1461. Antimicrobial Susceptibility Patterns of Common Complicated Urinary Tract Infection Pathogens in US Hospitals, 2013–2018
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Background. In response to increasing rates of antimicrobial resistance, carbapenems have become first-line treatments for many infections. This, in turn, fosters the potential for resistance (CR). Efforts to mitigate the emergence of CR through carbapenem-sparing strategies must rest on a fundamental understanding of antibiotic resistance patterns among commonly encountered pathogens. Therefore, we examined the microbiology of complicated urinary tract infections (cUTI) in hospitalized patients in the United States.

Methods. We performed a multicenter retrospective cohort study in the Premier database of approximately 180 hospitals, 2013–2018. Using an ICD-9/10-based algorithm we identified all adult patients hospitalized with cUTI and included those with a positive blood or urine culture. Patients with carbapenem-resistant organisms were excluded. We examined the microbiology and susceptibilities to common cUTI antimicrobials (third-generation cephalosporin [C3], fluoroquinolones [FQ], trimethoprim-sulfamethoxazole [TMP/SMZ], fosfomycin [FFM], nitrofurantoin [NFT], and triple-resistant [TR]) over time.

Results. Among 28,057 organisms from 23,331 patients, the 3 most common pathogens were Escherichia coli (40.1%), Klebsiella pneumoniae (KP) (12.1%), and Pseudomonas aeruginosa (PA, 11.0%). Among these organisms, resistance to C3 was 10.4% among PA, 12.6% KP, and 48.9% EC. EC was most likely to exhibit resistance to all agents of interest, and demonstrated the highest resistance rate to TMP/SMZ (61.5%), and lowest to NFT (10.4%). In contrast, KP had the highest rate of resistance to NFT (37.9%) and lowest to FQ (4.9%). The lowest rate of resistance among PA was to TMP/SMZ (1.9%), and highest to C3 (10.4%). The prevalence of TR in 2013–2014 and 2017–2018, respectively, was 34.2% and 37.4% for EC, 11.8% and 14.2% for KP, and 7.0% and 4.6% for PA.

Conclusion. The most common pathogens isolated in hospitalized patients with cUTI, and particularly in EC, high and increasing single resistance and TR rates to common antimicrobials were evident. Current empiric treatment strategies may be insufficient against the growing threat of TR.

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1462. Derivation of a Prediction Model for Risk of Drug-Resistant Urinary Tract Infection
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Background. Urinary tract infections (UTIs) are among the most common indications for antibiotic therapy. As antibiotic resistance continues to grow, it is critical to identify those at higher risk for drug-resistant (DR) UTIs to guide empiric therapy, improve clinical outcomes, and limit costs of care. The aim of this study was to identify risk factors for DR UTI and develop a risk scoring tool which could aid in empiric antibiotic prescribing.

Methods. Single-center retrospective pilot study of adult patients treated for UTI at University of Iowa Hospitals and Clinics from August 1, 2015, to August 31, 2016. Patients who had asymptomatic bacteriuria, were pregnant within 4 months of admission, or had improperly collected urine cultures were excluded. DR was defined as phenotypic resistance to at least 1 agent in 3 or more antibiotic classes commonly used to treat UTIs. Risk factors for DR UTI were derived from previously published literature and multivariable logistic regression of individual patient data (IPD). Adjusted odds ratios (aORs) were developed by combining ORs from previous literature and IPD. A scoring tool was derived from weight- proportional integer-adjusted coefficients of the predictive model aORs.

Results. Risk factors were derived from 9 previously published studies and adapted using IPD (N = 77) and included: long-term care (aOR = 4.31), prior hospitalization (aOR = 1.8), previous antibiotics (aOR = 4.33), advanced age (aOR = 1.12), urinary catheterization (aOR = 2.2), immune suppression (aOR = 1.6), and male sex (aOR = 2.56). Previous DR UTI was forced into the model (OR = 1.1). Baseline incidence of DR UTI was 28.7%. A risk score from 0 to 20 was developed and applied to IPD and demonstrated an area under the receiver operator curve (AUROC) of 0.625 (95% CI 0.540–0.717). Removing sex from the score produced an AUROC of 0.64 (95% CI 0.497–0.783). A sensitivity analysis applying the score to only urinary isolates produced an AUROC of 0.64 (95% CI 0.507–0.778). A sensitivity analysis applying the score to only urinary isolates that exhibited resistance to third-generation cephalosporins (13.8%) produced similar results.

Conclusion. Residence in long-term care and previous antibiotics were among the risk factors most closely associated with DR UTI. Considering cumulative risk scores may be useful in predicting DR UTI however the current study was hindered by a large degree of heterogeneity in previous literature.

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1463. The Rates of UTI Outpatient and Inpatient Visits from 2001 to 2015 Among an Insured Population
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Background. Hospitals attributable to urinary tract infections (UTI) have increased over recent years. One possible reason for the increase in admissions is a lack of effective oral agents, due to increasing rates of antimicrobial resistance, necessitating treatment with IV antibiotics. Our objective was to compare the rates of inpatient vs. outpatient treatment for UTIs.

Methods. We used the MarketScan database to identify UTI inpatient and outpatient visits from January 2001 through September 2015. Incidence rates for inpatient and outpatient visits were determined as a function of people at risk for UTIs. A difference-in-difference model with a change point in 2007 was used.

Results. During our study period, we identified 32,521 inpatient visits for UTI and 297,470 inpatient UTI visits. Rates for inpatient and outpatient visits were rising at similar rates before 2007. After 2007, the slopes differed, and the incidence of outpatient visits increased statistically (P = 0.023) when compared with inpatient visits.

Conclusion. Incidence of UTI hospitalizations is increasing but not as quickly as UTI outpatient visits. Since 2007, patients are more likely to be treated in the outpatient setting rather than in the inpatient setting.

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1464. The Utility of Double Balloon Urinary Catheter in Reducing Rates of Catheter-Associated Urinary Tract Infections in a Tertiary Care Teaching Hospital
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Background. Catheter-associated urinary tract infections (CAUTI) have been shown to increase hospital length of stay, healthcare costs, morbidity, and mortality. Studies that evaluate the role of urinary catheter design in preventing CAUTI are lacking. One such design is the double-balloon (DB) urinary catheter that has a second distal balloon; this design is aimed at reducing mucosal injury and inhibiting coiling of the in situ catheter. We carried out a comparative study to (a) determine whether CAUTI rates differ for different types of urinary catheters, and (b) identify risk factors associated with the acquisition of CAUTI in patients with DB vs. non-double-balloon (NDB) urinary catheters.

Methods. We conducted a retrospective cohort study of all patients who acquired CAUTI from January 2017 through December 2018. We collected age, sex, body mass index, medical history including benign prostatic hypertrophy, urinary tract infection (UTI), prostate cancer, stroke, surgery within the last 30 days including the type of surgery, indication for indwelling urinary catheter, location of catheter insertion, duration of catheterization, presence of pyuria, and type of catheter used. Statistical analyses were carried out using IBM SPSS software. Test statistics included independent sample t-test. CAUTI rates were expressed per 1000 catheter-days.

Results. Among sixty-seven patients included CAUTI during the study period. NDB catheters included the following types: Foley, temperature sensing catheters, and coude catheters. Patients with DB and NDB catheters were similar in age, gender, diabetes, history of stroke, history of recent surgery, or history of UTI. CAUTI rates among patients with the DB-catheters was 28 events per 29,018 catheter-days vs. 39 events per 33,579 catheter-days for NDB type (P = 0.51). On stratification, CAUTI rates for Foley, temperature sensing catheters, and coude catheters were 1.12, 1.27 and 2.70, respectively (P = 0.51).

Conclusion. There were no statistically significant differences in CAUTI rates at our facility among patients with DB vs. NDB urinary catheters. The decision on the choice of the catheter for use in our facility will likely depend on the comparative costs of the respective catheters.

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1465. Resistance to Oral Antibiotics Among Urinary Tract Infection Isolates of Escherichia coli from the United States and Europe in 2017
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Background. Clinical guidelines have recommended oral antibiotics such as the cephalosporins, fluoroquinolones, and trimethoprim-sulfamethoxazole (TMP-SMX) for the treatment of urinary tract infections (UTIs) caused by Escherichia coli (EC). The utility of these agents continues to be eroded by increased prevalence of expanded spectrum β-lactamase (ESBL) genes and concomitant resistance determinants to other antimicrobial classes. This study assessed the prevalence of ESBL phenotypes among
EC from UTIs in the United States and 11 countries in Europe (EU) in 2017 and the impact of co-resistance to oral agents used to treat UTIs.

Methods. 2422 unique EC from UTIs in the United States and EU in the SENTRY Surveillance program were evaluated for susceptibility to various agents. All isolates were consecutively collected and centrally tested by CLSI methods and interpreted by Etest. Isolates met ESBL MHC screening criteria were characterized for the presence of β-lactamase genes.

Results. Among the 2422 isolates of EC from UTIs in the United States and EU the resistance (R) rates for cefuroxime (CEF), levofloxacin (LEV) and TMP-SMX were 17.9%, 25.6% and 33.2%, respectively. The overall prevalence of ESBL phenotypes was 18.2% (18.7% in the United States and 21.0% in EU). Among the 411 ESBL phenotypes, R to CEF, LEV and TMP-SMX were: 94.3%, 70.6%, and 61.6%, respectively. In contrast, ≤0.1% of all EC or ≤0.2% of ESBL EC were meropenem (MER)-R. Only two carbapenem-producing organisms were identified, an NDM-5 and a KPC-2 producing EC from Turkey and Greece, respectively. The CTX-M-15 was the most prevalent ESBL and identified among 167 isolates; with co-resistance to CEF, LEV and TMP-SMX noted in 100%, 82.6% and 70.7%, respectively. All CTX-M-15 isolates were susceptible to MER.

Conclusion. Oral agents such as CEF, LEV, and TMP-SMX exhibit R rates ≥17.9%. Co-resistance to CEF, LEV, and TMP-SMX were considerably higher among ESBL phenotypes (>61.1%) and confirmed blaCTX-M-15 genotypes (70.7%). In contrast, the carbapenems remained active against ESBL phenotypes and genotypes, such as blaKPC-3. New oral agents with the spectrum and potency of the carbapenems would address an unmet need for new options to treat multi-drug-resistant EC UTIs.

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1466. Alkaline Urine: A Cause for Urinary Tract Infection Recurrence
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Background. Urinary tract infections (UTIs) are one of the most common indications for antibiotics both in the inpatient and outpatient setting. The purpose of this study was to examine the impact of urinary pH on recurrence of UTIs. A recent review article stated imaging should be considered for patients with a urinary pH of 7 or higher. This study examines the impact of pH on outcomes of patients with UTI to determine whether pH plays a role in recurrent infection and presentations to the healthcare facility.

Methods. This was a retrospective chart review via the computerized patient record system. Patients over the age of 18 years who presented to the healthcare facility between January 1, 2005 to January 1, 2019 for treatment of UTIs were included in this study. Alkaline urine was defined as a urinary pH greater than or equal to 7, while acidic urine was defined as a urinary pH less than 7. Urease splitting organisms included Proteus spp., Providencia spp., and Morganella spp. Outcomes included recurrence and representation to the healthcare facility with a urinary pH ≥7 within 30 days.

Results. A total of 793 patients were included in this study, of which 21.3% had alkaline urine. Patients with alkaline urine were more likely to have recurrence of UTI (8.3% vs. 4.3%). Patients with a catheter were more likely to have alkaline urine (30% vs 18%; P = 0.0005). As expected, alkaline urine was associated with a higher frequency of urease splitting organisms (19% in alkaline urine vs. 3% in acidic urine). Renal calculi were found in 3.6% of patients with alkaline urine; however, only 3.4% of patients with alkaline urine had imaging completed. The use of drugs which can alkalinize the urine may be a marker for urease splitting organisms and calculi formation. More widespread imaging may be able to detect stones, allowing for potential urologic intervention, preventing subsequent antibiotic courses and repeated healthcare presentations.

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1467. Antimicrobial Susceptibility and Molecular Characterization of Extended-Spectrum β-Lactamase of Escherichia coli and Klebsiella pneumoniae of Urine Samples Isolated from Community Patients in South Brazil
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Background. Enterobacteriaceae is the main pathogens of UTI. It is important to be aware the local epidemiological data for an appropriate initial treatment. Resistance to antimicrobial agents has increased, especially to first-choice antibiotics in the treatment of cystitis. Our objective is to assess the antimicrobial susceptibility profile from uropathogens isolated in community and evaluated the dissemination of extended-spectrum β lactamase (ESBL), in E. coli and K. pneumoniae in south of Brazil.

Methods. From June 2016 to June 2017, all urine samples collected in the Basic Health Units and Emergency Departments were sent to a Central Laboratory. Identification and susceptibility tests were performed on the VITEK® 2 (bioMérieux, France) system. Clinical Laboratory Standards Institute (CLSI) breakpoints were used for the interpretation of susceptibility. Positive cultures were defined as those demonstrating ≥20 μg/ml (colony-forming units). The presence of ESBL was also subjected to the Chrom ID BILE agar plate test (bioMérieux – Marcy L’Etoile, France). PCR technique uses specific primers for genes blaCTX-M and blaTEM. Detection of the blaCTX-M genes was performed by multiplex PCR.

Results. A total of 56,555 microbiologic tests were performed, 8189 were positive. Women were responsible for 89.4%, and 10% were pregnant. Table 1 shows uropathogens isolated. Graphic 1 shows antimicrobial susceptibility. Extended-spectrum β lactamase production was present in 6.7% (n = 489). People older than 60 years had ESBL more frequently (P < 0.05) as well as being pregnant was not related to ESBL (P > 0.05). Table 2 shows the distribution of the bla genotypes.

Table 3: Distribution of blaCTX-M. Among blaCTX-M-1 genotype, blaCTX-M-15 was the most frequent.

Conclusion. In this study, the most frequent uropathogen isolated was E. coli followed by K. pneumoniae. C. urealyticum had high rates of resistance and nitrofurantoin the lowest. Quinolone resistance was more than 10%. Sensitivity to aminoglycosides and carbapenems remains high. We found relevant frequency of ESBL, CTX-M-1 group most commonly found. Among CTX-M-1, blaCTX-M-15 was the most isolated.