious Diseases Society of America practice guidelines for CDI do not recommend screening for or isolation of asymptomatic carriers of *C. difficile* (12). However, given recent evidence that carriers may shed spores and contribute to transmission (1, 2, 4), some health care facilities might consider efforts to limit transmission by carriers in settings where standard control measures are ineffective. For example, Curry et al. (4) found, based on molecular typing, that transmission from asymptomatic carriers accounted for 29% of all hospital-associated CDI cases in a hospital with established control measures to prevent transmission from CDI cases. The authors recommended that identification and isolation of carriers might be necessary to further reduce transmission of *C. difficile* in such settings. The application of clinical prediction rules to identify subsets of patients at increased risk for asymptomatic carriage of *C. difficile* might provide a strategy to limit screening to high-risk patients (1).

Our study has some limitations. We did not compare the rectal and perirectal swab results with results of cultures of passed-stool specimens. It is possible that culture of passed-stool specimens would have detected additional patients with low levels of *C. difficile* in stool. The number of subjects studied was relatively small. The patient population included mostly men, and only LTCF residents and spinal cord injury patients with relatively high frequencies of asymptomatic carriage were studied. Strain typing was not performed on the *C. difficile* isolates. However, in previous studies from our institution, the current epidemic strain (North American pulsed-field gel electrophoresis type 1) accounted for a majority of *C. difficile* isolates in CDI patients and asymptomatic carriers of *C. difficile* (1). Therefore, it is possible that our results may differ from results in other settings and in facilities where the current epidemic strain is not predominant. Finally, appropriate collection of perirectal swab specimens is necessary to ensure accurate results because the collection of swabs could be prone to variability in sampling technique. We found that a majority of perirectal swabs had visible fecal soiling, which could potentially be useful as a means to ensure adequate specimen collection. However, 15% of subjects with positive cultures for toxigenic *C. difficile* did not have visible fecal staining on their rectal or perirectal swabs.

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