

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

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Background

(Please refer to abbreviations section for definitions)

- ASB is common, with the incidence reported as high as 9.5% in young healthy adults and 37% in elderly patients.²
- Treatment of ASB does not decrease the likelihood of developing a symptomatic infection and does not translate to any difference in outcomes.¹
- Treatment of ASB contributes to unnecessary prescribing of antibiotics, increased rates of *Clostridoides difficile* infection, and drug toxicity.⁴
- The IDSA does not recommend screening for or treating patients with ASB, except for those who are currently pregnant, are undergoing an invasive urological procedure, or have high risk neutropenia.¹
- At ChristianaCare, a UARC order set was made available for providers, which allows for urine culture to be performed automatically if pre-defined criteria for a positive urinalysis are met. This order set is intended to only be utilized if signs and symptoms attributable to UTI are present.
- A retrospective study performed at ChristianaCare evaluating individuals age ≥65 presenting to the ED with AMS found that 92% of patients with ASB were initiated on antibiotics.⁵
- A positive UARC, when ordered in asymptomatic patients, may lead to increased prescribing of antibiotics, increased rates of *C. difficile* infection, and adverse drug events.

Purpose

- To evaluate the predictive value of the UARC as it relates to identifying a symptomatic UTI, as well as to describe the impact of the UARC on antibiotic utilization.

Outcome Measures

- Primary outcome**
 - To determine the utility of the UARC in identifying a symptomatic UTI, assessed by the Youden index
- Secondary outcomes**
 - Mean days antibiotics prescribed
 - Mean length of stay
 - 30 day post-discharge mortality
 - 30 day post-discharge readmissions
 - New *C. difficile* infection within 30 days
 - Adherence to local duration of treatment guidelines

Definitions

- Asymptomatic bacteriuria:** The presence of ≥10⁵ colony-forming units (CFU)/mL in a voided urine specimen in patients without an indwelling catheter, or signs and symptoms attributable to a UTI
- Positive UARC:** Urinalysis with positive leukocyte esterase, positive nitrite, moderate or many bacteria, or WBC>10x10⁹/L
- High risk neutropenia:** Absolute neutrophil count <100cells/mm³
- New *C. difficile* infection within 30 days:** Positive *C. difficile* polymerase chain reaction (PCR) 48 hours after UARC ordered through 30 days post discharge

Methods

Study design: Exploratory retrospective cohort study **Time frame:** May 1st 2019 – May 14th 2019

Inclusion Criteria

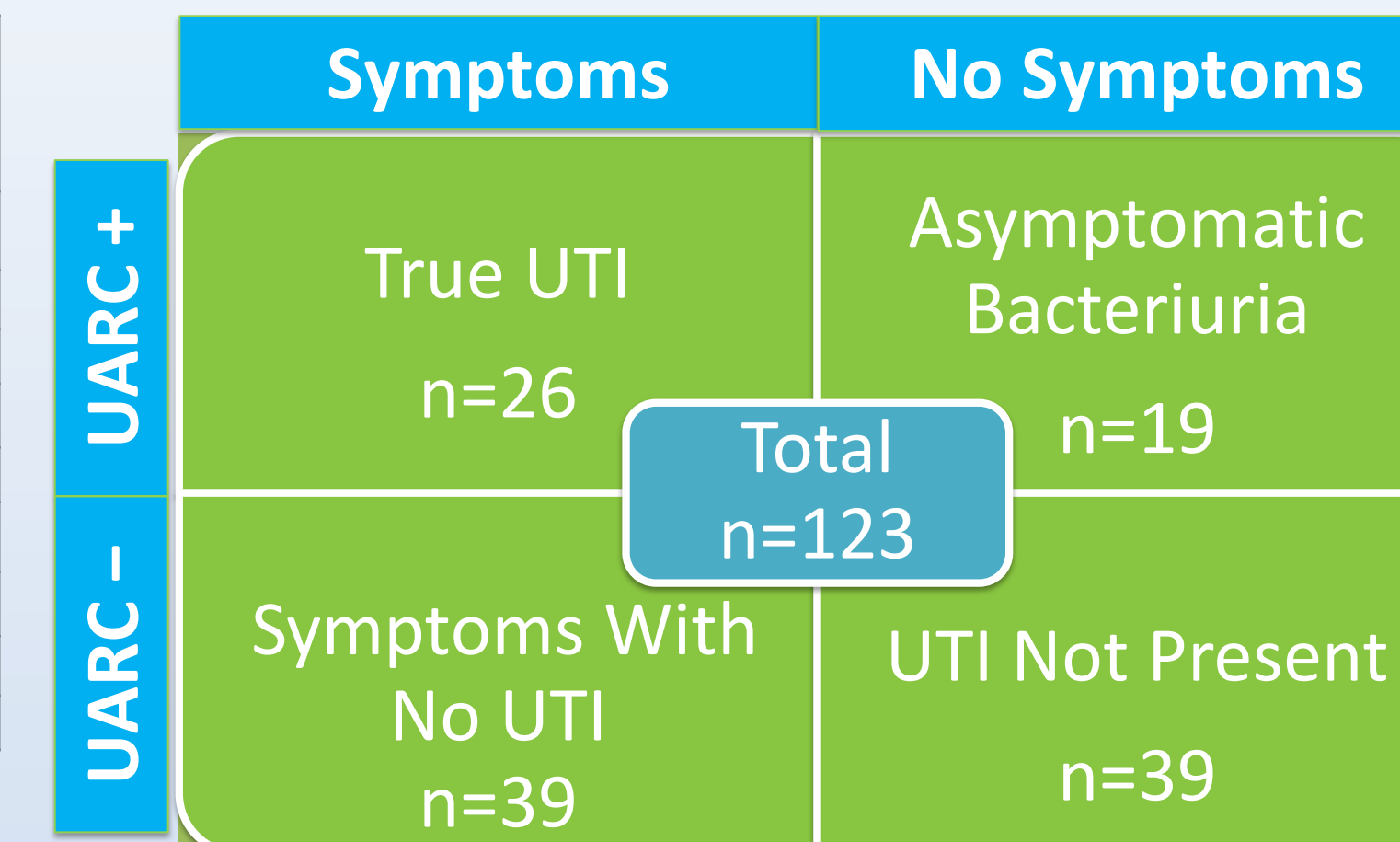
- Age 18-89 years old
- UARC ordered during time frame of May 1st 2019 – May 14th 2019

Exclusion Criteria

- Pregnant women
- High risk neutropenia
- Patient undergoing a urological procedure
- Patient receiving antibiotics for indication other than UTI

Results

Baseline Characteristics	True UTI n=26	Asymptomatic Bacteriuria n=19	UTI Not Present n=39	Total n=84
Mean age, years (range)	66.4 (29 - 86)	66.8 (42 - 86)	62.4 (28 - 88)	~
Female, n (%)	16 (61.5)	14 (73.7)	15 (38.5)	45 (53.6)
DM, n (%)	8 (30.8)	8 (42.1)	15 (38.5)	31 (36.9)
CKD, n (%)	6 (23.1)	5 (26.3)	11 (28.2)	22 (26.2)
Dementia, n (%)	2 (7.7)	1 (5.3)	4 (10.3)	7 (8.3)
Urinary catheter, n (%)	3 (11.5)	2 (10.5)	0 (0.0)	5 (6.0)
Black, n (%)	5 (19.2)	4 (21.1)	14 (35.9)	23 (27.4)
White, n (%)	19 (73.1)	15 (78.9)	23 (59.0)	57 (67.9)
Other, n (%)	2 (7.7)	0 (0.0)	2 (5.1)	4 (4.8)



Primary Outcome

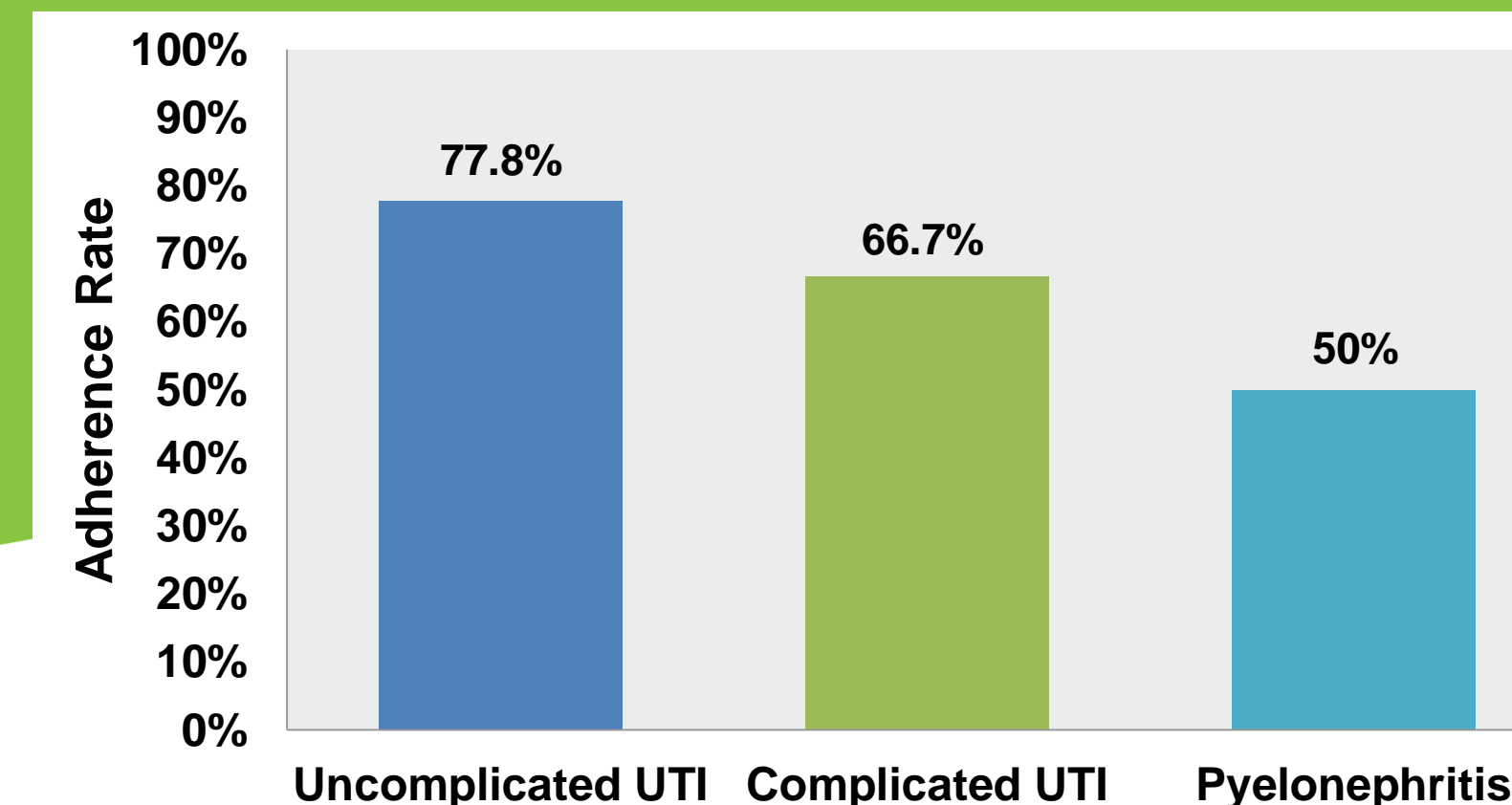
Youden Index

$$[\text{sensitivity of UARC (\%)} + \text{specificity (\%)} - 100\%] \quad [40\% + 67.2\% - 100\% = \mathbf{7.2\%}]$$

Secondary Outcomes

Outcome Measure	True UTI n=26	Asymptomatic Bacteriuria n=19	UTI Not Present n=39
Mean days antibiotics, days	7.5	3.1	0
Mean length of stay, days	4.9	6.6	5.2
30 day post-discharge mortality, n (%)	3 (11.5)	3 (15.8)	6 (15.4)
30 day post-discharge readmissions, n (%)	2 (7.7)	0 (0.0)	2 (5.1)
New <i>C. difficile</i> infection within 30 days, n (%)	0 (0.0)	0 (0.0)	0 (0.0)

Adherence to Duration of Treatment Guidelines



Discussion

- The Youden index is a way of summarizing the performance of a diagnostic test. Its value ranges from 0% through 100%, and has a zero value when a diagnostic test gives the same proportion of positive results for groups with and without the disease, making the test not valuable. Conversely, a value of 100% indicates that there are no false positives or false negatives, or the test is perfect. The calculated Youden Index of 7.2% demonstrates that the UARC does not have utility as a diagnostic test to predict a symptomatic UTI.
- Asymptomatic patients with a positive UARC received more days of antibiotics than those with a negative UARC, and this difference was found to be statistically significant (3.05 vs 0 days, respectively, p=0.02).
- There was no statistically significant difference between any groups in terms of mean length of stay, 30 day post-discharge mortality, 30 day post-discharge readmissions, or new *C. difficile* infection within 30 days.
- Adherence to treatment guidelines was defined as having a treatment duration that did not exceed the recommendation for the indication and antibiotic selected. Patients were included in the analysis if a diagnosis of a UTI was documented. Adherence for uncomplicated cystitis was high at 77.8%, but declined for both complicated UTI and pyelonephritis.

Conclusion

- The UARC is currently being utilized frequently in asymptomatic patients
- The UARC does not have utility as a diagnostic test to predict a symptomatic UTI
- On average, patients who presented with no symptoms attributable to a UTI and a positive reflex to culture received 3 days more antibiotics than those who had a negative reflex to culture

Abbreviations

- ASB: Asymptomatic bacteriuria
- IDSA: Infectious Disease Society of America
- UARC: Urinalysis reflex to culture
- UTI: Urinary tract infection
- WBC: White blood cells
- CFU: Colony forming units
- AMS: Altered mental status
- DM: Diabetes mellitus
- CKD: Chronic kidney disease

References

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