isolate in that outbreak. A linear-mixed model with random effect for stool/urine was used to estimate the difference in incubation periods between stool/urine isolates. We also surveyed patients from a 2012 Salmonella Cubana outbreak with many urinary isolates and associated with sprouts, to ask about diarrhea, UTI symptoms, diagnosis, and treatment. Descriptive statistics were calculated.

Results. Urine isolates had later isolation dates than stool isolates for 102 of the 110 outbreaks identified. The average difference between stool and urine isolates was 10.6 days (95% CI: 6.0, 15.2). Seven women from the Salmonella Cubana outbreak were reached. All women were diagnosed with either a UTI (6/7 = 86%) and/or kidney infection (2/7 = 29%) and were treated with antibiotics (7/7 = 100%). All six women completing the survey reported multiple signs and/or symptoms including frequency, urgency, dysuria, and hematuria with only two women reporting diarrhea prior to UTI.

Conclusion. Salmonella UTI seen during foodborne outbreaks are symptomatic foodborne infections not associated with diarrhea and appear to have a longer incubation period than Salmonella gastrointestinal (GI) illness. A 13- to 16-day incubation period for Salmonella UTI may be more appropriate, calculated by adding a 3- to 4-day GI illness incubation period plus delay in obtaining a stool isolate. Foodborne UTI investigation may need to change as the current method of obtaining a food history for the 6–72 hours prior to illness does not accurately reflect the incubation period for Salmonella UTI.

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1433. Predictive Models for Antibiotic Coverage of Gram-Negative Urinary Tract Infections

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Background. Providers use institutional recommendations, national guidelines, and antibiograms to decide on empiric antibiotics. As local antibiograms are most effective after organisms are known, we sought to use local microbiology and clinical data to develop predictive models for antibiotic coverage prior to identifying the organism. We focused on Gram-negative organisms as they are common urinary pathogens and are often the cause of sepsis originating in the urinary tract. As such, they are important to cover in hospitalized patients with urinary tract infections (UTI).

Methods. Hospitalized patients, with a diagnosis of UTI and a positive urine culture in the first 48 hours were included. Gram-positive organisms, yeast, and cultures without susceptibilities were excluded. Unknown susceptibilities were filled in using expert-derived rules. Clinical information from electronic health record (EHR) data were extracted on each patient. Penalized logistic regression with 10-fold cross validation was used to develop final models for coverage for five antibiotics (cefazolin, ceftriaxone, ciprofloxacin, cefepime, piperacillin–tazobactam). Final models were chosen based on their discrimination, calibration, and number of predictors, and then tested on a held-out validation dataset.

Results. Included were 5,096 patients (80% training; 20% validation). Coverage ranged from 65% for cefazolin to 90% for cefepime. Positive blood cultures were present in 544 (11%) with 388 (71%), including a urinary pathogen. In the first 24 hours, 2329 (46%) were hypotensive, 2179 (43%) had a respiratory rate > 22, 2049 (40%) had a WBC > 12, 1079 (21%) were febrile, and 584 (11%) required ICU care. Final model covariates included demographics, antibiotic exposure, prior resistant pathogens, and antibiotic allergies. The five predictive models had a point-estimate for the area under the ROC on the validation set that ranged from 0.70 for ciprofloxacin to 0.73 for ceftriaxone.

Conclusion. In this cohort of moderate to high acuity hospitalized patients with Gram-negative urinary pathogens, we used EHR data to develop 5 models that predict antibiotic coverage which could be used to support empiric prescribing. These models performed well in a held-out validation set.

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1434. Risk Factors for Community-Acquired Urinary Tract Infections Caused by Extended-Spectrum β-Lactamase (ESBL) Producing *Escherichia coli* in Children: A Case–Control Study

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Background. In recent years, there has been an increasing incidence of community-acquired urinary tract infections (UTI) caused by extended-spectrum β-lactamase (ESBL) producing *Escherichia coli*. However, the risk factors of ESBL-producing bacteria in community-acquired (CA)-UTI in children in the USA remain unclear.

Methods. A retrospective case–control study of UTI due to CA-ESBL-producing *E. coli* during a 5-year period (2011–2016) was performed. Control cases of non-ESBL-producing *E. coli* UTI were matched by age, gender, and year of infection. Medical

records were manually reviewed to collect data for potential risk factors for ESBL-positive infection.

Results. A total of 111 patients with ESBL-producing *E coli* UTI and 103 control patients were included. The proportion of ESBL-producing *E coli* UTI ranged from 7% to 15% per year. The median age was 4 years with female predominance (84%). The ESBL group was predominantly African American (32%) followed by patients of Middle Eastern (ME) ethnic background (31%). Risk factors by univariate analysis were vesicoureteral reflux (VUR): (20.9 ESBL group vs. 6% controls; $P = 0.002$), prior antibiotic usage in the previous 3 months (including β-lactams), prior UTI (last 3 months), recent hospitalization (last 3 months) and ME ethnic background. However, multivariate analysis showed that only prior antibiotic usage ($P = 0.001$) and ME ethnic background ($P < 0.001$) remained statistically significant. 18% (11/60) of patients exposed to prior antibiotic use in the ESBL group were on long-term antibiotic prophylaxis for VUR.

Conclusion. Risk factors for CA-ESBL-producing *E coli* UTI in children were: (1) antibiotic usage within the previous 3 months and (2) ME background. Prior antibiotic usage as a risk factor reinforces the need for judicious use of antibiotics. The high percentage of patients in this group (18%) receiving long-term antibiotic prophylaxis for VUR warrants further study as this practice may increase the prevalence of ESBL-producing infections in a population at high risk for UTI. The increased risk among children of ME ethnic background warrants further study to evaluate possible additional associated risk factors such as recent international travel or contact with international travelers.

Table 1: Demographic Information and Laboratory Values of Children with ESBL-Producing *E. coli* UTI compared to Controls

	ESBL-producing *E. coli* (n=109)	Non ESBL-producing *E. coli* (n=103)	p-value
Demographics[1]			
Median Age in years (range)	4 (1 mo-18 yrs, n=109)	4 (1 mo-18 yrs, n=103)	
Female Gender	84% (n=92)	88% (n=91)	
Ethnic Background			
Caucasian	17% (n=19)	17% (n=18)	
African American	32% (n=35)	49% (n=50)	
Hispanic	16% (n=17)	22% (n=23)	
Middle Eastern	31% (n=34)	10% (n=10)	
Other	4% (n=4)	2% (n=2)	
Laboratory Value (mean)			
WBC (10³/mm³)	14.5 (n=88)	14.3 (n=58)	0.340
Hemoglobin (g/dL)	11.9 (n=88)	11.4 (n=58)	0.340
Hematocrit (%)	34.9 (n=88)	33.7 (n=58)	0.212
Platelets (10³/ml)	318.5 (n=88)	318.2 (n=58)	0.775
BUN (mg/dL)	13.4 (n=63)	11.6 (n=46)	0.437
Creatinine (mg/dL)	0.5 (n=62)	1.6 (n=58)	0.028
CRP (mg/dL)	81.5 (n=23)	60.8 (n=20)	0.661

ESBL: Extended spectrum β-lactamase; CRP: C-reactive protein
Denominators for percentages noted in header row of table
[1]All patients were case-controlled by age, sex, and year of UTI.

Table 2: Antimicrobial Resistance of ESBL-Producing *E. coli* compared to Non ESBL-Producing *E. coli*

Resistance to Antimicrobial Agents	ESBL-producing *E. coli*	Non ESBL-producing *E. coli*
Amikacin	0%	0%
Ampicillin/Sulbactam	92%	22%
Ampicillin	100%	63%
Aztreonam	81%	0%
Cefazolin	100%	0%
Cefepime	88%	0%
Cefoxitin	86%	0%
Ceftriaxone	100%	0%
Ciprofloxacin	73%	5%
Ertapenem	2%	0%
Gentamicin	36%	5%
Imipenem	0%	0%
Meropenem	0%	0%
Nitrofurantoin	1%	0%
Piperacillin/Tazobactam	75%	17%
Tobramycin	39%	2%
Trimethoprim/Sulfamethoxazole	72%	25%

Table 3: Univariate Analysis of Risk Factors for ESBL-Producing *E. coli* UTI compared to Controls

Risk Factors	ESBL-producing *E. coli*	Non ESBL-producing *E. coli*	p-value
VUR	20.9% (n=23)	5.9% (n=6)	0.002
Prior Antibiotic use (last 3 months)	54.5% (n=60)	14.6% (n=15)	<0.001
Prior β-lactam use (last 3 months)	30.9% (n=34)	8.8% (n=9)	<0.001
Prior UTI (last 3 months)	23.6% (n=26)	5.9% (n=6)	<0.001
Prior Hospitalization (last 3 months)	24.5% (n=27)	10.1% (n=10)	0.007
Prior Surgery (last 3 months)	7.3% (n=8)	3.9% (n=4)	0.378
Intraurinary tract intervention	4.6% (n=5)	3.9% (n=4)	1.000
Middle Eastern ethnic background	30.6% (n=34)	9.8% (n=10)	<0.001
GU Abnormalities[1]	22.2% (n=26)	30.8% (n=26)	0.182
Intraurinary tract device[2]	11.8% (n=13)	6.9% (n=7)	0.247
Functional abnormalities			
Neurogenic Bladder	7.9% (n=7)	1.4% (n=1)	0.077
Voiding Dysfunction	3.5% (n=3)	5.4% (n=4)	0.706
Neurogenic Bladder and voiding dysfunction	9.9% (n=9)	12.5% (n=15)	0.632
Constipation	10.9% (n=10)	19.5% (n=17)	0.143
Immunosuppression	8.2% (n=9)	4.9% (n=5)	0.412

[1]GU abnormalities included hydronephrosis, ureteropelvic junction obstruction, duplex collection system, duplex kidney, other renal/genitourinary tract abnormalities
[2]Intraurinary tract device included use of clean intermittent catherization and presence of any intraurinary tract stents