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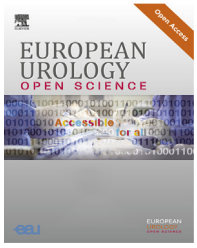

European Association of Urology

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Classification of Urinary Tract Infections in 2025: Moving Beyond Uncomplicated and Complicated

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Classification of urinary tract infections

Urinary tract infections (UTIs) encompass a wide range of clinical and pathological conditions affecting different parts of the urinary tract. Each condition has its own epidemiology, natural history, and diagnostic and treatment considerations, highlighting the need for a standardized classification. Several classification systems are currently in use. Most guidelines for clinical practice [1–4] and research [5–7] are based on classification of UTIs as uncomplicated or complicated infections. This concept was first introduced by Lindemeyer et al [8] in 1963, and later refined by the Infectious Diseases Society of America (IDSA) and the European Society of Clinical Microbiology and Infectious Diseases in 1992 [9]. However, this distinction is often misunderstood and a persistent source of confusion, even among UTI experts, and especially among physicians who are not infectious disease specialists [10,11].

It is complicated

The term "complicated" was originally used to refer specifically to the presence of underlying predisposing conditions that make a UTI more difficult to treat and lead to more severe outcomes. Over time, however, the term has also been used to describe clinical severity, systemic involvement, or complications of the infection. Variations in defining UTIs across studies create challenges in interpreting results and formulating evidence-based guidelines [12]. Two recent comprehensive systematic reviews effectively highlighted the heterogeneity in UTI definitions used in current research [12,13]. Among the studies included, the clinical criteria used to define complicated UTIs varied considerably. Although most studies required the presence of clinical signs or symptoms, the type and number of symptoms varied, and some studies did not explicitly specify which signs or symptoms were necessary. Such inconsistencies are confusing not

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only for the definition of study populations in UTI research but also for the management of patients, as the following example illustrates. The IDSA [3] and the Asian Association of UTI and Sexually Transmitted Infection [4] proposed a classification of pyelonephritis as either an uncomplicated or a complicated UTI. On the contrary, recent publications and ongoing studies, such as the CERTAIN-1 study [14] and the European Clinical Research Alliance for Infectious Diseases POS-cUTI study on complicated UTIs [15], do not distinguish between uncomplicated and complicated pyelonephritis. Instead, pyelonephritis is generally classified as a complicated UTI regardless of the presence or absence of predisposing risk factors. This controversy has the potential to create issues in clinical practice. For instance, a young woman presenting with high fever and symptoms of pyelonephritis, but without risk factors, could be categorized as having an uncomplicated UTI. Consequently, suboptimal treatment may be administered, such as antibiotics intended for uncomplicated UTIs (eg, nitrofurantoin), which may prove ineffective in managing pyelonephritis.

Moving beyond uncomplicated and complicated UTIs

The lack of a standardized definition of UTIs and the different interpretations of "uncomplicated" and "complicated" pose significant challenges. These inconsistencies complicate patient management and hinder consistency across trials, leading to difficulties in treatment and interpretation of study results. This ongoing problem has been reflected in recent attempts to improve the classification of UTIs [16,17]. Despite these adjustments, the European Association of Urology (EAU) guideline panel on urological infections has continued to work intensively on this issue. After extensive discussion both within the panel and with other experts in the field, a conclusion was reached that the complexity of the issue required additional modifications. The idea was born to replace the concept of uncomplicated and complicated with a definition that is less prone to misinterpretation and that could further contribute to clearer communication and more consistent clinical decision-making.

The new EAU classification of UTIs

The new EAU classification categorizes UTIs as either localized or systemic, according to the presence of specific clinical signs and symptoms (Fig. 1 and Table 1).

1. Localized UTI: Cystitis without any signs and symptoms of systemic infection in either sex.
2. Systemic UTI: A UTI with signs and symptoms of systemic infection, with or without localized symptoms originating from any site in the urinary tract in either sex.

Risk factors

Both localized and systemic UTIs can be associated with various risk factors that increase the likelihood of a more complicated clinical course, making diagnosis and treatment more difficult (Table 2). Clinicians must be vigilant in identifying these risk factors, as they can significantly alter the course of the infection, the choice of treatment, and the patient's prognosis.

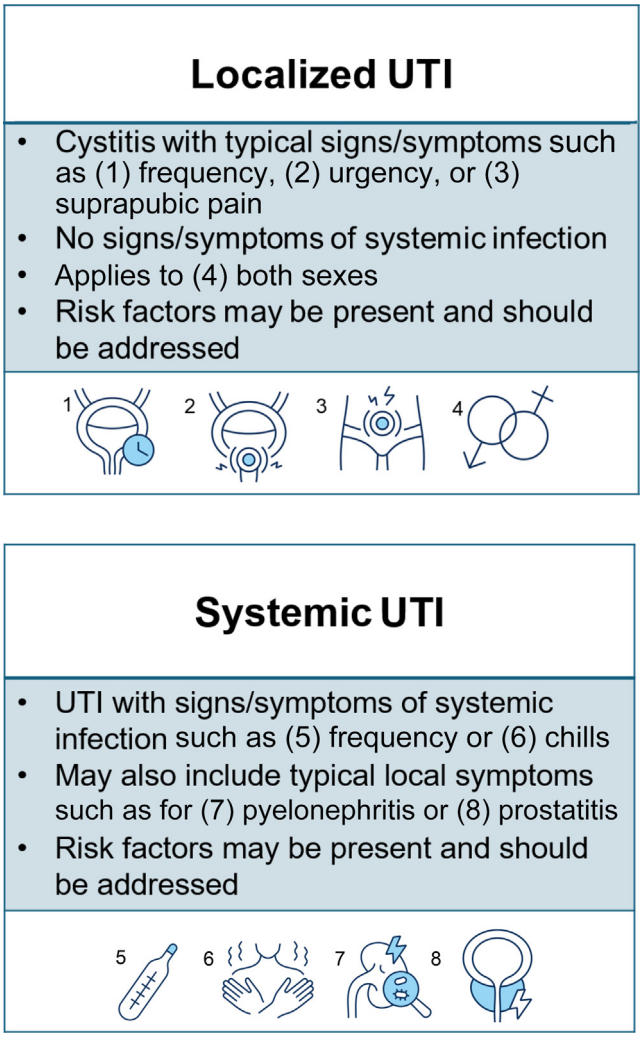

Fig. 1 – European Association of Urology classification of urinary tract infection (UTI).

Table 1 – Localized and systemic signs and symptoms of urinary tract infection

Localized urinary tract infection [a]	Systemic urinary tract infection [a,b]
Dysuria (pain, burning, stinging)	Fever or hypothermia
Urgency	Rigors, shaking chills
Frequency	Delirium
Incontinence	Hypotension
Urethral purulence	Tachycardia
Pressure or cramping in the lower abdomen	Costovertebral angle pain/tenderness

[a] Recent onset of these localized and/or systemic signs and symptoms.
[b] These signs and symptoms are possibly caused by a systemic urinary tract infection, but there may also be alternative explanations.

Table 2 – Risk factors for urinary tract infection [a]

Infants
Geriatric or frail patients
Anatomic or functional abnormalities of the urinary tract
Indwelling urinary catheters
Stones
Immunocompromised state
Postvoid residual urine volume
Neurourological patients
Antibiotic use in the past
Resistant organisms
Obstruction
Recent instrumentation
Male sex:
Prostatic involvement
Female sex:
Pregnancy
Pelvic organ prolapse

[a] Both localized and systemic urinary tract infections may be accompanied by risk factors that increase the likelihood of a challenging clinical course and jeopardize treatment success. Clinicians must be aware of these risk factors to adjust treatment if necessary.

It is not complicated any more

According to the new EAU classification, UTIs present as either cystitis (localized infection) or systemic infection (eg, pyelonephritis, prostatitis). The terms "uncomplicated" and "complicated" are no longer used. The distinction between localized and systemic UTIs is critical, as it affects clinical management and therapeutic decisions. Cystitis typically presents with symptoms such as dysuria, increased frequency, and urgency without accompanying signs of systemic illness. By contrast, systemic UTIs are characterized by fever, chills, and, in severe cases, bacteremia, which indicates that the infection has spread beyond the bladder, potentially involving the kidneys, prostate, or even the bloodstream. The new EAU classification allows clinicians to make the important distinction between a localized UTI (ie, cystitis), which can typically be managed on an outpatient basis, and a more complex, systemic UTI that requires more intensive diagnostic evaluation and treatment, including blood cultures, imaging (such as ultrasound or cross-sectional imaging), intravenous antimicrobial therapy, and possibly even hospitalization for closer monitoring and more intensive care. Referring to the example of a young woman with pyelonephritis, the symptoms, combined with the systemic nature of the infection, emphasize the need for prompt diagnosis and targeted treatment of pyelonephritis as a systemic UTI. This approach allows clinicians to focus on management of the systemic infection without the need to categorize the UTI as "complicated" or "uncomplicated", which could lead to inappropriate treatments and a worse outcome for the patient. Of course, clinicians must remain aware of the risk factors for a potentially complicated course and actively investigate these when taking the patient's history. Finally, the new EAU classification could serve as a standardized research definition to improve study homogeneity, which is crucial for interpreting, synthesizing, and comparing results while reducing the risk of misclassification bias. This is particularly important in an era of increasing antimicrobial resistance in which novel antimicrobials are being evaluated in large randomized controlled trials.

Conclusions

In summary, the evolution of UTI classifications reflects the ongoing drive towards a more personalized approach to improve treatment outcomes. Previous classification systems provided an important foundation, but they often fell short of providing the clinical clarity needed to make appropriate decisions and to improve consistency in UTI research. The new EAU classification, which will be included in the 2025 version of the EAU guidelines on urological infections, provides a more focused and clinically applicable framework that addresses these limitations by emphasizing the clinical signs and symptoms of infection. By moving away from the confusing uncomplicated versus complicated dichotomy, this new system facilitates decision-making for clinicians to ensure that patients receive the most appropriate treatment according to the severity of their infection, and improves patient safety by minimizing the risks of overtreatment or undertreatment. The new classification marks a substantial advance in the field of UTI research by providing a clearer, more consistent way for classifying study populations for randomized clinical trials and basic research.

Conflicts of interest: Gernot Bonkat reports consultation fees from Janssen-Cilag AG, OM-Pharma, IBSA, Zambon SpA, and Sun Pharma; company speaker honoraria from Zambon SpA, OM-Pharma, IBSA, Bionorica SE, Hoechst Marion Roussel, and Sun Pharma; and fellowship and travel grants from Sun Pharma, OM-Pharma, IBSA, and Bionorica SE. Suzanne Geerlings reports an advisory board from Immunotek. Jennifer Kranz reports consultation fees from Bionorica, GSK, and Shionogi; speaker honoraria from Bionorica, GSK, Janssen-Cilag, MSD, and Apogepha Arzneimittel GmbH; trial participation for Janssen-Cilag; and research grants from DFG. José Medina-Polo reports speaker honoraria from Astellas, Boston Scientific, GSK, and Q-Pharma. Fabian Peter Stangl reports a speaker honorarium from OM-Pharma; fellowship and travel grants from Janssen-Cilag and OM-Pharma; and research grants from Repha Pharma. Laila Schneidewind reports consultation fees from Bristol-Myers Squibb, MSD Phama, and GSK; a speaker honorarium from Bionorica; fellowship and travel grants from Apogepha and Debiopharm; research grants from DFG, Monika-Kutzner Foundation, and DFIT e.V.; and panel membership for the German AWMF S3 guidelines on urethritis and uncomplicated urinary tract infections. Rajan Veeratterapillay reports travel and fellowship grants from Ipsen. Florian Wagenlehner reports a leadership position as Director of the Clinic of Urology, Pediatric Urology and Andrology for Justus-Liebig-University; consultation fees from Achaogen, Bionorica, GSK, Janssen, Klosterfrau, Pfizer, MIP Pharma, Shionogi, Spero, VenatorRX, and OM-Pharma; speaker honoraria from Astellas, AstraZeneca, Bionorica, GSK, Janssen, Klosterfrau, MSD, Pfizer, MIP Pharma, and OM-Pharma; trial participation for GSK, Klosterfrau, Select Immune, Janssen, and VenatoRx; and research grants from DFG and DZIF. The remaining authors have nothing to disclose.

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