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Creation and implementation of a urinary tract infection diagnostic and treatment algorithm for psychiatric inpatients with a communication barrier

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Abstract

Background: Urinary tract infection (UTI) is considered a common cause of mental status changes, particularly in elderly patients and patients with a psychiatric condition. Genitourinary symptoms are essential to confirm UTI diagnosis but may be unobtainable in patients with a communication barrier. Sparse guidance suggests assessing specific symptoms that do not rely on patient report. The primary objective of this project was to provide assistance in diagnosis and treatment of UTIs in noncommunicative patients through the creation of an algorithm.

Algorithm Creation and Implementation: Through extensive interdisciplinary collaboration, the authors developed criteria to identify UTI symptoms that do not require communication. In order to make the algorithm comprehensive, we chose to include general information related to UTI diagnosis and treatment. The algorithm was implemented within the psychiatric emergency department as this is where patients are evaluated to determine need for psychiatric admission. Providers in the psychiatric emergency department were provided with detailed education on the algorithm as well as information about UTI diagnosis and treatment.

Discussion: Creating an algorithm within our institution required significant interdisciplinary collaboration. Providers were receptive to and appreciative of a comprehensive resource to assist in this difficult clinical situation. The authors plan to study the effects of algorithm implementation, specifically assessing changes in symptom documentation and antibiotic use.

Keywords: algorithms, asymptomatic bacteriuria, ASB, altered mental status, AMS, autism spectrum disorder, ASD, communication barriers, cystitis, dementia, intellectual disability, ID, neurocognitive disorder, pyelonephritis, urinary tract infection, UTI

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Background

Urinary tract infection (UTI) is commonly considered a cause of mental status changes, particularly in elderly patients and patients with primary psychiatric conditions.[1] The term UTI describes both cystitis and pyelonephritis. According to the Infectious Diseases Society of America (IDSA), genitourinary symptoms must be present to differentiate between a UTI and asymptomatic bacteriuria (ASB).[2] Easily recognized genitourinary symptoms such as dysuria and polyuria traditionally rely on patient report, complicating the diagnosis in patients with a communication barrier. In situations where patients cannot accurately communicate symptoms, characteristics of a urinalysis (UA) may be more heavily relied upon to identify a potential UTI. Given that symptoms are required to confirm the diagnosis

This algorithm (viewed with Figure 2) is meant to assist providers in interpreting existing urinalysis results in patients who cannot communicate the presence or absence of genitourinary symptoms related to a urinary tract infection. For patients who can communicate the presence/absence of genitourinary symptoms, refer to the most recent IDSA guidelines for the treatment of UTIs.

Refer to Table 1 for tips associated with applying Figures 1 and 2.

Patients with severe systemic symptoms of infection (SBP<90, HR>100, RR>22) should be evaluated outside of this algorithm.

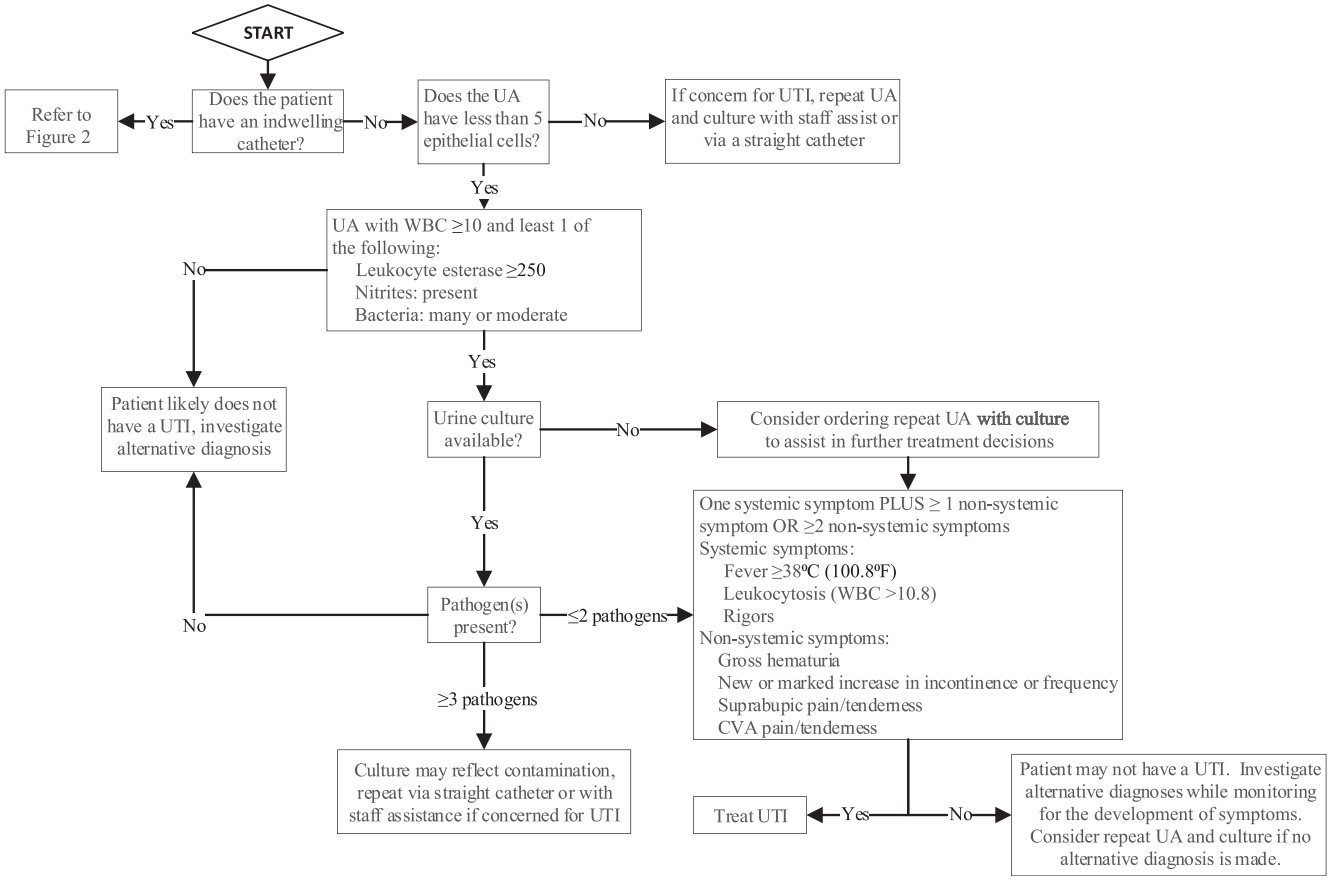

FIGURE 1: Urinary tract infection (UTI) algorithm for patients without indwelling catheter (CVA = costovertebral angle; HR = heart rate; IDSA = Infectious Diseases Society of America; RR = respiratory rate; SBP = systolic blood pressure; UA = urinalysis; WBC = white blood cell)

of UTI rather than ASB, this practice is not in line with guideline recommendations. Unfortunately, there is limited evidence suggesting genitourinary symptoms that do not rely on patient report.[3-6]

The IDSA recommends against treating ASB in elderly patients with new functional impairment living in the community or within long-term care facilities.[2] When making this recommendation, IDSA cites the risk of unnecessary antimicrobial use including *Clostridium difficile* infection, adverse drug events, and increased antimicrobial resistance. A 2014 study[7] performed at our institution revealed that two-thirds of antibiotics prescribed for UTI within the inpatient psychiatric hospital were for asymptomatic patients—highlighting a historical concern for overtreatment of ASB. This overtreatment has potentially contributed to high rates of resistant *Escherichia coli* at our institution, specifically >20% empiric resistance to fluoroquinolones and sulfamethoxazole-trimethoprim. Despite the acknowledged risks of overprescribing, prescribers may feel obligated to prescribe antibiotics to patients with a change in mental status and a UA that may be indicative of infection regardless of genitourinary symptoms.

The aim of this intervention was to design and implement an algorithm meant to aid in the diagnosis and treatment of UTIs in patients admitted to a psychiatric service with a diagnosis indicative of a communication barrier (Figures 1 and 2; Table 1).

Algorithm Creation

Creating a comprehensive algorithm that included both diagnostic and treatment recommendations required extensive interdisciplinary collaboration prior to approval for implementation. Psychiatric pharmacists worked with psychiatrists to identify the primary patient population at risk for overuse of antibiotics in ASB at our institution—elderly

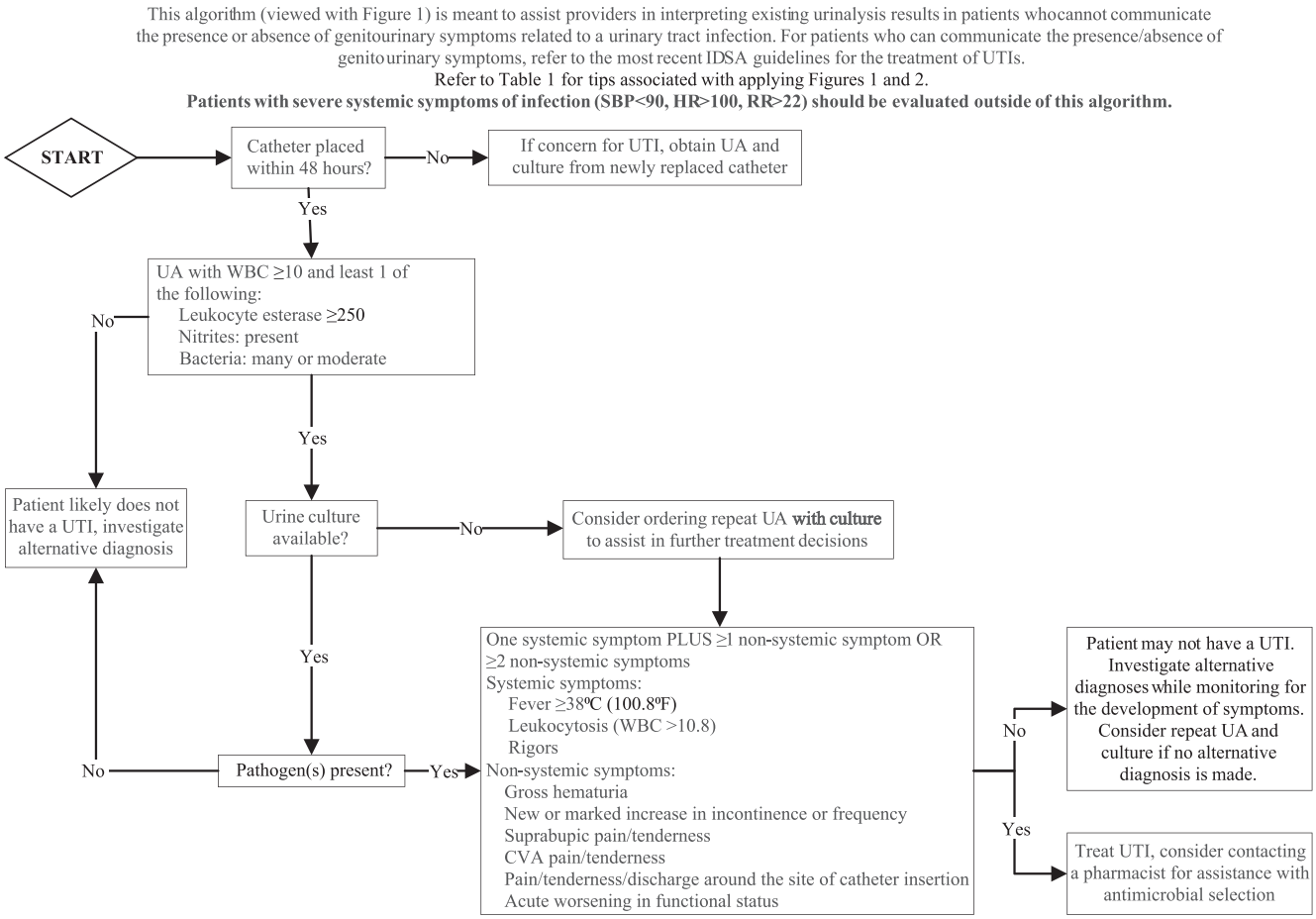

FIGURE 2: Urinary tract infection (UTI) algorithm for patients with indwelling catheter (CVA = costovertebral angle; IDSA = Infectious Diseases Society of America; UA = urinalysis; WBC = white blood cells)

patients with neurocognitive disorders and other patients with a potential communication barrier, such as patients with intellectual disability and autism spectrum disorder. Pharmacists then performed a literature search through PubMed, specifically looking for publications regarding the diagnosis of UTI in these populations; however only a small number of publications[2-6] reported validated symptoms of UTI that do not rely on direct patient report.

Upon further discussion with inpatient psychiatric providers and the Pharmacy & Therapeutics Committee Anti-Infective Subcommittee, it became apparent that an algorithm should be as comprehensive as possible by including general information related to UTI diagnosis and treatment, not just symptoms related to UTI. This prompted the inclusion of UA interpretation, urine culture ordering procedures, and detailed treatment recommendations for cystitis and pyelonephritis. All of the aforementioned components were described for patients with and without an indwelling catheter as there are notable differences related to appropriate sample collection, symptoms, and treatment for patients with an indwelling catheter.

Detailed Algorithm Components

Exclusion From Algorithm Use

Because of concern that decreasing antibiotic use may lead to increased rates of severe infections such as bacteremia and urosepsis, we included symptoms that would exclude patients from being evaluated with this algorithm. In discussion with emergency medicine and infectious disease providers, we concluded that symptoms consistent with Systemic Inflammatory Response Syndrome criteria should warrant a broader infective workup.[8] This decision was based on the common use of Systemic Inflammatory Response Syndrome criteria by our emergency medicine physicians as well as relative ease of use.

Urinalysis Collection and Interpretation

The second step of the algorithm included guidance for ensuring appropriate UA collection and interpretation. We first provided clarification that a high number of squamous cells (>5) within a noncatheter indwelling UA or a sample taken from an indwelling catheter placed >48

TABLE 1: Tips for urinary tract infection algorithm use

Tips for Use

- Patients with severe systemic symptoms require further infective work-up and should be evaluated outside of this algorithm
- Immunocompromised patients should be evaluated outside of this algorithm
- In geriatric patients, fever is defined as >2°F increase from baseline, rectal temperature >99.5°F (37.5°C), or other reading >100°F (37.8°C)
- Pain should be considered positive if grimacing, retracting, or other non-verbal markers of pain are present on physical exam
- Pyelonephritis should be considered in patients with systemic symptoms and/or costovertebral angle pain/tenderness

Cystitis Treatment Options

- Begin empiric treatment and adjust based on culture results:
  - Nitrofurantoin 100 mg BID CrCl >60 mL/min
  - Cefuroxime 500 mg BID CrCl >30 mL/min
  - Cefuroxime 250 mg BID CrCl 29-10 mL/min
  - Cefuroxime 250 mg daily CrCl <10 mL/min
- Duration of therapy:
  - Uncomplicated 5 d
  - Complicated 7 to 14 d depending on symptom resolution

Pyelonephritis Treatment Options

- Begin empiric treatment and adjust based on culture results
- All patients should receive an initial dose of ceftriaxone 1 g intravenously followed by:
  - Cefuroxime 500 mg BID CrCl >30 mL/min
  - Cefuroxime 250 mg BID CrCl 29-10 mL/min
  - Cefuroxime 250 mg daily CrCl <10 mL/min
- Duration of therapy: 14 d

BID = twice daily; CrCl = creatinine clearance.

hours from the time of sample collection increase the likelihood of contamination and should not be used in the diagnostic workup.[9] Unfortunately, there is a lack of consensus on an abnormal range for each UA component and how many components of the UA need to be abnormal for that sample to indicate infection. We worked closely with urology providers and the microbiology lab to determine cutoffs that were appropriate and easily applied to current institutional practices. The infectious disease group felt strongly that pyuria (>10 WBCs) was required for diagnosis in addition to 1 other component that indicated infection, such as nitrites, bacteria, or leukocyte esterase.

At our institution, UAs do not automatically reflex to a urine culture, requiring providers to place 2 separate orders. This has led to antibiotics being initiated in patients from whom a urine culture was never collected. Thus, we suggested ordering a urine culture prior to antibiotic initiation if one has not yet been ordered. Additionally, the numeric cutoff for colony forming units that indicate infection is not standardized within our institution, so we chose to omit a specific number but rather provided guidance that in a noncatheterized sample, 3 or more separate pathogens is likely indicative of contamination rather than bacteriuria.[9]

TABLE 2: Urinary tract infection symptom criteria[a]

Systemic	• Fever[b] • Leukocytosis • Rigors
Nonsystemic	• Gross hematuria • New or increase in incontinence or urinary frequency • Suprapubic pain/tenderness[c] • Costovertebral angle pain/tenderness[c] • Acute worsening in functional status

[a]In order to meet diagnostic criteria, patients must have at least 1 systemic AND one nonsystemic symptom OR at least 2 nonsystemic symptoms in the absence of systemic symptoms.

[b]In geriatric patients, fever can be defined as >2°F increase from baseline temperature, rectal temperature >99.5°F (37.5°C), or other reading >100°F (37.8°C).

[c]Pain should be considered positive if grimacing, retracting, or other nonverbal markers of pain are present on physical exam.

Included Symptoms

The McGeer Criteria[10] for infection surveillance in long-term care facilities were first proposed in 1991 and include guidance for UTI diagnosis. Based on the increase in available literature and changing demographics of long-term care facilities, Stone and colleagues[5] published an update to the McGeer Criteria in 2013. In addition to providing detailed criteria to diagnose a UTI, the authors specifically note that altered mental status, changes in urine characteristics, and falls are not sufficient for diagnosis. The Centers for Medicare and Medicaid[4] include an acute change in mental status or functional status, in addition to at least 2 other symptoms as an indication to treat a UTI. Interdisciplinary collaboration occurred with members of the Anti-Infective Subcommittee of our Pharmacy & Therapeutics Committee to determine appropriate symptoms to include in the algorithm. Symptoms were selected based on the clinical experience and opinions of physicians and pharmacists serving in that subcommittee with a focus on including symptoms that are indicative of UTI and would not rely upon patient report. Based on the results of our literature analysis and interdisciplinary consensus, we determined the symptom criteria listed in Table 2 would be sufficient to initiate empiric antibiotic therapy. It is important to note that many of these symptoms are consistent with identifiable genitourinary symptoms in patients who can readily communicate; however, in patients with a communication

barrier, symptom assessment relies more heavily on collateral from caregivers and physical exam findings. For example, to assess increased frequency or incontinence, providers were educated to ask caregivers about changes in behaviors (ie, getting up more frequently at night may indicate frequency) or an increased use of incontinence supplies. Suprapubic and costovertebral pain or tenderness can be interpreted as guarding, grimacing, retraction, or vocalization upon palpation.

Treatment Recommendations

Through collaboration with antimicrobial stewardship and infectious disease providers as well as consideration of the current IDSA recommendations, we suggested appropriate empiric antibiotic treatment selections for uncomplicated and complicated cystitis and pyelonephritis.[9] Of note, the antibiotics listed are specific to our institution's current antibiogram and formulary options.

Algorithm Implementation

Prior to implementation, the algorithm was approved by the Pharmacy Practice Committee and Anti-Infective Subcommittee of the Pharmacy & Therapeutics Committee. At our institution, patients with psychiatric complaints are initially seen in the medical emergency department (ED) where basic labs (often including a UA) are collected prior to transferring to the psychiatric ED. Once in the psychiatric ED, providers determine the need for psychiatric admission as well as interpret the laboratory data collected in the medical ED including UAs and determining the need for antibiotics. Given that nearly all patients admitted to a psychiatric service receive initial care in the psychiatric ED, the algorithm was implemented in this area to assess impact prior to further expansion. Implementation included a brief educational slide-set presented to all providers who would be working in the psychiatric ED within the postintervention period. Education focused on content of the algorithm as well as general education related to treating UTIs, including the importance of not treating ASB, the current institutional antibiogram, and in-depth empiric antibiotic recommendations. The education occurred as multiple presentations through January 2019, and algorithm implementation was completed on January 31, 2019. The algorithm was also uploaded to an online file-sharing system and posted in the provider workroom.

Discussion

Creation of a detailed algorithm to aid in the diagnosis and treatment of UTI in patients with a communication barrier required extensive interdisciplinary collaboration within our institution. It was important to identify and involve key stakeholders early in the creation process to ensure all experts in the field agreed with each component of the algorithm prior to implementation. Additionally, limiting the initial implementation to a small area within inpatient psychiatry allowed us to provide thorough guidance to a subset of providers and assess and triage any difficulties early on.

We encountered many difficulties while creating and implementing this algorithm. Because of the limited existing recommendations, many of the symptoms were included based largely on discussions with an interdisciplinary clinician group, weighing which symptoms will likely be present and can be elicited without patient communication. Additionally, the project was time consuming, taking approximately 5 months for algorithm creation and approval with an additional month dedicated to implementation. Part of this may be due to the project being an additional responsibility added the normal workload of the 2 pharmacists tasked with creation.

There are also limitations of applying this algorithm that must be acknowledged. As mentioned above, most recommendations including symptoms and UA criteria are based on clinical experience and opinion. Additionally, all antibiotic recommendations are based on our institution's most recent antibiogram and formulary, limiting external generalizability of this information. It is important to note that the authors are not suggesting this algorithm be used outside of our institution, but rather demonstrating the process of creating and implementing an algorithm such as this.

Despite the limitations listed above, overall, providers were receptive to and appreciative of a comprehensive resource to address a commonly encountered and difficult clinical situation. The psychiatric providers who received formal training were quick to accept the algorithm as part of their workflow, often citing the algorithm in progress notes to justify their decision to withhold empiric antibiotic therapy. The authors of this manuscript are performing a preintervention and postintervention analysis in hopes of publishing the impact of the algorithm within our institution.

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