possible duration. Unnecessary empirical antibiotic therapy may have adverse pharmacoeconomic and clinical consequences—for example, in this case *C. difficile* diarrhea.[5] In conclusion, it cannot be overstated that accurate diagnosis is essential for accurate therapy. In hospitalized adults with viral pneumonia of unknown etiology, if 3 NP PCR specimens are negative, results should be interpreted in light of the specimen source—that is, is the specimen test result reflective of the infection source?

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Fecal Microbiota Therapy as Rescue Therapy for Life-Threatening *Clostridium difficile* Infection in the Critically Ill: A Small Case Series

To the Editor—A retrospective review of anonymous data obtained from patients treated with fecal microbiota therapy (FMT) was conducted as part of an antibiotic stewardship program in a Bavarian regional medical center that is part of the Network of the German Consulting Center for Infection Control and Prevention. Data handling was perfomed in accordance with German Federal Data Protection Law (Bundesdatenschutzgesetz); the analysis of anonymous routine quality assurance data does not constitute human research requiring institutional review board approval. Table 1 summarizes the descriptions of each case based on point prevalence data from antibiotic stewardship rounds.

All patients were recovering well from their underlying illness at the time of *Clostridium difficile* infection (CDI) onset and deteriorated rapidly in septic shock, so that the attending physicians opted for an emergency FMT as rescue therapy. Our patients met criteria for septic shock with multiple organ failure unresponsive to fluids, specific antibiotics, and increasing vasopressor demand. Informed consent from the patient or guardian was obtained and relatives volunteered as stool donors after an abbreviated medical screen. FMT was performed as soon as possible, at least within 24 hours after the therapeutic decision. One patient died during the preparation period. All treated patients started to respond within 12–24 hours after FMT with clinical improvement including a change of consistency and odor of stools within 12 h, resolution of shock symptoms, significantly reduced vasopressor support after 48 hours, and resolution of inflammatory markers. No immediate procedure-specific complications were observed; however, no long-term follow up was possible owing to the nature of the data source, highlighting the importance of registry projects like the one by the German Society of Gastroenterology and the University of Jena (https://service.zks.med.uni-jena.de/STReg).

Disturbance of the intestinal microbiome by multiple antibiotics, particularly third-generation cephalosporins, fluoroquinolones, and clindamycin[1] and likely proton-pump inhibitors, especially in combination with high-risk antibiotics,[2] plays an important role for the development of symptomatic CDI. Several definitions of CDI severity of illness make comparative studies of treatment difficult. There are increasing positive experiences with FMT in cases of recurrent illness; despite methodological limitations FMT has become a part of the treatment algorithm for recurrent CDI.[3] In a recent meta-analysis the great majority of adverse events of FMT appeared to be mild and self-limiting. In some cases, a credible association was not established owing to the lack of controlled data.[4]

TABLE 1. Case Descriptions in Study of Fecal Microbiota Therapy as Rescue Therapy for Life-Threatening CDI

Patient	Primary ICU diagnosis and risk factors before onset of life-threatening CDI	Clinical course after FMT[a]	Length of stay in ICU after FMT	30 day-survival
1	GI-bleeding from adenocarcinoma, anastomotic leakage after carcinoma resection and pneumonia; treatment with PPI, piperacillin/tazobactam and levofloxacin and anidulafungin.	Resolution of septic shock within 48 hours after FMT	38 days due to recurrent surgeries for anastomotic leakage	Yes
2	Cholecystitis and small bowel perforation, wound infection after cholecystectomy; treatment with ceftriaxone, cotrimoxazol and fluconazole, PPI.	Resolution of septic shock within 24 hours after FMT	9 days	Yes
3	Osteoporotic fracture T 12, COPD exacerbation by pneumonia and tachyarrhythmia absoluta; treatment with piperacillin/tazobactam and levofloxacin, PPI.	Resolution of septic shock within 24 hours after FMT.	32 days due to prolonged weaning from mechanical ventilation	Yes
4	Spontaneous epidural hematoma T 10–12, postoperative pneumonia; treatment with piperacillin/tazobactam and levofloxacin, PPI.	Resolution of septic shock within 24 hours after FMT.	?	?
5	Community-onset severe CDI with unclear antibiotic history. Chronic PPI treatment. Presentation with septic shock and toxic megacolon. Continuous shock symptoms after hemicolectomy and treatment with metronidazole, meropenem and anidulafungin intravenously and vancomycin enteral.	Patient died during preparation for FMT.	not applicable	No
6	Patient with septic shock due to CDI with toxic megacolon after pacemaker implant with cefazolin prophylaxis. PPI.	Resolution of septic shock within 48 hours after FMT	?	?

NOTE. ?, no data available; CDI, *Clostridium difficile* infection diagnosed by clinical signs and positive glutamate dehydrogenase test and *C. difficile* toxin production by polymerase chain reaction; COPD, chronic obstructive pulmonary disease; FMT, fecal microbiota therapy; GI, gastrointestinal; ICU, intensive care unit; PPI, proton-pump inhibitor.

[a]FMT was performed with an abbreviated donor screening program consisting of history and physical exam, no known chronic gastrointestinal disease, negative glutamate dehydrogenase screen, and negative human immunodeficiency virus screen by discretion of the critical care attending in charge after progression of severe CDI to septic shock despite intravenous metronidazole (3×500 mg) and enteral vancomycin (4×250 mg). In 1 case enteral vancomycin treatment was continued after FMT for 2 more days after resolution of symptoms but did not seem to interfere with the effectiveness of FMT.

On the basis of our experiences, FMT can be considered as rescue therapy in life-threatening CDI unresponsive to conventional treatment, using an abbreviated donor screening protocol and informed consent stressing the potential risks and nature of the treatment. We recommend participation in existing registries and future studies including critically ill patients and using prescreened volunteer stool or capsules[5] in order to resolve the problem of minimally screened emergency donors.

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Specialty, but Not Age, Is Related to Provider Hand Hygiene Compliance

To the Editor—Hand hygiene by healthcare providers is a leading measure to reduce hospital-acquired infections. According to World Health Organization guidelines, hygiene should be performed before and after patient contact, and after contact with inanimate surfaces and objects (including medical equipment) in the immediate vicinity of the patient.[1] Compliance with hand hygiene has been reported to be as low as 32% among physicians.[1] Barriers to compliance include environmental factors, educational gaps in infection control training, and behavioral factors.[2] Physician status, in contrast to nurse status, has been associated with lower hygiene rates.[3] Additionally, provider experience may be linked to a more casual attitude toward infection prevention precautions.[4]

Virginia Hospital Center (VHC) is a 334-bed teaching hospital in Arlington, Virginia, located in the Washington, D.C., metropolitan area. Hand hygiene rates have historically been ~50%–60% among providers, and they have increased since 2012 to 85% with stronger emphasis on hand hygiene. We investigated whether the age of the provider or the specialty of the provider is related to hand hygiene compliance.

Hand hygiene observations were performed by "secret shoppers" as outlined in the Joint Commision's 2009 monograph regarding the measurement of hand hygiene adherence.[5] Providers were observed entering and exiting patient rooms and bays and performing hand hygiene with either soap and water or alcohol-based hand sanitizer. Each time a provider crossed the threshold of a room and was observed interacting with the patient, an encounter was noted. If the door was closed or the observer's view was similarly obstructed, the encounter was not recorded. Compliance was defined as the number of times hand hygiene was observed compared to the number of encounters recorded. Entering and exiting the room were considered separate encounters.

We reviewed hand hygiene observations from physicians or physician extenders at our hospital from January 2014 to December 2014. We compared compliance and noncompliance of those born prior to or after January 1, 1964, (ie, older or younger than 50 years old) and of those in a medical or surgical specialty. If a provider had more than 1 encounter, we counted only 1 encounter for compliance and noncompliance, respectively.

In total, 209 observations were made during this period, with a compliance rate of 54% overall (Table 1). Among the observations for those under age 50, 55% were compliant, but 53% of those over age 50 were compliant. The odds ratio for younger providers being compliant with hand hygiene was 1.07 (confidence interval [CI], 0.59–1.95). Among the observations for those in a medical specialty, 76% of providers were complaint, but only 38% of providers in a surgical specialty were compliant. The odds ratio for medical providers being compliant with hand hygiene was 5.13 (CI, 2.77–9.52).

Among younger physicians in our hospital, there is a notion that noncompliance with hand hygiene is a problem with older providers. Medical students and residents are actively taught about hand hygiene expectations, and its importance is emphasized on a monthly basis. Although compliance may wane with experience,[6,7] this preconception in our hospital is not supported by our data, and age was not related to compliance in this study. Notably, we selected age 50 as our cutoff because the Centers for Disease Control and Prevention published its first hand hygiene guidelines in 1985.[8] Those who are under age 50 would have likely started their medical education after this document was published.

Those in surgical specialties were less likely to be compliant with hand hygiene. Although not reported here, a number of our noncompliant observations occurred in

TABLE 1. Provider Hand Hygiene Compliance by Age and Specialty

	Total Observations	Age		Specialty	
		≤50 y	>50 y	Medical	Surgical
Compliant, No. (%)	112 (100)	34 (30)	78 (70)	64 (57)	48 (43)
Noncompliant, No. (%)	97 (100)	28 (29)	69 (71)	20 (21)	77 (79)
Odds ratio	…	1.07		5.13	
95% confidence interval	…	0.59 to 1.95		2.77 to 9.52	
Significance level	…	$P = .81$		$P < .0001$	

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