Clinical Practice Guideline by Infectious Diseases Society of America (IDSA): 2025 Guideline on Management and Treatment of Complicated Urinary Tract Infections: Duration of Antibiotics for Complicated UTI

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In patients presenting with complicated UTI (cUTI) with a clinical response to therapy, should total duration of antibiotics be prolonged to >7 days rather than shorter (<=7 days)?

Recommendations:

I. In patients presenting with complicated UTI (including acute pyelonephritis) and who are improving clinically on effective therapy, we suggest treating with a shorter course of antimicrobials, using either 5-7 days of a fluoroquinolone (conditional recommendation, moderate certainty of evidence) or 7 days of a non-fluoroquinolone antibiotic (*conditional recommendation, very low certainty of evidence*), rather than a longer course (10-14 days).

Definitions:

- An effective antimicrobial agent achieves therapeutic levels in the urine and relevant tissue and is active against the causative pathogen.
- The duration of therapy is counted from the first day of effective antibiotic therapy.

Comments:

- Most studies supporting this recommendation excluded patients with indwelling urinary catheters, severe sepsis, immunocompromising conditions, abscesses in the urinary tract, chronic kidney disease, bacterial prostatitis, complete urinary obstruction, or undergoing urologic surgical procedures. Some patients in these subpopulations may be at higher risk for complications or treatment failure and may need an individualized duration of therapy.
- Men with febrile UTI in whom acute bacterial prostatitis is suspected may benefit from a longer treatment duration (i.e., 10-14 days), although evidence to guide the optimal duration in this subgroup is lacking.
- This recommendation is driven by evidence from trials that primarily studied fluoroquinolones during a time when fluroquinolone resistance was less common. Evidence for short courses of oral beta lactams in cUTI is more limited, and higher doses may be required for efficacy.
- Consider evaluation for an ongoing nidus of infection requiring source control in patients who do not have prompt clinical improvement.
- This recommendation places a high value on antibiotic stewardship considerations as well as reducing the burden of antimicrobial administration from a healthcare perspective and reducing the burden of taking antibiotics from a patient perspective.
- Refer to **Figure 1.3 for a stepwise assessment of the intravenous to oral switch and the duration of antibiotic therapy.**

II. In patients presenting with complicated UTI with associated Gram-negative bacteremia and who are improving clinically on effective therapy, we suggest treating with a shorter course (7 days) of antimicrobial therapy rather than a longer course (14 days) (*conditional recommendation, low certainty in the evidence*).

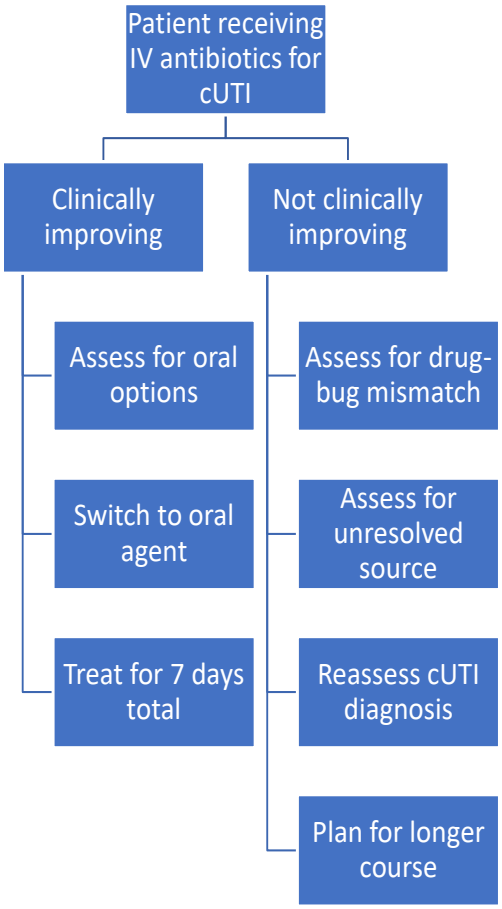
Definitions:

- An effective antimicrobial agent for bacteremic patients means that the antibiotic achieves therapeutic levels in the bloodstream, urine, and relevant tissue and is active against the causative pathogen.
- The duration of therapy is counted from the first day of effective antibiotic therapy.

Comments:

- Men with febrile, bacteremic UTI in whom acute bacterial prostatitis is suspected may benefit from a longer treatment duration (i.e., 10-14 days), although evidence to guide the optimal duration in this subgroup is lacking.
- Consider evaluation for an ongoing nidus of infection requiring source control in patients who do not have prompt clinical improvement.
- This recommendation places a high value on antibiotic stewardship considerations as well as reducing the burden of antimicrobial administration from a healthcare perspective and reducing the burden of taking antibiotics from a patient perspective.
- Refer to **Figure 1.3** for a stepwise assessment of the intravenous to oral switch and the duration of antibiotic therapy.

Figure 1.3: Stepwise assessment of IV to oral switch and duration of antibiotic therapy



Abbreviations: IV=intravenous, cUTI=complicated UTI. Drug-bug mismatch means that the causative organism is not susceptible to the antibiotic prescribed.

Introduction

The duration of therapy is important for antibiotic stewardship and has relevance to patients' wellbeing. Although it is unclear whether shortening an antibiotic course from 14 to 7 days has a meaningful impact on the individual's microbiome,[1] broader societal concern to reduce overall antibiotic use remains a priority.[2] Many studies show that infections are often treated for longer than guidelines recommend, and evidence demonstrates that each additional day of antibiotics increases the risk of patient harm, particularly in terms of adverse effects, and can negatively impact patient well-being.[3-5] These risks to individuals are further compounded by the public health concern of increased selection for and transmission of multidrug resistant organisms. Both IDSA guidelines on establishing antibiotic stewardship programs[6] and the CDC Core Elements of Hospital Antibiotic Stewardship Programs[7] recommend implementing strategies to reduce antibiotic therapy to the shortest effective duration.

Summary of evidence

Our systematic review of the literature (spanning from January 2000 up to September 2023) identified ten randomized, controlled trials comparing treatment with short duration (less than or equal to seven days) with longer duration of antimicrobial therapy (greater than seven days) for adults with complicated UTI.[8-17]

Studied populations and clinical settings: These ten trials enrolled and randomized a total of 2,945 patients, of which 2,681 were further described and analyzed. The timeframe for enrollment spanned from October 1994 up to April 2019. Trials were performed in North America (Darouiche 2014, Peterson 2008, Talan 2000),[8-10] Europe (Dinh 2017, Sandberg 2012, van Niewkoop 2017, Wagenlehner 2018, Lafaurie 2023),[11-15] and Asia (Ren 2017, Rubrabhatla 2018).[16,17] The settings for enrollment varied, with some trials enrolling only outpatients who presented to a primary care clinic or the emergency department,[10,14,15] some enrolling both outpatients and hospitalized patients,[9,11,13,17] and others exclusively enrolling patients who had been hospitalized for cUTI.[12,16] One of the ten trials enrolled hospitalized patients with spinal cord injury and an indwelling urinary catheter.[8]

Most studies enrolled both adult males and females,[8,9,12,13,16,17] while three trials included only adult women,[10,12,14,15] and one only included adult men.[11] Across all ten trials, a total of 909 males (33.9%) and 1,772 females (66.1%) were studied.

The clinical distinctions between uncomplicated pyelonephritis, complicated pyelonephritis, febrile UTI, and complicated UTI are not standardized or clearly understood from a pathogenesis point of view. Not surprisingly, several studies that included patients with both pyelonephritis and other types of cUTI did not specify how many patients fell into each category of infection. All studies included patients with a presumptive or confirmed diagnosis of cUTI as defined by these guidelines (which includes acute uncomplicated pyelonephritis). Two trials included only women with acute uncomplicated pyelonephritis, excluding other forms of complicated UTI.[10,15] Definitions of cUTI varied widely between trials and were not always clearly specified. For example, van Nieuwkoop et al. required symptoms of UTI with fever and a positive urine nitrite test or pyuria,[13] while Sandberg et al. required only presence of a urinary

symptom plus fever.[14] Peterson et al. enrolled patients with a diagnosis of either acute pyelonephritis or complicated UTI, but the definitions for these two conditions were not clear.[9]

The organism causing the cUTI was *Escherichia coli* in the majority of cases. Of the nine trials reporting on causal uropathogens,[9-17] the organism most frequently identified was *Escherichia coli* (1,202/1,604 (74.9%), median of 84.2%, ranging from 36.9% to 97.7% between studies).

Exclusion criteria varied greatly between studies. Studies excluded patients with indwelling urinary catheters, with the exception of three trials.[8,9,13] The subpopulation of patients with urinary catheters comprised only 5-7% of the overall population included in our meta-analysis. Eight of the studies excluded patients who presented with severe sepsis or septic shock, while two trials included this sicker population.[9,13] Immunosuppression was a reason for exclusion, except for two trials.[9,13] Features used to define immunosuppression included neutropenia, transplant recipient, advanced cirrhosis, and receiving >20 mg/day of corticosteroids. Patients with severe chronic kidney disease, on renal replacement therapy or with acute prostatitis were excluded from most studies (except van Niewkoop 2017 and Lafaurie 2023).[11,13] Overall, only a small number of patients within the total cohort had indwelling catheters, severe sepsis on initial presentation, immunocompromised status, chronic kidney disease, or acute bacterial prostatitis.

The majority of studies formally excluded patients with suppurative or chronic infections of the urinary tract, such as renal abscesses, chronic pyelonephritis and chronic bacterial prostatitis. Patients with complete urinary obstruction or recent urinary instrumentation, surgery, or lithotripsy were excluded. Additionally, pregnant and lactating women were excluded. Overall, the evidence identified to address the question of duration of treatment for cUTI did not include these subpopulations.

Comparisons Studied: The trials included in this evidence base compared either a 5-day course of antibiotics against 10-day course[8,9,12,15] or a 7-day course of antibiotics against 14-day course,[10,11,13,14,16] except for one study which compared 5 to 7-14 days of two different doses of levofloxacin.[17]

The majority of included trials addressed duration of fluoroquinolone therapy. Five of these trials examined the effect of a shorter versus longer duration of fluoroquinolone therapy,[9,12,14,15,17] while two trials permitted the use of a non-fluoroquinolone regimen in hospitalized patients before switching to an effective fluoroquinolone as soon as the results of urine culture became available, for 7 versus 14 days total therapy.[11,13] Talan et al. (2000) compared 7 days of ciprofloxacin to 14 days of trimethoprim-sulfamethoxazole in 255 women with acute pyelonephritis.[10] Only one small trial studied duration of therapy with two non-fluoroquinolone regimens, in the context of a very high fluoroquinolone resistance rate (about 78% of *E. coli* isolates were resistant to ciprofloxacin).[16] Ceftriaxone and amikacin were the antibiotics used most often in this trial. The Darouiche et al. trial (2014) studied 5 versus 10 days of antibiotics in 61 persons with spinal cord injury and indwelling catheters.[8] Antibiotic regimens were not specified by the study protocol, and 30% of patients received a

fluoroquinolone. In summary, 8 of the 10 trials specified fluoroquinolone use in one or both arms of the trial.

Many of these trials were conducted before widespread emergence of resistance to fluoroquinolones. Most trials studying the optimal duration of therapy using fluoroquinolones either avoided randomizing patients with fluoroquinolone-resistant uropathogens[11,13] or withdrew them from the analysis after randomization.[14,15] Two of the three trials that did not systematically exclude this subpopulation reported fluoroquinolone resistance rates of uropathogens varying from 9% to 16%.[9,12] Enrollment was completed in the most recent of these trials in 2014. The trial which compared a fluoroquinolone to trimethoprim-sulfamethoxazole was performed in 1994-1997 (Talan et al., 2000).[10] *Escherichia coli* was the causative pathogen in 93% of these cases of acute pyelonephritis, with resistance rates of 0% to ciprofloxacin and 18% to trimethoprim-sulfamethoxazole.

Two of these trials provided only indirect evidence on the effect of shorter duration of therapy since their results may have been influenced by another simultaneous intervention in addition to different durations of therapy. The Darouiche et al. study (2014) compared a 5-day course therapy plus urinary catheter exchange vs a 10-day course of therapy without catheter exchange in patients with spinal cord injury and long-term indwelling urinary catheters, so the two arms differed in catheter exchange in addition to duration of therapy.[8] Talan et al. (2000) compared a 7-day course of a fluoroquinolone to a 14-day course of trimethoprim-sulfamethoxazole in women with acute uncomplicated pyelonephritis, so the two arms differed in terms of antibiotic given as well as duration.[10] See the supplementary material (Characteristics of the studies).

Study design and risk of bias: All studies but one[12] consisted of non-inferiority trials, with a predefined non-inferiority margin varying from 10% to 15%. Most trials randomized patients at diagnosis (prior to any clinical assessment) except for Rhudrabhatla et al. (2018) in which patients needed to have improved clinically to be randomized (eligible patients should have clinically improved following empirical or culture-guided antibiotic treatment and should be afebrile for >48 hours at the time of randomization).[16] Most trials simply assessed clinical improvement as part of their primary outcome for clinical cure.

Four trials were open-label studies, meaning that participants, healthcare workers, and outcome assessors were not blinded to the treatment arms.[8,15-17] Unblinded studies can affect the outcomes that require judgment, such as how clinical improvement or adverse events are measured and interpreted, thus potentially introducing detection and/or performance bias.

Results of multiple trials may have been influenced by incomplete outcome data due to exclusion after randomization (e.g., early withdrawal secondary to the lack of a confirmatory positive urine culture or presence of an uropathogen showing resistance to the investigational drug).[8-10,14,15] Unfortunately, the full extent of this potential attrition was not completely assessable in most studies, and attrition could reduce sample size without introducing bias. The three studies funded by industry may also have been biased due to potential financial conflict of interest.[9,10] Two studies showed evidence of potentially failed randomization.[8,11] See the supplementary material (Cochrane Risk of Bias).

Studied outcomes: The patient-important outcomes which were considered critical for decision-making included clinical cure at end of therapy (EOT) or at the first follow up after EOT and recurrence of infection (up to a maximum of 180 days). Other outcomes that were considered important for decision-making were microbiologic cure, serious adverse events, non-serious adverse events, length of hospital stay, and readmission rate. While most trials reported on these outcomes, only two studies reported on readmission/rehospitalization rate,[13,16] and only one reported on length of hospital stay.[16]

Microbiological failure (post-treatment asymptomatic bacteriuria) is frequently considered a surrogate marker for recurrence of infection. Since recurrence of infection was already included in our analysis as a critical outcome for decision-making, the panelists and the patients considered microbiologic cure as important but not critical for decision-making.

Benefits, Harms, and Certainty of the Evidence (CoE)

Benefits and harms: Overall, a shorter course of treatment likely does not reduce clinical efficacy or increase recurrence of infection, but a shorter course may not reduce adverse events.

Treatment with a shorter course of antimicrobial therapy in patients with cUTI likely does not reduce clinical cure (at TOC) (risk difference or RD: 0%; 95% CI: -2.6% to 3.5% / relative risk or RR:1.00; 95% CI: 0.97 to 1.04; moderate CoE) and may not reduce microbiological cure (at TOC) (risk difference or RD: -0.8%; 95% CI: -5.1% to 4.2% / relative risk or RR:0.99; 95% CI: 0.94 to 1.05; low CoE) as compared to patients treated with a longer course.

Shorter duration of therapy likely does not increase recurrence of infection (up to 180 days of follow-up) (RD: 0.5%; 95% CI: -2.1% to 4.5% / RR:1.07; 95% CI: 0.69 to 1.65; moderate CoE). The evidence suggests that shorter therapy may not increase readmission/rehospitalization during follow-up (RD: 0%; 95% CI -0.7% to 6.9% / RR: 0.99; 95% CI: 0.10 to 9.33; low CoE).

A shorter course of antimicrobial therapy might have reduced the length of hospital stay in the only study that looked at this outcome (median 8 days vs. 14 days, absolute reduction of 6 days, $p<0.001$; very low CoE). However, length of hospitalization was likely influenced by the route of administration of antimicrobials, as all patients received parenteral antibiotics throughout this study for the assigned duration in the hospital, without switching to an oral option.[16]

The evidence provided by the ten included trials suggests that shorter course of antimicrobial therapy results in little to no reduction in serious and non-serious adverse events in these trial populations during follow- (RD: -0.6%; 95% CI: -1.6% to 0.9% / RR: 0.82; 95%CI: 0.54 to 1.25; low CoE, and RD: -2.3%; 95% CI: -6.0% to 2.0% / RR: 0.92; 95% CI: 0.79 to 1.07; low CoE, respectively).

Other supporting evidence on harms: A recently published review included 71 randomized, controlled trials published between 1972 to 2016 on various fixed duration of antibiotics

(between 3 and 15 days) for different types of infections (of which 29 studies looked at UTI more specifically).[3] This meta-analysis found that each additional day of antibiotic therapy is associated with an increased odds of experiencing adverse events (OR 1.04; 95% CI: 1.02 to 1.07) and severe adverse events (OR 1.09; 95% CI: 1.00 to 1.19), but not of superinfection (such as *C. difficile* and candidiasis) and antimicrobial resistance.

Certainty of Evidence: The panel agreed on the overall certainty of evidence for treatment with a short course compared to a longer course of treatment as being moderate, mainly due to concerns with the risk of bias. Given that shorter course of treatment: (1) likely does not reduce clinical efficacy, (2) probably does not increase recurrence of infection or readmission/rehospitalization, and (3) may reduce length of hospitalization, the panel recognized the benefit of a shorter course of treatment. The shorter course of treatment may not reduce adverse events compared to the longer course. See the supplementary material (Evidence Profile Table).

Special Populations and Special Situations

Choice of antibiotics

Fluoroquinolone antibiotics: Seven out of 10 studies compared shorter to longer course of fluoroquinolone therapy in patients with cUTI (including pyelonephritis).[9,11-15,17] Our stratified analysis focusing on fluoroquinolone therapy showed that treatment with a shorter course of fluoroquinolone likely does not reduce clinical cure (at TOC) (RD: -1.8%; 95% CI: -3.5% to 0.9% / RR:0.98; 95% CI: 0.96 to 1.01; moderate CoE) and may not reduce microbiological cure (at TOC) (RD: -1.7%; 95% CI: -5.9% to 2.5% / RR:0.98; 95% CI: 0.93 to 1.03; low CoE). Furthermore, shorter therapy likely does not increase recurrence of infection (up to 90 days of follow-up) (RD: -0.5%; 95% CI: -2.8% to 3.2% / RR:0.93; 95% CI: 0.58 to 1.49; moderate CoE) and may not increase readmission/ rehospitalization during follow-up (RD: -0.5%; 95% CI: -1.4 to 0.5% / RR: 3.00; 95%CI: 0.1 to 72.7; low CoE). See the supplementary material (Evidence Profile Table).

Non-fluoroquinolone antibiotics: One trial directly compared shorter versus longer duration of non-fluoroquinolone antibiotics. The evidence from this one trial suggests that shorter duration of antibiotics may not lead to reduced clinical or microbiological cure, or to more recurrence of infection or readmission, but these estimates are very uncertain (very low CoE) due to the very small number of patients enrolled in this trial (54 patients).[16] Patients who received the shorter course of antibiotics possibly had a shorter length of hospitalization as compared to those treated with longer duration. Patients in this trial were primarily treated with aminoglycosides; 78% of the *E. coli* isolates collected from patients in this trial were resistant to fluoroquinolones. See the supplementary material (Forest plots).

Furthermore, trials of three days of beta-lactam antibiotics for acute cystitis in women (cefpodoxime, amoxicillin-clavulanate, cefadroxil, and amoxicillin) consistently found lower clinical and microbiologic cure in the beta-lactam recipients, in comparison to three days of ciprofloxacin or trimethoprim-sulfamethoxazole.[18,19] These trials provide indirect evidence that

beta-lactams are not as effective for acute cystitis when used for the same duration as other classes of antibiotics; whether these results are generalizable to the necessary duration of beta-lactam antibiotic to treat complicated UTI is unknown. Another concern with treating cUTI with oral beta-lactam antibiotics is that standard dosing may not achieve adequate levels in the urine. For example, a retrospective cohort study found that 7 days of IV or highly bioavailable antibiotics was as effective as 14 days of antibiotic therapy for bacteremic cUTI; of note, the doses of beta-lactams considered to be bioavailable were the following: amoxicillin 1000 mg orally every 8 hours, amoxicillin-clavulanate 875–1000 mg orally every 8 hours, or cephalexin 1000 mg orally every 6 hours.[20] Increasingly institutions are using higher dose regimens for oral beta-lactams and cephalosporins as step down therapy for Gram-negative bacteremia of urinary origin.[21,22]

Presence of bacteremia

Complicated UTI is frequently accompanied by bacteremia, although the prevalence of bacteremia is difficult to specify as populations and definitions of cUTI vary across studies. Our systematic review of the literature identified three trials that performed post-hoc analyses stratifying for subgroup of patients presenting with cUTI with or without bacteremia.[10,13,14] Although the analysis of these post-hoc analyses did not show a reduction in clinical cure at TOC between shorter and longer course of treatment, this analysis only included a very small subgroup of each of the initial three cohorts, which thus brought serious concerns regarding risk of bias (selection bias) and imprecision (very small sample size, n=91). These issues undermine the certainty of this finding when making inferences on efficacy of short course of antibiotics among bacteremic patients. Similar results were reported in a previously published meta-analysis including randomized, controlled trials published between 1988-2012 on duration of therapy for pyelonephritis (only including 86 of 2,515 patients with bacteremia).[23]

We found additional evidence about how to manage bacteremic cUTI from randomized, controlled trials of duration of therapy for Gram-negative bacteremia arising from multiple infectious etiologies. Three recently published randomized, controlled trials compared 7 versus 14 days of antibiotics to treat uncomplicated Gram-negative bacteremia in patients who were on antibiotic therapy, afebrile, hemodynamically stable, and with appropriate source control.[24-26] Source control in the context of cUTI was defined as relief of urinary obstruction, if present. None of the studies were focused on cUTI, but between 55% to 68% of patients in these studies had a urinary source of bacteremia. Antibiotics given in these studies were drawn from multiple classes. A recent meta-analysis of these three trials pooled the results of post-hoc analyses for cUTI patients.[24] The meta-analysis showed that shorter duration was not associated with an increase in relapse of bacteremia, mortality at 30 or 90-days, or readmission in patients with cUTI. Unfortunately, some uncertainty in these estimates remains due to the inherent nature of these post-hoc analyses and the lack of blinding.

Post hoc analysis of one of these three RCTs showed inferiority of the 7-day treatment in the 173 males with UTI and bacteremia included in this cohort, although the trial excluded men with known prostatitis.[24,27] In these 173 men, 24% of the 7-day treatment group, and 37% of the 14-day treatment group had an indwelling urinary device (urinary catheter, nephrostomy tube, or double J catheter). The difference in the primary composite outcome (which included all-cause

mortality; relapse, suppurative, or distant complications; and readmission or extended hospitalization over 14 days) between the two groups (RD: 6.2%; 95%CI: -8.6% to 21.2%) was driven primarily by a higher rehospitalization rate in the 7-day treatment group (RD: 4.5%; 95%CI: -10.2% to 19.3%). Whether this post hoc analysis limited by a small sample size from a single trial should guide management of men with cUTI and bacteremia is unclear.

A recent trial added evidence in support of our recommendation. The BALANCE trial randomized 3,608 hospitalized patients with bacteremia to 7 versus 14 days of antibiotics (IV or oral); the majority of the patients had a Gram-negative organism, and 42% had a urinary source of bacteremia. The shorter duration of therapy was non-inferior to the longer duration of antibiotic therapy for the primary outcome of death within 90 days, both overall and in the subgroup of patients with bacteremia from a urinary source (risk difference -1.9% with 95% CI -5.2 to 1.4), which provides support for our recommendation.[28]

Males with cUTI

Across all 10 trials, seven enrolled men, including a total of 909 men with cUTI or pyelonephritis. Of these seven trials, only two (van Nieuwkoop FUTIRST 2017 and Lafaurie PROSTASHORT 2023) could provide data for a stratified analysis of outcomes in men with cUTI, covering 326 men (36% of the men included in these seven trials).[11,13] In both of these studies, men were not systematically screened with rectal examination and *were not excluded if suspected of having acute prostatitis*. Of note, this analysis does not include 583 men who are represented in other studies presented here, because we could not obtain stratified information from the authors of these studies based on male sex/gender. The stratified analysis that follows is thus based on these two trials but does not include the larger population of men who were enrolled in the other five trials; in these five trials the overall clinical outcomes of shorter and longer duration of therapy for cUTI were comparable.

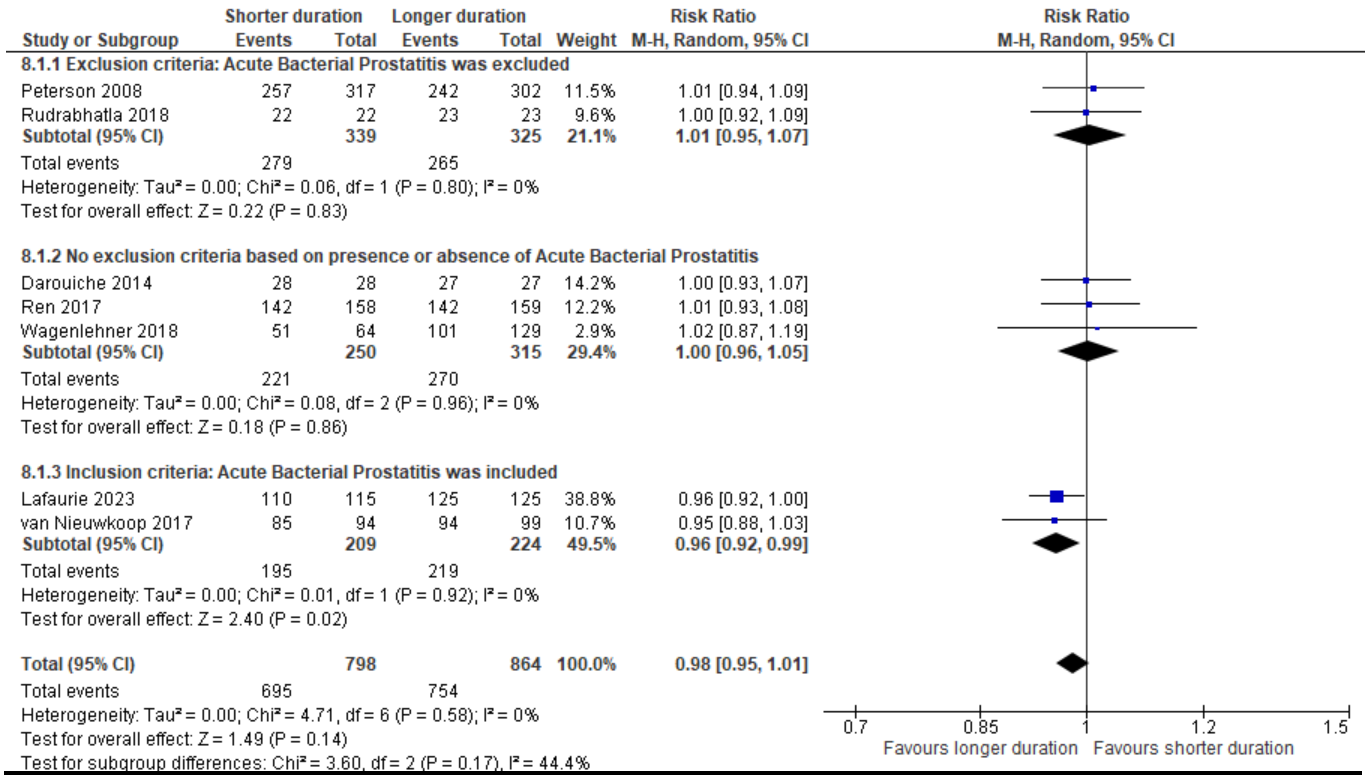
Based on our pre-determined decision threshold (non-inferiority margin) of 10% for clinical and microbiological cure, the evidence suggests that a shorter course of antimicrobial therapy in men with febrile UTI from these two trials [11,13] may decrease clinical cure (up to 6 weeks after starting therapy) (RD: -6.1%; 95% CI: -12.7% to 4.1% / RR: 0.94; 95% CI: 0.87 to 1.01; very low CoE) as well as microbiological cure (at TOC) (RD: -14.5%; 95% CI: -23.1% to -5.9%/ RR: 0.85; 95%CI: 0.76 to 0.94; very low CoE), but this evidence is very uncertain due to the high risk of bias in these studies and the small sample size (N= 326). In terms of risk of bias, in the larger study the men in the shorter course group had more comorbidities, thus randomization may have failed.[11]

The subgroup of men with acute prostatitis in these studies may be driving the conclusion that shorter course therapy is not non-inferior for febrile UTI in men (**Supplementary Table 6:** Studies of duration of treatment for cUTI including men). This point about prostatitis is important, so we have illustrated it with both a table (**Supplementary Table 6**) and a Forest plot (**Figure 2.3**). Lafaurie et al. (2023)[11] provided data on a subgroup of 27 patients suspected of having acute prostatitis on rectal examination (personal communication), and this analysis showed a non-significant reduction in clinical cure with shorter course of antimicrobial therapy

was observed (RD: -20.0%; 95% CI: -51.7% to 11.8% / RR: 0.77; 95% CI: 0.49 to 1.20). Recurrence of infection (up to 12 week of follow-up) was comparable between groups (RD: -2.4%; 95%CI: -7.7% to 2.8% / RR: 0.50; 95%CI: 0.10 to 2.49) but this evidence was based on a very small number of patients from only one study and might have been influenced by a higher rate of lost-to-follow-up in the short course group.[11]

Detection of a painful prostate on rectal examination is probably the most practical way to diagnose acute prostatitis. In current clinical practice, digital rectal examination is rarely done in men with UTI, and the diagnostic accuracy of the digital rectal examination for prostatitis is not well defined.[29] Acute prostatitis may have a spectrum of severity, in which most men with febrile UTI have some early degree of prostate involvement, as marked by elevated prostate specific antigen, but only in a few of them does the entire gland become infected and inflamed.[30]

Figure 2.3: Subgroup analysis of the impact of prostatitis on effectiveness of shorter versus longer treatment duration for cUTI: Forest plots for clinical cure (n=7 trials, 2000-2024). In these Forest plots the trials are groups by whether the eligibility criteria for enrolling males assessed the presence/absence of acute bacterial prostatitis and either did or did not exclude men if prostatitis was suspected. Trials that did not comment on presence or absence of prostatitis in men are grouped under "No exclusion criteria based on the presence or absence of acute bacterial prostatitis."



Patients with indwelling catheters

Our systematic review of the literature only included one trial that compared duration of therapy in UTI associated with indwelling urinary catheters,[8] and this was a study exclusively in hospitalized patients with spinal cord injury. Two other trials included some patients with indwelling catheters.[9,13] Generalizability of our meta-analysis to patients with indwelling catheters is unclear due to the limited data and the unique characteristics of the population.

Other considerations

Stewardship considerations

In general, shorter courses of antibiotics reduce complications, and reduce pressure for resistance as well as reduce adverse outcomes.[31] Risk of superinfection (secondary infection with another organism) and resistance increases substantially with extended duration of therapy,[3] and *C. difficile* superinfection risk is clearly extended with antibiotics.[32] A meta-analysis which included 35 systematic reviews reported that each day of antibiotic therapy was associated with 4% increased odds of experiencing an adverse event and a 3% increased odds of development of antimicrobial resistance.[3]

Reducing the duration of therapy to the shortest effective course is therefore very important to antibiotic stewardship. Both IDSA guidelines on establishing antibiotic stewardship programs and the CDC Core Elements of Hospital Antibiotic Stewardship Programs recommend implementing strategies to reduce antibiotic therapy to the shortest effective duration.[6,7] A narrative review of over 120 randomized clinical trials showed that shorter-course therapy was as effective as longer-course therapy for a variety of infections, although the durations and types of infections treated were heterogeneous.[33] Many studies show infections are often treated for longer than guidelines recommend, and evidence demonstrates that each additional day of antibiotics increases the risk of patient harm.[4,5] These risks to individuals are further compounded by the public health concern of increased selection for and transmission of multidrug resistant organisms. Furthermore, providing patients with longer courses of oral antibiotics has the practical concern of creating more opportunities for patients to store leftover antibiotics at home, if they do not take the entire prescribed course.[34]

Patients' values and preferences

There is little direct evidence addressing antibiotic duration in cUTI and patient well-being. Consultation with patient representatives participating in this guideline revealed a

disconnect between stewardship goals (shorter is better) and their desire to avoid chronic urinary symptoms (longer is better). Several of our patient representatives suffer from chronic UTI symptoms, and their experience may be representative of a subpopulation that is most severely affected by UTI. Our recommendations may be less applicable to this subpopulation. In light of the high value our patient representatives place on avoidance of recurrent infection, we considered recurrence of infection to be a critical outcome for our analyses.

Clinical cure (with relief of symptoms) was the most important outcome from the patient representatives' perspectives, and the duration of antibiotics chosen should be sufficient to achieve clinical cure. They did not feel that a negative urine culture was necessarily a goal, and they lacked confidence in the accuracy of urine cultures at predicting urinary symptoms. They also valued avoiding recurrence of symptomatic infection and readmission to hospital. Patients expressed that if an individual patient has experienced clinical recurrence of cUTI after a shorter duration of therapy, consideration should be given to treating the recurrence with a longer course of antibiotics.

Additional days of IV antibiotics incur all the risks of having an intravenous device in place, including pain and discomfort, reduced mobility, phlebitis, infusion site reactions, cellulitis, and even bacteremia. Antibiotics administered systemically through any route can cause nausea, diarrhea, gastrointestinal upset, metallic taste, or other side effects that limit the patient's ability to function normally. Longer courses of antibiotics are associated with antibiotic-related complications, including hospitalizations and resistant infections.[31]

Costs, Resources, Feasibility and Equity

While few studies have quantified cost/resource reductions associated with a shorter duration of treatment specific to cUTI, the panel judged that a potential reduction in cost and resources favors the shorter course of antibiotics. This can be justified by a reduction in medication costs, length of hospitalization, or outpatient parenteral antibiotic therapy costs.[35-37] The panel could not identify a scenario where a longer duration of therapy would be more feasible, as compared to a shorter course of treatment. Likewise, a longer duration of therapy, if no more effective than a shorter duration of therapy, should not impact equity.

Conclusions and research needs

The guideline panel suggests treating cUTI, including acute pyelonephritis, with a shorter course of antibiotics rather than a longer course. The panel notes that the majority of the patients included in the evidence base were female, outpatients, and treated with a fluoroquinolone. Also, these trials generally enrolled patients whose organisms were susceptible to the antibiotics under study, meaning that effective therapy is likely important to the success of a shorter course of treatment. For patients with uncomplicated Gram-negative bacteremia, the panel suggests a shorter course of antibiotic therapy in patients with cUTI when afebrile, hemodynamically stable and with adequate source control. Source control in the context of urinary-source bacteremia would mean ensuring relief of any urinary obstruction.

Additional clinical trial data would be very helpful to determine the duration of therapy for cUTI using non-fluoroquinolone antibiotics, as the resistance rate to fluoroquinolone antibiotics has increased dramatically since many of the studies supporting this recommendation were conducted. Also, larger studies that address the risk of complications with *E. coli* versus non-*E. coli* organisms would be welcome, as some urinary pathogens may be more likely to persist, invade the bloodstream, or evolve into abscesses. Additional clinical trials are needed to provide increased certainty about the potential for both benefit and harms of shorter treatment in cUTI complicated by bacteremia.

Subgroup analysis of men with cUTI, including those who are febrile and/or bacteremic, suggests that 10-14 days of antibiotics may be associated with higher rates of cure. Additionally, men with cUTI and acute prostatitis may need a longer course of antibiotics than 7 days to avoid clinical failure. Research is needed on when to consider prostatic involvement in men with febrile UTI and how the extent of prostatic involvement impacts the ideal treatment duration. Additional studies are needed to define how to diagnose and manage acute prostatitis.

Additional research into safety of shorter treatment in patients at higher risk of treatment failure or complications of cUTI, such as men (with or without acute prostatitis), patients with indwelling urinary catheters, with sepsis or septic shock on initial presentation, with immunocompromised status, or with severe renal insufficiency is needed to ascertain whether this course of action is acceptable in these scenarios. Infectious diseases practice in general is trending towards more individualized durations of therapy based on patient-specific risk factors for treatment failure, and further research is needed to determine such risk factors in patients presenting with cUTI. Individualized durations of therapy based on symptom resolution should also be studied.

These recommendations are not necessarily applicable to lactating or pregnant women, who were often excluded from the studies evaluated; patients with suppurative or chronic infections, such as renal abscesses, chronic pyelonephritis, and chronic bacterial prostatitis; patients with complete urinary obstruction; patients with nephrostomy tubes; or patients with recent urinary instrumentation, surgery, or lithotripsy (in the prior 7 days). Traditional practice, albeit not informed by comparative data, favors longer durations in these subpopulations widely perceived to be at higher risk for treatment failure with shorter course of antimicrobial therapy.

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