

## Documented Transmission of Extended-Spectrum Beta-Lactamase–Producing *Klebsiella pneumoniae* From Patient to Gastroscope

*To the Editor*—In July 2015, patient A was admitted from an outside hospital to the University of Minnesota Medical Center with complaints of abdominal pain, nausea, and weakness. The patient's medical history was significant for multiple gastric-bypass surgeries, abdominal fistulas, and abdominal operations. The patient also had a prior history of carbapenem-resistant and extended-spectrum  $\beta$ -lactamase-producing *Klebsiella pneumoniae* (ESBL-KP) from an abdominal surgical site and from endotracheal sputum. Repeated cultures from the sites remained positive for ESBL-KP. On day 6 of admission, the patient underwent an esophagogastroduodenoscopy (EGD) procedure to assess for possible bowel obstruction.

At the same time, the Infection Prevention Department at University of Minnesota Medical Center identified 5 patients with past or current carbapenem-resistant *Enterobacteriaceae* (CRE) infections who were currently inpatients at the hospital. An outbreak investigation was initiated and subsequently revealed that these patients were on a variety of hospital units and received a variety of services, but several of these patients had had multiple endoscopy or bronchoscopy procedures over the preceding weeks. As a part of the investigation, all gastroscopes, bronchoscopes, and duodenoscopes used on the CRE-positive patients were identified, sequestered, and cultured for microbiological growth. The scopes were sampled according to the Interim Duodenoscope Sampling Method<sup>1</sup> from the Centers for Disease Control and Prevention, with slight adjustments to accommodate the scopes without an elevator channel. For rinsing, sterile water was used instead of phosphate-buffered saline (0.01M) with 0.02% Tween®-80 solution. The samples were processed immediately. The brushes were cultured in tryptic soy broth and the rinse water was cultured using membrane filtration on tryptic soy agar.

None of the cultures from the 3 sequestered bronchoscopes were positive. One duodenoscope was cultured and grew organisms that indicated oral flora contamination. A total of 3 gastroscopes were cultured: 1 had no growth and 1 grew 1 colony-forming unit of *Burkholderia cepacia*. The third gastroscope was used on patient A and cultured positive for ESBL-KP. Pulsed-field gel electrophoresis (PFGE) testing was conducted on *K. pneumoniae* isolates from the gastroscope, patient abdominal site, and patient sputum in coordination with the Minnesota Department of Health, Public Health Laboratory (Figure 1). PFGE was performed using the Pulse-Net standardized protocol<sup>2</sup> with slight modifications. The resulting *K. pneumoniae* isolate subtypes differed by 1 band and were therefore closely related according to the

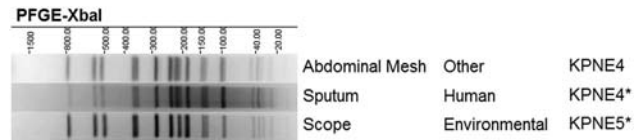


FIGURE 1. PFGE results for abdominal mesh isolate obtained January 12, 2015, and sputum and gastroscope isolates obtained July 26–30, 2015. These isolates have a 1-band difference.

Tenover criteria.<sup>3</sup> These results suggest contamination of the gastroscope with the ESBL-KP.

This gastroscope had previously undergone high-level disinfection 12 times and had been used on 9 patients between the day it was used on patient A and the date it was cultured. Endoscope cleaning and high-level disinfection procedures in the endoscopy unit were reviewed regularly in the preceding year and at the time of this incident, and no gaps in following the manufacturer's instructions for use and reprocessing were identified. Repeated cultures collected after high-level disinfection were negative for ESBL-KP. The 9 patients, along with their care teams, were notified of the exposure to a contaminated gastroscope. To date, no evidence of transmission of the ESBL-KP to any of the 9 patients has appeared, and they remain closely watched for signs and symptoms of transmission.

Examples of CRE outbreaks associated with exposure to duodenoscopes have been well documented.<sup>4</sup> Despite meticulous adherence to manufacturer's guidelines for endoscope reprocessing, there have also been reports of persistent biological contamination of colonoscopes and gastroscopes.<sup>5</sup> In France, a well-documented outbreak of ESBL-producing *Pseudomonas aeruginosa* was associated with a contaminated gastroscope.<sup>6</sup> However, subsequent observations of endoscope reprocessing identified deviations from guidelines. We believe this is the first reported evidence of cross contamination of ESBL-KP from a patient to a gastroscope, with subsequent persistent contamination despite reprocessing using the manufacturer's instructions. This finding demonstrates a need for more effective methods of cleaning and disinfection and an improvement in the scope design that allows for better disinfection.

### ACKNOWLEDGMENTS

The authors appreciate the support provided by the Minnesota Department of Health, including that of Ruth Lynfield, MD, especially in result interpretation, patient notification, and editorial assistance. We would like to thank Patricia Ferrieri, MD, Medical Director of Infectious Disease Diagnostic Laboratory, University of Minnesota Medical Center, for her role in organism identification.

*Financial support.* No financial support was provided relevant to this article.

*Potential conflicts of interest.* All authors report no conflicts of interest relevant to this article.

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*Infect. Control Hosp. Epidemiol.* 2016;37(4):493–494

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## Inappropriate Antibiotic Use and Gastric Acid Suppression Preceding *Clostridium difficile* Infection

*To the Editor*—*Clostridium difficile* infection (CDI) is a major cause of healthcare-associated diarrhea and the most common cause of healthcare-associated infections (HAIs) in the United States, representing 12% of all HAIs each year.<sup>1</sup> CDI has been labeled an “urgent” threat to public health by the Centers for Disease Control and Prevention (CDC).<sup>2</sup> The major established risk factor for CDI is antibiotic use.<sup>3</sup> Currently, 60% of inpatients receive antimicrobials,<sup>4</sup> and up to 73% of CDIs are preceded by inappropriate antimicrobial use.<sup>5</sup> Other risk factors for CDI have been identified, notably gastric acid suppression medications, which have been associated with an increase in CDI.<sup>3,6</sup> To our knowledge, no

studies have investigated the frequency of inappropriate gastric acid suppressant medication use preceding CDI.

To understand how often CDI is related to inappropriate medication use, we evaluated appropriateness of antimicrobial therapy and gastric acid suppression preceding CDI acquired in an integrated healthcare system. We conducted the study within the Veterans’ Affairs (VA) Maryland Health Care System, which has a total of 727 inpatient beds, including an acute-care medical center, 2 long-term care community living centers, and outpatient clinics. The study was approved by the University of Maryland School of Medicine Institutional Review Board and the Baltimore VA Research and Development Board. Eligible patients were 18 years of age and older with a primary, recurrent, or reinfection case of CDI that occurred between October 2013 and December 2014. Patients were identified from a list of all *C. difficile* toxin gene polymerase chain reaction (PCR)-positive assays during this period. Medical records of PCR-positive patients were reviewed by 1 of 2 physicians (J.L. or M.D.) for confirmation of CDI diagnosis. Type of CDI was classified according to CDC definitions and Society for Healthcare Epidemiology of America (SHEA)-Infectious Diseases Society of America (IDSA) joint practice guidelines.<sup>3,7</sup> Primary CDI included new onset symptoms and PCR-positive toxin assay. Recurrent CDI had recurrent symptoms and positive test within 8 weeks of resolved primary CDI, while reinfection cases occurred >8 weeks after the positive CDI test.

Gastric acid suppressant medications prescribed in acute care, long-term care, or primary care settings within 8 weeks preceding CDI diagnosis were reviewed and assessed for appropriateness of diagnosis, start, and maintenance of gastric acid suppression therapy using AGA guidelines.<sup>8</sup> Appropriate indications for gastric acid suppression were gastroesophageal reflux disease (GERD), acute upper gastrointestinal bleed, peptic ulcer disease, and intensive care unit (ICU) stress ulcer prophylaxis.

All antibiotics prescribed up to 8 weeks prior to CDI diagnosis were also reviewed. Appropriateness of diagnosis of infection, antibiotic spectrum, and treatment duration were determined as in past studies, using SHEA-IDSA guidelines.<sup>3,9,10</sup>

During the study period, 50 patients and 71 episodes of CDI occurred. Forty-nine patients were male and 12 patients were readmitted following the first episode. The average patient age was 66.8 years (standard deviation [SD], 12.3; range, 39–94 years) and median length of stay for acute care patients was 20.2 days (interquartile range, 1–28.5 days). Most episodes were primary infections (60.6%; Table 1). Of all 71 episodes, 63.4% received inappropriate antibiotics prior to infection. Among the 62 episodes treated with antibiotics prior, 45 (72.6%) were inappropriately treated, most commonly due to use of antibiotics without any evidence of infection (59.6% of antibiotic courses) and overly long courses (25% of antibiotic courses). In addition, inappropriate antibiotic use continued after diagnosis of CDI in 38% (27 of 71) of all episodes. In the subset of CDI patients remaining on antibiotics, inappropriate use occurred in 27 of 42 (64.3%) of episodes.