TABLE 1. Sensitivities and Specificities Distinguishing Carbapenemase-Producing and Non-carbapenemase-Producing Carbapenem Non-susceptible *Pseudomonas* and *Acinetobacter* Isolates

Carbapenemase-Producing *Pseudomonas aeruginosa*			Carbapenemase-Producing *Acinetobacter baumannii*		
Minimum Inhibitory Concentrations	Sensitivity, %	Specificity, %	Minimum Inhibitory Concentrations	Sensitivity, %	Specificity, %
Meropenem ≥2 mcg/mL	100	10	Meropenem ≥2 mcg/mL	100	0
Meropenem ≥4 mcg/mL	100	19	Meropenem ≥4 mcg/mL	100	7
Meropenem ≥8 mcg/mL	98	24	Meropenem ≥8 mcg/mL	100	10
Meropenem ≥16 mcg/mL	83	48	Meropenem ≥16 mcg/mL	98	13
Imipenem ≥2 mcg/mL	100	6	Imipenem ≥2 mcg/mL	98	3
Imipenem ≥4 mcg/mL	100	13	Imipenem ≥4 mcg/mL	98	7
Imipenem ≥8 mcg/mL	100	17	Imipenem ≥8 mcg/mL	98	13
Imipenem ≥16 mcg/mL	96	22	Imipenem ≥16 mcg/mL	96	16

values, however, would be poor. We prioritized sensitivity over specificity because failing to recognize the presence of carbapenemase-producing organisms in healthcare settings could have unfortunate infection control implications. An MIC cutoff value above the carbapenem susceptibility breakpoint would reduce the proportion of patients placed on contact precautions.

Mobile genetic elements containing carbapenemase genes can spread rapidly in healthcare settings, between both glucose-fermenting (e.g., *Enterobacteriaceae*) and non-fermenting organisms.[1,2] Identifying carbapenem cutoff values highly sensitive for detecting carbapenemase production can support enhanced infection control practices for patients harboring CP organisms, potentially averting outbreaks.

The isolates provided by the CDC-FDA bank purposefully contain an overrepresentation of carbapenemase producers to allow for diverse resistance mechanisms to be evaluated. The inclusion of the CDC-FDA isolates improved the accuracy of our sensitivity estimates; however, the prevalence of CP isolates in our cohort should not be extrapolated to general US prevalence estimates. Because only US isolates were included in our cohort, our results may not be generalizable to carbapenem-nonsusceptible isolates from other parts of the world.

Our findings suggest that meropenem or imipenem MIC cutoff values of 8 mcg/mL have sensitivities approaching 100% for the detection of CP *P. aeruginosa* and CP *A. baumannii*. Carbapenem susceptibility patterns and resistance mechanisms for nonfermenters are anticipated to change over time, and appropriate MIC cutoff values need to be reviewed periodically to remain accurate.

ACKNOWLEDGMENTS

Financial support: This work was supported by funding from The National Institutes of Health (grant no. K23-AI127935 awarded to P.D.T. and grant no. R21-AI130608 awarded to P.J.S.). *Potential conflicts of interest:* All authors report no conflicts of interest relevant to this article.

Pranita D. Tamma, MD, MHS;[1]
Ruibin Wang, MHS;[2]
Shawna Lewis, BA;[3]
Belita N.A. Opene, BA;[3]
Patricia J. Simner, PhD[3]

Affiliations: 1. Division of Infectious Diseases Department of Pediatrics, Johns Hopkins University School of Medicine, Baltimore, Maryland; 2. Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland; 3. Department of Pathology, Johns Hopkins University School of Medicine, Baltimore, Maryland.

Address correspondence to Pranita D. Tamma, MD, MHS, Division of Infectious Diseases, Department of Pediatrics, Johns Hopkins University School of Medicine, 200 North Wolfe Street, Suite 3149, Baltimore, MD 21287 (ptamma1@jhmi.edu).

Infect Control Hosp Epidemiol 2017;38:1378–1379
 0899-823X/2017/3811-0021. DOI: 10.1017/ice.2017.210

REFERENCES

1. Logan LK, Weinstein RA. The epidemiology of carbapenem-resistant Enterobacteriaceae: the impact and evolution of a global menace. *J Infect Dis* 2017;215:S28–S36.
2. Gniadek TJ, Carroll KC, Simner PJ. Carnapenem-resistant non-glucose-fermenting gram-negative bacilli: the missing piece to the puzzle. *J Clin Microbiol* 2016;54:1700–1710.
3. Simner PJ, Opene BN, Chambers KK, Naumann ME, Carroll KC, Tamma PD. Carbapenemase detection amongst carbapenem-resistant glucose nonfermenting gram-negative bacilli. *J Clin Microbiol* 2017;55:2858–2864.
4. Tamma PD, Huang Y, Opene BN, Simner PJ. Determining the optimal carbapenem MIC that distinguishes carbapenemase-producing and non-carbapenemase-producing carbapenem-resistant Enterobacteriaceae. *Antimicrob Agents Chemother* 2016;60:6425–6429.

Cessation of Contact Precautions for Extended-Spectrum Beta-Lactamase (ESBL)–Producing *Escherichia coli* Seems to be Safe in a Nonepidemic Setting

To the Editor—According to a prospective multicenter cohort study, when the proportion of patients in contact isolation increases, compliance with contact isolation precautions

TABLE 1. Infection Density Rates and Rate Ratios of Pathogens

	IDR (per 100,000 Inpatient Days)			
	2015	2016	CMLE of Rate Ratio (95% CI)	*P* Value[a]
Adult hospital				
ESBL-producing *Escherichia coli*	4.993	2.056	2.428 (0.678–10.790)	.211
CR *E. coli*	1.110	1.028	1.079 (0.078–14.890)	1.000
ESBL-producing *Klebsiella pneumoniae*	6.657	7.711	0.863 (0.369–1.976)	.854
CR *K. pneumoniae*	4.438	5.655	0.7848 (0.274–2.142)	.773
Oncology hospital				
ESBL-producing *E. coli*	20.380	21.240	0.960 (0.287–3.206)	1.000
CR *E. coli*	5.822	9.102	0.640 (0.053–5.584)	.961
ESBL-producing *K. pneumoniae*	14.560	12.140	1.199 (0.258–6.045)	1.000
CR *K. pneumoniae*	8.734	3.034	2.879 (0.231–151.100)	.656
Both adult and oncology hospital				
ESBL-producing *E. coli*	7.456	4.836	1.542 (0.672–3.674)	.357
CR *E. coli*	1.864	2.198	0.848 (0.168–3.940)	1.000
ESBL-producing *K. pneumoniae*	7.921	8.352	0.948 (0.463–1.927)	1.000
CR *K. pneumoniae*	5.126	5.275	0.972 (0.388–2.405)	1.000

NOTES. CI, confidence interval; CMLE, conditional maximum likelihood estimate; CR, carbapenem (ertapenem or imipenem or meropenem) resistant; ESBL, extended-spectrum β-lactamase; IDR, infection density rate.
[a]The Fisher exact test was used.

decreases.[1] European Society of Clinical Microbiology and Infectious Diseases guidelines recommend contact precautions for extended-spectrum β-lactamase (ESBL)–producing Enterobacteriaceae with the exception of ESBL-producing *Esherichia coli* (ESBL-EC) due to low transmission rates in nonepidemic settings (except intensive care units [ICUs] and hematolocigal units).[2] ESBL-EC caused a therapeutic challenge, and a high rate of carbapenem usage, resulting in the first clinical strain of carbapenem-resistant *E. coli* at our hospital.[3,4] We implemented contact precautions for all patients colonized or infected with ESBL-EC until 2016. However, with this approach, a high number of patients required contact precautions.

Hacettepe Adult Hospital is a tertiary care center with 700-beds. The adult hospital has 3 surgical ICUs with 42 beds and a medical ICU (MICU) with 9 beds. Hacettepe Oncology Hospital has a total of 114 beds, including an 8-bed ICU and a 24-bed bone marrow transplantation (BMT) unit. Transfer of patients with cancer between 2 hospitals is common. All rooms have a single bed in the BMT unit. The other hospital rooms have 1 or 2 beds. There is no standard distance between beds in rooms with 2 beds, but usually this distance is no shorter than 1.5 meters. Alcohol-based hand rub and gloves are available at the bedside for all patients. A patient-based infection control program has been in place for more than 20 years. An infection control nurse visits all patients hospitalized at ICUs daily to detect ICU-acquired infections. Patient-based nosocomial infection surveillance is conducted for certain surgical procedures. Hospital-wide nosocomial bacteremia surveillance is performed by following the microbiology laboratory results daily. Infection control nurses contact the wards when contact precautions are required according to the culture results. Patients who need contact precautions are electronically flagged in the hospital's electronic web system until the infection control team cancels them. Cautionary cards are placed at the bedside when a patient is isolated. Any clustering of multidrug-resistant bacteria in the same ward is discussed with an infectious disease specialist, and outbreak investigations begin as quickly as possible. Contact precautions are implemented for all patients infected or colonized with ESBL-producing Enterobacteriaceae, carbapenem-resistant (CR) Enterobacteriaceae, multidrug-resistant *Acinetobacter baumannii*, or multidrug-resistant *Pseudomonas aeruginosa*. Contact precautions were abandoned for patients infected or colonized with ESBL-EC from January 1, 2016, because the evidence for the usefulness of contact precautions for ESBL-EC is low. For neutropenic cancer patients, we recommend 1-bed rooms. When a 1-bed room is not available, these patients are not admitted to rooms with patients colonized or infected with ESBL-EC. The medical devices used were either for single use or were disinfected before use with neutropenic patients.

During the study period, the identification of the isolates was performed using VITEK MS matrix-assisted laser desorption/ionization–time-of-flight mass spectrometry (MALDI-TOF MS). Antimicrobial susceptibility testing was performed with VITEK 2 (BioMérieux, Marcy-l'Étoile, France), and results were interpreted according to Clinical and Laboratory Standard Institute recommendations. When specific tests for ESBL production were not reported, *E. coli* and *K. pneumoniae* resistant to third-generation cephalosporins were considered ESBL producers for infection control purposes.

We compared the rates of ESBL-EC, ESBL-producing *K. pneumoniae*, CR *E. coli*, and *K. pneumoniae* between 2015 and 2016 to determine the results of our intervention. OpenEpi version 3.01 (www.openepi.com) was used for data

https://doi.org/10.1017/ice.2017.198 Published online by Cambridge University Press

analysis. Infection density rate (IDR), conditional maximum likelihood estimate (CMLE) of rate ratio (RR), 95% confidence intervals (CI), and *P* values were calculated. The Fisher exact test was used to compare IDRs among years. $P < .05$ was considered statistically significant.

The IDR did not increase for ESBL-EC after cessation of contact precautions in our hospital. Also, no change was observed for IDR for ESBL-producing *K. pneumoniae* or for CR *K. pneumoniae* between 2015 and 2016. An increase in CR *E. coli* bacteremia at the Oncology Hospital was observed, but it was not statistically significant (Table 1).

A recent Swiss study showed the safety of cessation of contact precautions for ESBL-EC in a setting where compliance with standard infection control precautions and hand hygiene is high.[5] Compliance with infection control precaution is highly variable in our hospital. The rate of compliance with hand hygiene before patient contact is nearly 90% in the oncology ICU and BMT units; however, it was 30%–60% in the surgical ICUs. Nevertheless, we did not observe an increase in the rate of ESBL-EC bacteremia.

This study has some limitations. First, we did not compare the types of ESBL-EC infection other than bacteremia between 2015 and 2016, but no clusters of ESBL-EC infections were detected in any of the wards during surveillance activities. Bacteremia surveillance is the only type of surveillance that is performed hospital-wide, so we decided to compare the bacteremia rates. Also, we did not have access the molecular epidemiology of ESBL-EC because it is very difficult to analyze the genetic relatedness of ESBL-EC in daily practice for infection control purposes.

Despite all limitations, our study showed that, in a middle outcome country where compliance to infection control precaution is highly variable, cessation of contact precautions for ESBL-EC did not result in a negative outcome. However, infection control teams practicing in crowded hospitals under high workload with insufficient staff should be cautious because ESBL-EC outbreaks are common.

ACKNOWLEDGMENTS

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

Potential conflicts of interest: Gökhan Metan has received honoraria for speaking at symposia and lectures organized by Gilead; Merck, Sharp, and Dohme (MSD); and Pfizer. He received financial compensation from Pfizer for a meeting organized to discuss the content of a review paper, and he is a member of the advisory board of Pfizer and Astellas. He has received travel grants from MSD, Pfizer, and Gilead to participate in conferences. Serhat Üna has received honoraria for lectures from Pfizer, MSD, and Gilead, as well as travel grants from MSD, Pfizer, and Gilead to participate in conferences. All other authors report no conflicts of interest relevant to this article.

Gökhan Metan, MD;[1,2]
Baki Can Metin, MD;[3]
Zeynep Başтuğ;[2]
İlknur Tekin;[2]
Hanife Aytaç;[2]
Burcu Çınar, MSc;[2]
Hümeyra Zengin, MSc;[2]
Serhat Ünal, MD[1,2]

Affiliations: 1. Department of Infectious Diseases and Clinical Microbiology, Hacettepe University, Faculty of Medicine, Ankara, Turkey; 2. Infection Control Committee, Hacettepe University Hospital, Ankara, Turkey; 3. Department of Public Health, Hacettepe University, Faculty of Medicine, Ankara, Turkey.

Address correspondence to Gokhan Metan, MD, Hacettepe Üniversitesi Tıp Fakültesi Hastanesi, İç Hastalıkları Binası, Enfeksiyon Hastalıkları ve Klinik Mikrobiyoloji Anabilim Dalı, Sıhhıye, Ankara, Turkey (gokhanmetan@gmail.com, gokhanmetan@hacettepe.edu.tr).

Infect Control Hosp Epidemiol 2017;38:1379–1381
 0899-823X/2017/3811-0022. DOI: 10.1017/ice.2017.198

REFERENCES

1. Dhar S, Marchaim D, Tansek R, et al. Contact precautions: more is not necessarily better. *Infect Control Hosp Epidemiol* 2014;35:213–221.
2. Tacconelli E, Cataldo MA, Dancer SJ, et al; European Society of Clinical Microbiology. ESCMID guidelines for the management of the infection control measures to reduce transmission of multidrug-resistant gram-negative bacteria in hospitalized patients. *Clin Microbiol Infect* 2014;20(Suppl 1):1–55.
3. Metan G, Zarakolu P, Cakir B, Hascelik G, Uzun O. Clinical outcomes and therapeutic options of bloodstream infections caused by extended-spectrum beta-lactamase-producing *Escherichia coli*. *Int J Antimicrob Agents* 2005;26:254–257.
4. Gulmez D, Woodford N, Palepou MF, et al. Carbapenem-resistant *Escherichia coli* and *Klebsiella pneumoniae* isolates from Turkey with OXA-48-like carbapenemases and outer membrane protein loss. *Int J Antimicrob Agents* 2008;31:523–526.
5. Tschudin-Sutter S, Frei R, Schwahn F, et al. Prospective validation of cessation of contact precautions for extended-spectrum β-lactamase-producing *Escherichia coli*. *Emerg Infect Dis* 2016;22:1094–1097.

ICD-9-CM Coding for Multidrug Resistant Infection Correlates Poorly With Microbiologically Confirmed Multidrug Resistant Infection

To the Editor—The *International Classification of Diseases, Ninth revision, Clinical Modification* (ICD-9-CM) coding system is often used to conduct surveillance for various infections.[1] Unfortunately, ICD-9-CM coding is subject to error and does not always reflect the true level of comorbid and acute illnesses.[2] Little research has been done to determine the accuracy of ICD-9-CM codes to identify multidrug-resistant organism (MDRO) infections.[3] Inaccurate coding of MDROs has implications for monitoring of MDRO transmission