NCP CRE (table). The 30-day mortality or length of hospital stay (LOS) did not differ between the two groups. Majority (n = 12) of CPE were identified to carry blaOXA (MM MIC, $\geq$2 mg/L), and two CPE were positive for blaKPC (MM MIC, $\leq 1$ mg/L). All NCP-CRE had IPM MIC of 2 mg/L; 7 (70%) had MM of $\leq 1$ mg/L. Resistance to amikacin (AMK) and levofloxacin (LFX) was noted in one and five CPE, respectively, whereas all NCP-CRE were sensitive, and nine blaKPC and 1 blaKPC were transferable by conjugation.

Conclusion. CPE and NCP-CRE had different clinical characteristics. Non-β-lactam treatment options were more available for NCP-CRE than CPE. CPE and NCP-CRE may require different control strategies.

Table: Comparison of CPE and NCP-CRE, n(%)  
| Age (y) | CPE (n = 12) | NCP-CRE (n = 10) | P-value |
|---------|--------------|------------------|---------|
| Male    | 5 (42)       | 8 (90)           | 0.1     |
| Nursing home residence | 4 (33) | 0               | 0.1     |
| Charlson Comorbidity Index$^a$ | 3 (1–5) | 2 (2–5) | 0.92    |
| Dependent functional status | 9 (75) | 3 (30) | 0.08    |
| Urinary catheter | 9 (75) | 2 (20) | 0.03    |
| NG tube | 8 (67) | 0 | $\leq 0.01$ |
| Infection (not colonization) | 3 (27) | 3 (30) | $>0.99$ |
| Polymicrobial isolation | 7 (58) | 9 (90) | 0.16    |
| Carbapenem exposure$^b$ | 3 (25) | 2 (20) | $>0.99$ |
| Any antimicrobial exposure$^c$ | 10 (83) | 8 (80) | $>0.99$ |
| LOS after isolation, days | 31 (10–59) | 22 (8–45) | 0.39    |

$^a$Median (IQR) and $^b$$^c$1 month.

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1179. Incidence of Bacteremia and Bacteriuria With Antibiotic-Resistant Enterobacteriaceae After Transrectal Ultrasound-Guided Biopsy of the Prostate (TRUSBP)  
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Background. Infection with Escherichia coli after TRUSBP is common, but other Enterobacteriaceae also occur. In the absence of microbiological data, prophylaxis with co-trimoxazole (TMP-SMX) or fluoroquinolones (FQ) is usually prescribed. We estimated the incidence of bacteremia and bacteriuria after TRUSBP with distinct species of Enterobacteriaceae and their rate of resistance to common antibiotics.

Methods. Using Veterans Healthcare Administration (VHA) databases, we identified patients undergoing TRUSBP between January 1, 2013 and December 31, 2017. We determined the incidence of Enterobacteriaceae isolated from urine and blood cultures obtained within 30 days of TRUSBP. Using microbiology data from VHA, we determined rates of resistance to TMP-SMX, FQ (ciprofloxacin as marker), ESC (ceftriaxone as marker), and carbapenems (Carb) (ertapenem as marker).

Results. Overall, 377 (0.3%) and 1,739 (1.4%) of 126,761 TRUSBPs were complicated by bacteremia or bacteriuria with Enterobacteriaceae, respectively. E. coli was predominant (91% of blood and 81% in urine). Rates of FQ resistance were 65% (Klebsiella) and 72% (Enterobacter) but exceeded 60% in E. coli. In general, TMP-SMX resistance exceeded 30%. Of note, 16.6% of blood and 11% of urine Enterobacteriaceae were resistant to ESC, while Carb-resistance was rare.

Conclusion. FQ and ESC-resistant Enterobacteriaceae are prevalent in bacteremia and bacteriuria after TRUSBP. Antibiotics used for prophylaxis and empirical treatment are likely to be ineffective. The prevention and management of TRUSBP-related infections should include microbiology-guided approaches.

1180. Addition of Chronic Kidney Disease Status to Pitt Bacteremia Score Improves Prediction of Mortality in Patients With Carbapenem-Resistant Enterobacteriaceae Infections  
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Background. Carbapenem-resistant Enterobacteriaceae (CRE) infections are associated with high mortality. The Pitt Bacteremia Score (PBS) was developed and validated to predict mortality in bloodstream infections (BSI). The first goal of this analysis is to evaluate whether PBS also predicts mortality in non-BSI infections. Second, we determine whether adding chronic kidney disease (CKD) as a parameter to PBS improves prediction of mortality.

Methods. The Consortium on resistance against carbapenems in Klebsiella and other Enterobacteriaceae (CRACKLE-1) is a prospective multicenter consortium of hospitals. Each patient with CRE infection was included once at the time of the last positive culture episode. Infections were distinguished from colonization using established definitions. Relative risk regression was used to evaluate the association of PBS 24 and CKD with 14-day all-cause hospital mortality.

Results. From December 2011 to June 2016, 364 unique patients were included with the following infections: bloodstream (34%), respiratory (20%), urinary (30%), and wound (16%). Median PBS was 3 (IQR: 2–4); 45% of patients had PBS >24. CKD was present in 31% of patients with PBS ≥24 and 20% of patients with PBS <24. All-cause mortality within 14 days of the last positive culture episode was 20%. In multivariable analysis, PBS ≥24 was strongly associated with mortality in patients with bacteriaemia (PBS ≥24 adjusted RR = 6.1, 95% CI 2.5–14.6, CKD aRR = 1.5, 95% CI 0.9–2.3) and in patients with other infections (PBS ≥24 aRR = 14.0, 95% CI 4.3–44.6, CKD aRR = 1.6, 95% CI 1.0–2.7). Adding CKD as a parameter to the PBS improved mortality prediction, specifically in patients with PBS ≥24 (figure).

Conclusion. As expected, PBS ≥24 was predictive of the 14-day risk of hospital mortality in this cohort of CRE bacteremic patients. In patients with other CRE infections, PBS ≥24 was also predictive of mortality. In this cohort, adding CKD to the PBS improved prediction of mortality among patients with PBS ≥24.

Figure: Risks and 95% confidence intervals for 14-day all-cause hospital mortality, by Pitt bacteremia score and chronic kidney disease (CKD) status.

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1181. Use of the Combination Antibigram in the Era of MDR Gram-Negative Pathogens
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Background. Combinations of two or more antimicrobial agents are frequently used in empiric therapy regimens to ensure at least one agent demonstrates activity against suspected pathogens. A combination antibigram can assess the increase in empiric coverage of a particular combination vs. either of the agents alone (i.e., percent gain). These data could assist in developing empiric regimens that may be particularly useful in settings with problematic multidrug-resistant Gram-negative pathogens.

Methods. A combination model to correlate combination antibigrams was developed to assist clinicians in evaluating institutional susceptibility data. The University of Florida Health Shands Hospital microbiology laboratory supplied susceptibility data for ceftazidime (CFTX), cefepime (CEF), ciprofloxacin (CIP), and amikacin (AMI) to assess % gain achieved with combinations for E. coli all blood isolates (n = 206) and blood isolates with an ESBL phenotype (n = 35). The same laboratory provided susceptibility data for CEF, piperacillin-tazobactam (PTZ), AMI and CIP for P. aeruginosa (all, n = 250; carbapenem-resistant (CARB-R), n = 30).

Results. Percent gains achieved by adding AMI or CIP to CFX and CEF to capture at least one agent exhibiting in vitro susceptibility against all blood E. coli were calculated: CFX-AMI, 16%; CFTX-CIP 3%; CEF-AMI, 10%; CEF-CIP 1%. The percent gain specific to E. coli blood isolates with an ESBL phenotype ranged from 9% to 86%. The combination with the greatest percent loss against blood E. coli isolates comparing all blood isolates to those with an ESBL phenotype, was CFX-CIP (Δ-66%). Percent gain achieved against all isolates of PA by adding AMI or CIP to PTZ and CEF were CEF-AMI 8%; CEF-CIP 5%; PTZ-AMI 15%; PTZ-CIP 9%; percent gain of the same combinations against P. aeruginosa CARB-R isolates were 23%, 10%, 47%, and 30%, respectively. Adding AMI to either β-lactam: PTZ % S increased from 47% to 77% (+AMI) and to 94% (+AMI); CEF % S increased from 60% to 70% (+CIP) and to 83% (+AMI).

Conclusion. Combination antibigram models can assist clinicians in identifying regimens which provide improved targeting of MDR phenotypes through calculation of percent gain.

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1182. Risk Factors for the Acquisition of IMP-Type Carbapenemase-Producing Carbapenemase-Resistant Enterobacteriaceae in Japan: A Matched Case–control Study
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Background. The majority of CRE in Japan are IMP-type carbapenemase-producing CRE (IMP-CRE). However, research on risk factors for the acquisition of IMP-CRE has been limited, and questions exist regarding whether IMP-CRE have risk factors similar to other types of CRE such as KPC.

Methods. We conducted a matched case–control study involving patients from whom IMP-CRE had been isolated. The controls were selected among patients with carbapenem susceptible Enterobacteriaceae (CSE). Non-meropenem-susceptible per CLSI criteria and/or cefazidime-resistant Enterobacteriaceae were screened, and metallo-β-lactamate-positive isolates were examined for blaIMP by PCR (January 2012 to December 2016).

Results. Ninety-six patients with CRE were matched with 96 patients with CSE. They comprised Enterobacter sp. (n = 112 [CRE: 66, CSE: 66], 68.8%) and Klebsiella pneumoniae (n = 60 [CRE:30, CSE:30], 31.2%), and bacteria were most commonly isolated from sputum (n = 76 [39.6%]), followed by urine (n = 62 [32.3%]). Background factors such as age (median = 75 [IQR: 66–84]), sex (male = 56.8%), and the Charlson comorbidity index (median = 2 [IQR: 1–3.1]) were similar between CRE and CSE. In multivariate analysis, independent risk factors were identified: history of gastrointestinal (GI) endoscopy or surgery, history of ICU stay, and a previous exposure within 1 month to penicillins with β-lactamase inhibitors, cephalosporins, or carbapenams.

Conclusion. Histories of GI endoscopy and ICU stay as well as broad-spectrum antimicrobial exposure were identified as risk factors for CRE isolation. Infection control measures combined with enhanced antimicrobial stewardship are key to preventing the spread of IMP-CRE.