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Outbreak of *Clostridium difficile* Infections at an Outpatient Hemodialysis Facility—Michigan, 2012–2013

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Abstract

Investigation of an outbreak of *Clostridium difficile* infection (CDI) at a hemodialysis facility revealed evidence that limited intra-facility transmission occurred despite adherence to published infection control standards for dialysis clinics. Outpatient dialysis facilities should consider CDI prevention, including environmental disinfection for *C. difficile*, when formulating their infection control plans.

Introduction

Although dialysis patients have increased risk for *Clostridium difficile* infection (CDI)[1,2] outbreaks within outpatient hemodialysis facilities have not been described previously. We describe the first reported CDI outbreak at an outpatient hemodialysis facility and subsequent investigations to assess for potential intrafacility transmission and evaluate risk factors for CDI.

Methods

A CDI case was defined as an incident diarrheal illness (self-reported or observed loose stool) during October 2012–March 2013 associated with a positive *C. difficile* test (Xpert *C.*

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difficile, Cepheid) in a hemodialysis facility patient. A subsequent CDI episode was defined as diarrheal illness associated with a positive *C. difficile* test occurring after ≥ 2 weeks. Cases were identified from dialysis facility, local nursing home, and hospital records.

Cases with outpatient onset of diarrhea or onset before day 4 of a hospitalization were considered community-onset. Community-onset cases with an overnight hospital stay within 12 weeks prior to CDI were classified as hospital-associated; others were community-associated.

Patients dialyzed at the facility during October 2012–March 2013 were included in a cohort study. Potential risk factors for incident CDI were assessed through patient interview and chart review.

To screen for *C. difficile* carriage or undetected infection among patients not reporting diarrheal symptoms, stool samples from patients not receiving treatment for CDI were tested using a polymerase chain reaction assay (Xpert *C. difficile*). Twenty-five of 29 eligible patients were screened. Specimens testing positive were cultured for *C. difficile*. Recovered isolates underwent pulsed-field gel electrophoresis (PFGE). Facility staff were asked to report symptoms of diarrheal illness but did not undergo laboratory screening.

Environmental samples from high-touch surfaces within the facility and from healthcare personnel's hands were obtained and cultured for *C. difficile*. The dialysis facility's infection control practices were observed, including hand hygiene, personal protective equipment use, and environmental disinfection practices.

Statistical analysis was performed with SAS, version 9.3. Categorical variables were compared using Chi-squared or Fisher's exact test. Continuous variables were compared with a Wilcoxon Rank-Sum test. *P* values ≤ 0.05 were considered significant.

Results

Between October 2012 and March 2013, 37 outpatients were dialyzed at the facility, a hospital-based outpatient hemodialysis clinic. No hospital inpatients were dialyzed at the hemodialysis clinic. Six patients developed incident CDI; 5 (83%) also developed a subsequent CDI episode. All cases were community-onset; three were hospital-associated, from the same hospital. The three community-associated case-patients had not received antibiotics within 12 weeks before illness onset and had no common healthcare exposures other than hemodialysis.

One facility staff member with recent prior antibiotic exposure developed laboratory-confirmed CDI after caring for the first symptomatic case-patient. This staff member's only healthcare exposures within the 12 weeks prior consisted of outpatient clinic visits and antibiotic exposure. No clear epidemiologic links were found between this staff member and subsequent cases.

Two additional patients who initially denied having diarrhea screened positive for *C. difficile* and were CDI cases based on consistency of stool collected for screening. Therefore, 8 of 37 patients at the facility developed CDI (attack rate: 22%).

Antibiotics were received by 44.1% of patients in the cohort, and 35.1% were hospitalized within the prior 12 weeks. Hospitalization within the prior 30 days (P=0.05) and non-fistula dialysis access (i.e., arteriovenous graft or hemodialysis catheter) (P=0.01) were significant risk factors for CDI in univariate analysis (Table 1). Prior antibiotic use overall was not a significant risk factor for CDI but use of β-lactam agents was (P=0.05). All case-patients receiving β-lactam agents had a non-fistula access and were diagnosed with sepsis within the prior 4 weeks.

C. difficile isolates were recovered from six case-patients: one hospital-associated, three community-associated, and two screen-positive. The hospital-associated case isolate's PFGE pattern was indistinguishable from that of a community-associated case that occurred one week later (both North American Pulse Field type 4). These two case-patients did not have the same dialysis schedule or station. However, they both received dialysis at the facility throughout the 12 weeks prior to the later case's illness onset. The other four isolates' PFGE types were unrelated to each other. No isolate from the affected staff member was available for analysis. *C. difficile* was not recovered from environmental (n=39) or hand (n=10) samples.

In accordance with infection control guidelines for hemodialysis facilities, staff were required to wear gloves during patient contact and to wait until the station was unoccupied before beginning routine disinfection[3,4]. Prior to this outbreak, the facility was using a 1:100 dilution of chlorine bleach for routine environmental surface disinfection after dialysis sessions. Initial response measures included designating three dialysis stations as CDI contact isolation stations for all CDI patients. Staff were required to don a dedicated, disposable gown and gloves while caring for a patient in contact isolation and to wash hands with soap and water afterwards. In addition, a 1:10 dilution of bleach was used to disinfect environmental surfaces in stations after treatment of CDI patients.

During infection prevention practice audits, hand hygiene was performed during 127 (89%) of 143 opportunities. The wet contact time of bleach was often less than manufacturer's recommendations. Additionally, on some occasions patients without CDI were dialyzed at contact isolation stations.

The facility instituted additional control measures after these audits, including heightened diligence to ensure adequate wet contact time of bleach on surfaces. Contact isolation stations were dedicated exclusively for CDI patients, and patients were maintained in contact isolation until 2 weeks after completion of CDI antibiotic treatment. As of June 2013, no new CDI cases had occurred.

Discussion

We describe an outbreak of CDI within a hemodialysis facility with high attack rate and recurrence rate. Many affected patients lacked classic risk factors (i.e., half had neither prior

recent hospitalization nor recent antibiotic use). Available epidemiologic and laboratory data suggest likely intrafaciliy transmission of *C. difficile* to at least one patient, despite observed hand hygiene adherence of nearly 90%. Transmission to the healthcare worker at the facility also may have occurred given the temporal association. The two case-patients with indistinguishable *C. difficile* isolates (by PFGE) lacked direct overlap with one another in space and time, suggesting indirect transmission between these two case-patients.

The shared patient environment and lack of physical barriers between stations in outpatient dialysis facilities might facilitate transmission of *C. difficile*. Infection control recommendations for hemodialysis clinics lack specific recommendations for *C. difficile*, but contain suggestions that could be relevant for CDI (e.g., wear a dedicated gown when caring for patients with uncontrolled diarrhea)[4]. The facility's response to this outbreak extended beyond these recommendations, e.g., dedicating certain dialysis stations for CDI patients and extending the duration of contact isolation.

We found that presence of an arteriovenous fistula was protective. Although this association of CDI with non-fistula access types could be a marker for underlying patient comorbidity, fistula patients might actually have lower risk and national efforts to reduce access-related infections in this dialysis patients[5,6] might have secondary benefits in terms of reduced antibiotic exposure, hospitalizations, and CDI risk.

Unlike in a prior study[7], Charlson index was not associated with CDI, and serum albumin levels were not available to evaluate. Other known CDI risk factors were common: nearly half of the patients had recently used antibiotics, and about one-third had recent hospitalizations. Though antibiotic use in general was not a significant risk factor, use of β-lactam agents was.

Limitations with this investigation include the relatively small number of cases, reliability of patients' self-reports, and availability of *C. difficile* isolates. Finally, increased attention to environmental cleaning prior to sample collection may have limited recovery of *C. difficile* from environmental samples.

In summary, CDI transmission within an outpatient dialysis facility can occur. Outpatient dialysis facilities should routinely adhere to practices that reduce the burden and risk of environmental contamination[3–4,8] and consider CDI prevention when developing an infection control plan.

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References

1. Keddis MT, Khanna S, Noheria A, Baddour LM, Pardi DS, Qian Q. *Clostridium difficile* infection in patients with chronic kidney disease. Mayo Clin Proc. 2012; 87:1046–1053. [PubMed: 23127731]

2. Eddi R, Malik MN, Shakov R, Baddoura W, Chandran C, Debari VA. Chronic kidney disease as a risk factor for *Clostridium difficile* infection. Nephrology. 2010; 15:471–475. [PubMed: 20609100]
3. Centers for Disease Control and Prevention. [Accesseed 18 Feb 2014] Checklist: dialysis station routine disinfection. Available at: http://www.cdc.gov/dialysis/PDFs/collaborative/Env_checklist-508.pdf
4. Recommendations for preventing transmission of infections among chronic hemodialysis patients. MMWR Recomm Rep. 2001 Apr 27; 50(RR-5):1–43.
5. U.S. Department of Health and Human Services. [Access 11 Jun 2014] National action plan to prevent healthcare-associated infections: road map to elimination. Chapter 6: end-stage renal disease facilities. Available at: http://www.health.gov/hai/pdfs/hai-action-plan-esrd.pdf
6. End Stage Renal Disease Network Coordinator Center. [Accessed 31 Oct 2014] Fistula First Catheter Last. Available at: http://esrdncc.org/ffcl/
7. Sheth H, Bernadini J, Burr R, et al. *Clostridium difficile* infections in outpatient dialysis cohort. Infect Control Hosp Epidemiol. 2010; 31:89–91. [PubMed: 19929691]
8. Rutala, WA.; Weber, DJ. the Healthcare Infection Control Practices Advisory Committee. [Accessed 14 Feb 2014] Guideline for disinfection and sterilization in healthcare facilities. 2008. Available at: http://www.cdc.gov/hicpac/Disinfection_Sterilization/acknowledg.html

Table 1

Potential Risk Factors for Incident *Clostridium difficile* Infection (CDI) among Patients of the Hemodialysis Facility

Risk factor	No. incident case-patients/Total (Attack rate)		Risk ratio (95% CI)	*P*
	With risk factor	Without risk factor		
Demographics and comorbidities				
Age >65 years	3/23 (13.0%)	3/11 (27.3%)	0.5 (0.1–2.0)	0.36
Female gender	5/16 (31.3%)	1/18 (5.6%)	5.6 (0.7–43.3)	0.08
Charlson score >5	4/17 (23.5%)	2/17 (11.8%)	2.0 (0.4–9.5)	0.66
Dialysis characteristics				
Longer than 42 months on dialysis	3/17 (17.7%)	3/17 (17.7%)	1.0 (0.2–4.3)	1.00
Vascular access: catheter or graft (vs fistula)	5/12 (41.7%)	1/22 (4.6%)	9.2 (1.2–69.9)	0.01
Healthcare exposures				
Hospitalization in prior 12 weeks	3/12 (25.0%)	3/22 (13.6%)	1.8 (0.4–7.7)	0.64
Hospitalization in prior 30 days	3/6 (50.0%)	3/28 (10.7%)	4.7 (1.2–17.7)	0.05
Surgery during prior 12 weeks	1/5 (20.0%)	5/29 (17.2%)	1.2 (0.2–8.0)	1.00
Long-term care facility stay in prior 12 weeks[a]	1/4 (25.0%)	5/29 (17.2%)	1.5 (0.2–9.5)	1.00
Medication use				
Antibiotic use in prior 12 weeks	3/15 (20.0%)	3/19 (15.8%)	1.3 (0.3–5.4)	1.00
Antibiotic use in prior 30 days[a]	3/8 (37.5%)	3/25 (12.0%)	3.1 (0.8–12.5)	0.13
β-lactam use in prior 12 weeks	3/6 (50.0%)	3/28 (10.7%)	4.7 (1.2–17.7)	0.05
Immunosuppressive use in prior 12 weeks	3/13 (23.1%)	3/21 (14.3%)	1.6 (0.4–6.8)	0.65
Acid suppressive therapy in prior 12 weeks	4/20 (20.0%)	2/14 (14.3%)	1.4 (0.3–6.6)	1.00

Note: one patient who developed CDI before initiation of hemodialysis, and two patients with unknown onset dates of CDI were excluded from the hemodialysis cohort. CI, confidence interval.

[a]Data not available for one non-case.