

Table 2 Antimicrobial Choice and Duration

Measurement	Result (n=50)
Durations of therapy; n (%):	
≤ 5 days	35 (70)
6 days	2 (4)
7 days	2 (4)
8 days	1 (2)
9 days	4 (8)
10 days	1 (2)
> 10 days	5 (10)
Initial antimicrobial; n (%)	
Oral antimicrobials	
Cefdinir	12 (24)
Fosfomycin	12 (24)
Nitrofurantoin	6 (12)
Sulfa-trimethoprim	5 (10)
Levofloxacin	4 (8)
Cephalexin	1 (2)
Amox-Clavulanate	1 (2)
Amoxicillin	1 (2)
Intravenous antimicrobials	
Levofloxacin	6 (12)
Ceftriaxone	2 (4)
Discharged antimicrobial; n = 30 (% of those that received discharge antibiotic)	
Cefdinir	11 (36.7)
Levofloxacin	9 (30)
Sulfa-trimethoprim	3 (10)
Nitrofurantoin	2 (6.7)
Amoxicillin	2 (6.7)
Cephalexin	1 (3.3)
Fosfomycin	1 (3.3)
Amoxicillin-clavulanate	1 (3.3)

**Conclusion.** Despite a well established stewardship program, nearly half of patients prescribed an antibiotic for UTI did not have signs or symptoms consistent with infection. This suggests many patients were treated for ASB, without necessity. Among hospitals with comparatively low antibiotic use, ASB may be a high-yield opportunity to reduce unnecessary antibiotic use.

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#### 1677. Evaluation of Optimal Treatment for Urinary Tract Infections in Outpatient Clinics at an Academic Medical Center

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**Session:** P-73. UTIs

**Background.** Inappropriate prescribing of antibiotics is an important modifiable risk factor for antibiotic resistance. The Joint Commission has identified the need for outpatient antimicrobial stewardship efforts. The purpose of this study was to assess the incidence of optimal empiric antibiotic therapy for urinary tract infections (UTIs) in outpatient clinics at VCU Health.

**Methods.** This was a retrospective study of patients seen in internal medicine (IM) and urology clinics between July 1, 2018 and June 30, 2019. Patients were included if they were ≥ 18 years old, had a diagnosis of UTI per ICD-10 code, and received a prescription to treat a UTI at the visit. Patients were excluded if they had a concurrent infection, currently prescribed antibiotics, or pregnant. The primary outcome was to evaluate the incidence of optimal empiric treatment for UTIs. Appropriateness of antibiotic therapy was assessed based on prior culture data along with our institutional UTI treatment guideline.

**Results.** Two hundred and twenty-six patients were included: 136 in IM clinics and 90 in urology clinics. Patients in the IM clinics were significantly older (mean age 64.8 vs. 60.5,  $p = 0.033$ ) and more were female (88% vs. 38%,  $p < 0.001$ ). More patients in the urology clinics had a history of a UTI within 24 months (72% vs. 57%,  $p = 0.016$ ), history of fluoroquinolone-resistant Gram-Negative UTIs (35% vs. 13%,  $p = 0.007$ ), and history of genitourinary cancer (28% vs. 1%,  $p < 0.001$ ). Overall, 61% of patients were treated with optimal empiric antibiotics. Incidence of optimal prescribing in the IM clinics was significantly higher compared to urology clinics (69% vs 49%,  $p = 0.002$ ). See table 1 for additional results.

Table 1. Optimal UTI Treatment in Internal Medicine Clinics vs Urology Clinics

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	Internal Medicine Clinics (N = 94)	Urology Clinics (N = 44)	p-value
Provider type, no. (%)			<0.001
Attending	47 (50)	13 (30)	
Resident	19 (20)	0 (0)	
Physician assistant	0 (0)	4 (9)	
Nurse practitioner	28 (30)	27 (61)	
UTI category, no. (%)			<0.001
Uncomplicated cystitis	62 (66)	5 (11)	
Complicated cystitis/pyelonephritis	32 (34)	39 (89)	
Beta-lactam allergy, no. (%)	17 (18)	11 (25)	0.353

**Conclusion:** IM clinics more frequently prescribed optimal empiric antibiotics for UTIs compared to urology clinics. Resident prescribers were more likely to prescribe optimal empiric therapy. Presence of a beta-lactam allergy was not predictive of optimal prescribing. These data highlight opportunities for antibiotic therapy optimization for UTIs at our health system.

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#### 1678. Evaluation of Sodium-Glucose Co-Transporter 2 Inhibitor Therapy and Other Potential Risk Factors for the Development of Bacteremia in Patients with Urosepsis

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**Session:** P-73. UTIs

**Background.** Though sodium-glucose co-transporter 2 (SGLT2) inhibitors have been associated with an increased risk of urinary tract infection, it is unknown whether SGLT2 inhibitors increase the risk of urinary-source bacteremia. Early recognition of bacteremia risk factors in patients with urosepsis could allow rapid management to improve patient outcomes. The purpose of this study is to assess patients presenting with urosepsis and a positive urine culture to evaluate the impact of sodium-glucose co-transporter 2 (SGLT2) inhibitor receipt and other potential risk factors for developing bacteremia.

**Methods.** This was a single-center, retrospective, case-control study performed at a community hospital. Patients were included if they presented with a positive urine culture and met pre-specified criteria for urosepsis. Patients were categorized in one of two groups: bacteremia and non-bacteremia. The following patients were excluded: confirmed pregnancy, age less than 18 years, and/or a proven source of bacteremia outside the urogenital tract. The primary endpoint assessed the percentage of patients taking a SGLT2 inhibitor in the bacteremia versus non-bacteremia groups. Independent risk factors for bacteremia were assessed via binary logistic regression. Additional statistical analysis included chi-square for categorical data and Student's t-test for continuous data.

**Results.** A total of 162 patients were analyzed in the study (n=81 in bacteremia and non-bacteremia groups). There was no difference in percentage of patients with or without bacteremia who received SGLT2 inhibitor therapy ( $p = 0.499$ ). The following were identified as independent risk factors for bacteremia in the binary logistic regression analysis: temperature ≥ 100.4 degrees Fahrenheit (OR 4.1; 95% CI 1.5 – 11.4), bicarbonate level < 20 mmol/L (OR 11.4; 95% CI 3.1 – 41.5), and blood glucose level > 180 mg/dL (OR 3.9; 95% CI 1.3 – 11.6).

**Conclusion.** In this study of patients in a community hospital, SGLT2 inhibitors in the setting of patients with urosepsis and positive urine cultures did not increase the risk for bacteremia. Independent risk factors associated with an increased risk of bacteremia included temperature ≥ 100.4 degrees Fahrenheit, bicarbonate level < 20 mmol/L, and blood glucose level > 180 mg/dL.

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#### 1679. Evaluation of the Treatment of Urinalyses and Urine Cultures in Multiple Sclerosis Patients

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**Session:** P-73. UTIs

**Background.** Patients with Multiple Sclerosis (MS) experience lower urinary tract dysfunction (LUTD) that in some cases, may necessitate catheterization. Discerning asymptomatic bacteriuria (ASB) from urinary tract infection (UTI) in MS patients is complicated by LUTD, leading to potentially inappropriate antimicrobial use. The purpose of this study was to evaluate the antimicrobial treatment practices of positive urine cultures in patients with MS.

**Methods:** A single-center, retrospective study. Positive cultures in patients with diagnosed MS (ICD10: G35) were included. The primary outcome was the proportion of patients that were appropriately treated with or without antimicrobial therapy.

Secondary endpoints included antimicrobial selection and urinalysis obtainment and positivity.

**Results.** 236 cultures from 139 patients were evaluated. Frequency, nocturia, dysuria, and foul-smelling urine were reported by patients in 54 (23%), 10 (4%), 25 (11%), and 14 (6%) of cases, respectively. Treatment was inappropriate in 81/201 (40%) of treated cultures. The agent selected was considered too broad in 35/201 (17%) instances. Of those, fluoroquinolones were the agents utilized in 33/35 (94%) cases. A urinalysis was sent in 200 (85%) cases, with 197/200 (99%) positive for at least one of four pre-defined positivity criteria.

**Conclusion.** Urinalyses and urine cultures are obtained frequently in patients with MS, often independent of patient symptomatology. Multiple sclerosis patients may be treated for ASB at higher rates than the general population, and traditional urinary symptoms may not be appropriate indicators of infection. Empiric therapy for UTI is frequently utilized in this population, often resulting in too broad of antimicrobial therapy.

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#### 1680. Evaluation of the Urinalysis Reflex to Culture Sensitivity and Impact on Antibiotic Utilization

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Session: P-73. UTIs

**Background.** In June of 2016 at ChristianaCare a urinalysis with reflex to culture (UARC) order set was made available, which allows for urine cultures to be performed automatically if pre-defined criteria for a positive urinalysis are met. The objective of this study was to evaluate the utility of the UARC as it relates to identifying a symptomatic urinary tract infection (UTI), as well as to describe the impact of UARC on antibiotic utilization.

**Methods.** A retrospective cohort study was performed including patients aged 18 to 89 ordered a UARC. Patients were excluded if they were currently pregnant, had an absolute neutrophil count of < 100 cells/mm<sup>3</sup>, were undergoing a urological procedure, or receiving antibiotics for another indication. The primary outcome of this study was to determine the utility of the UARC in identifying a symptomatic UTI, as determined by the Youden index. Secondary outcomes evaluated included mean days antibiotics and length of stay, adherence to duration of treatment guidelines, 30 day post discharge readmissions, 30 day post discharge mortality, and new *Clostridioides difficile* infection within 30 days.

**Results.** A total of 123 patients were included in this study. A Youden index of 7.2% was calculated for the primary outcome. Patients with a positive UARC and UTI symptoms received an average of 7.54 days of antibiotics. Asymptomatic patients with a positive UARC received significantly more antibiotics than those with a negative UARC (3.05 vs 0 days, respectively, p=0.02). Adherence to duration of treatment guidelines was found to be 77.8%, 66.7%, and 50% for uncomplicated cystitis, complicated cystitis and pyelonephritis respectively. No difference was observed between groups for length of stay, 30 day post discharge readmissions, and 30 day post discharge mortality. No cases of new *C. difficile* infection were identified.

**Conclusion.** This study demonstrates that the UARC does not have utility as a diagnostic test for predicting a symptomatic UTI. The presence of a positive UARC in the absence of symptoms attributable to a UTI resulted in inappropriate prescribing of antibiotics. Further evaluation of how a UARC is ordered, perhaps requiring prescribers to document urinary symptoms, in addition to caregiver education is warranted

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#### 1681. Female Urinary Metagenomic Analysis and Natural Language Processing Enhances the Infectious Diagnostic Yield in Precision Medicine

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Session: P-73. UTIs

**Background.** In this study, we assessed the diagnostic yield of metagenomics urine sample testing in patients with urological symptoms.

**Methods.** We conducted metagenomic analysis on 69 consecutive unbiased female patients, by sequencing their DNA using the KAPA HyperPlus library construction with next-generation sequencing (Nextseq500, Illumina) and reads were analyzed using Xplore-Patho<sup>®</sup>, an analytical system that permits the detection of 37,000+ microorganisms, including over 12,000 known pathogens, and examined report summaries written by infectious disease experts to obtain a diagnostic yield. In addition, infectious disease expert analysis was contrasted with a natural language (NLP) pathogen detection system to investigate its accuracy.

**Results.** In the expert data summaries, a total of 95% of the patients tested had at least one pathogen identified by metagenomics as a potential explanation of their urological symptoms and these results were binned into four categories: 1) 51% of infection likely, 2) 4% of infection possible, 3) 26% of low-grade infection likely and 4) 14% of low-grade infection possible. Data from healthy controls was used in conjunction with an NLP pathogen detection pipeline and compared to infectious disease expert summaries. The NLP pathogen algorithm detected that at least 97% of samples had one pathogen which was more than 5 standard deviations from the abundance of that pathogen in healthy controls, and least 84% had 2 or more pathogens. These diagnostic percentages were consistent with the infectious disease expert summaries. The

NLP algorithm had access to a large database derived from PubMed articles and it was found that several relevant uropathogens were not mentioned in report summaries. For example, one well-documented uropathogen was present in 13 samples, but was not mentioned in any report summaries.

**Conclusion.** In conclusion, this study demonstrated the high diagnostic yield in females with urological symptoms following metagenomic analysis and the ability of NLP to enhance the sensitivity of reportable pathogens.

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#### 1682. Health Resource Utilization in Patients with Complicated Urinary Tract Infections (cUTI) and Antibiotic Resistance or Treatment Failure: A Retrospective Database Analysis

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Session: P-73. UTIs

**Background.** In the United States, urinary tract infections (UTIs) are predominantly treated in the outpatient setting. Resistance to gram-negative bacteria has substantially increased in recent years, however, and many common oral treatment options continue to lose efficacy. As a result, patients may receive multiple courses of antibiotics at various outpatient settings and may ultimately require hospitalization. Here, we quantify health resource utilization and rate of hospitalization in patients with complicated UTI (cUTI).

**Methods.** A retrospective study was performed in partnership with Komodo Health, Inc., using aggregate data from the Komodo Healthcare Map<sup>™</sup> for cUTI-related events. Inclusion criteria: (1) 2+ UTI-related encounters within 35 days, beginning in 2017-2018, (2) clinical/coding features indicative of treatment failure or antibiotic resistance, or treatment with carbapenem or piperacillin/tazobactam. Location of service, number of cUTI-related healthcare encounters, and rate of hospitalization following service location were quantified.

**Results.** 1,889,216 cUTI patients with antibiotic resistance or treatment failure were identified; 1,545,559 were included in the site of care analysis. These patients incurred 8,694,236 cUTI-related healthcare encounters in 2017-2018. In 2017, among 1,105,459 patients, there were 385,981 cUTI-related inpatient hospitalizations, 798,574 emergency department (ED) visits, 285,985 long-term care (LTC) stays, 147,291 home health (HH) visits, and 2,534,083 other outpatient (OP) encounters. For patients with an ED visit, the mean number of visits was 1.67/patient; mean number of LTC, HH, and OP visits were 1.67, 3.07, and 2.97/patient, respectively. Of those who were hospitalized, 38% of patients were hospitalized following an ED encounter; hospitalization rates following LTC, HH, and OP visits were 30%, 43%, and 24%, respectively. The 30-day cUTI-related rehospitalization rate for inpatients was 12%. 2018 data was similar.

**Conclusion.** cUTI is associated with substantial health resource utilization, the majority of which occurs in the outpatient setting.

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#### 1683. Hospital Admission Patterns in Adult Patients with Complicated Urinary Tract Infections (cUTIs): Identification of Potentially Avoidable Hospital Admissions Across United States (US) Hospitals

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Session: P-73. UTIs

**Background.** There is an increase in hospital admissions for cUTI in the US despite apparent reductions in the severity of admissions. However, there are scant data on cUTI hospital admission rates from the emergency department (ED) stratified by age, infection severity, and presence of comorbidities. This study described US hospitalization patterns among adults who present to the ED with a cUTI. We sought to quantify the proportion of admissions that were potentially avoidable based on presence of sepsis and associated symptoms as well as Charlston Comorbidity Index (CCI) scores.

**Methods.** A retrospective multi-center study using data from the Premier Healthcare Database (2013-18) was performed. Inclusion criteria: (1) age ≥ 18 years, (2) primary cUTI ED/inpatient discharge diagnosis, (3) positive blood or urine culture between index ED service days -5 to +2. Transfers from acute care facilities were excluded. Based on ICD-9/10 diagnosis codes present on admission, incidence of hospital admissions were stratified by age (≥ 65 years vs. < 65 years), presence of sepsis (S), sepsis symptoms but no sepsis codes (SS) (e.g., fever, tachycardia, tachypnea, leukocytosis, etc.), and CCI.

**Results.** 187,789 patients met inclusion criteria. The mean (SD) age was 59.7 (21.9), 40.4% were male, 29.4% had sepsis, 16.7% had at least 1 SS symptom (but no S), and 53.9% had no evidence of S or SS. The median [IQR] CCI was 1 [0, 3]. 119,668 out of 187,789 (63.7%) were admitted to hospital. Among inpatients, median [IQR] length of stay (LOS) and total costs were 5 [3, 7] days and \$7,956 [\$4,834, \$13,960] USD. Incidence of hospital admissions by age, presence of S/SS, and CCI score are shown in the Table. 18.9% of admissions (22,644/119,668) occurred in patients with no S/SS and a CCI ≤ 2. Their median [IQR] LOS and total costs were 3 [2, 5] days and \$5,575 [\$3,607, \$9,133].