

19% experienced recurrence within 6 months.⁹ In a recent study, Suskind et al,¹⁰ using a database of health care claims, studied women aged 18 to 64 years who had an evaluation and management visit associated with an *International Classification of Disease, Ninth Revision* code for UTI and an antibiotic prescription within 14 days of that visit. They reported an overall rate of incident rUTI cases of 102 per 100,000 women per year, with the highest rates in women 18 to 34 years old and 55 to 66 years old.

Pathophysiology

Adjacent pelvic microbial niches serve as reservoirs for uropathogens that can lead to UTI/rUTI.¹¹ Currently, the majority of evidence for uropathogens in the urine comes from standard urine culture techniques, which have been refined to detect *Escherichia coli*. Standard cultures also detect other common pathogens including *Klebsiella* species, *Staphylococcus saprophyticus*, *Enterococcus faecalis*, and *Streptococcus agalactiae*. Culture-independent techniques, such as polymerase chain reaction testing and sequencing, confirm that standard urine cultures do not detect all uropathogens or other resident microbes of the urinary microbiota.¹¹ Enhanced culture techniques complement culture-independent methods to advance our understanding of UTI and rUTI prevention, pathogenesis, treatment, and recovery but are not yet widely available for clinical use.

Current evidence, based on standard cultures, indicates that *E. coli* causes most (70%–95%) community-acquired UTIs. Studies in older women suggest that *E. coli* accounts for more than half of UTIs, whereas other common organisms are *Klebsiella pneumoniae*, *Proteus mirabilis*, and *E. faecalis*. *E. coli* is also the most common cause of rUTI (66%). The uropathogens associated with rUTI are the same microbes associated with episodic (non-rUTI) UTI episodes. However, non-*E. coli* pathogens and resistant organisms are more likely to be associated with UTI episodes in women with rUTI.^{3,7,12}

E. coli has multiple strains and virulence factors.¹³ Uropathogenic *E. coli* (UPEC) has been widely studied in murine models, and some findings have been verified in human studies.^{14,15} Uropathogenic *E. coli* have special features that facilitate urothelial attachment, allowing the microbe to take up residence within the bladder.^{14,15} Uropathogenic *E. coli* can form intracellular bacterial communities that act like a biofilm, allowing bacteria to persist in quiescent intracellular reservoirs, acting as a source of recurrent infection.^{16,17} Episodes of rUTIs are often associated with the same bacterial strain; this has important implications for treatment, highlighting the need for careful antimicrobial sensitivity testing and treatment selection.

In addition to bacterial factors, host factors, including hormonal status, anatomy, functional, and behavioral variables, and genetic factors likely modulate UTI and rUTI susceptibility.^{3,14,18} For example, *E. coli* has an increased ability to adhere to the urothelium in women who are nonsecretors of certain blood group antigens.^{3,19} Individual factors, such as pre-UTI microbiota/microbiome health, degree of inflammation, and urothelial exfoliation from an infection, may affect response to UTI, recovery from UTI, and susceptibility to future UTI.^{13,14}

Risk Factors

Many commonly recommended behaviors have not been established as reducing risk for rUTI (wiping away from the urethra; voiding before and after intercourse; increasing frequency of voiding; wearing certain types of underwear; avoiding douching; or avoiding hot tubs, bubble bath, or tampons).³ Physicians should consider the contribution of gross fecal soilage, as in women with fecal incontinence.

A personal history of UTI before age 15 years and maternal UTI history are rUTI risk factors.^{3,20} A case-control study of more than 400 women reported an increased risk of rUTIs in women having a first-degree female relatives with a history of at least 5 UTIs.²¹ Sexual risk factors, such as a new sexual partner, intercourse frequency, and spermicide use, are more common in premenopausal women.²¹

Women with pelvic floor disorders are at increased risk for rUTIs, especially postmenopausal women with urinary incontinence. Some investigators suggest an association between postvoid residual of at least 50 mL and rUTI.¹⁹ The association with prolapse is unclear.²²

There is a risk of rUTI after surgery for stress urinary incontinence. The early postoperative period is associated with a transient increased rUTI risk (11%) after retropubic tension-free vaginal tape with or without concomitant prolapse repair.²³ Beyond the first 6 postoperative weeks, investigators reported rUTI in 2.3% to 2.4% of participants in 2 randomized surgical trials (Stress Incontinence Surgical Treatment Efficacy trial and Trial of Mid-Urethral Slings).²⁴ Between 2 and 12 months, women who had a midurethral sling had a postoperative rUTI rate of 2.3%.²⁵ No cases of rUTI were reported during a recent 10-year follow-up of 71 women who had transobturator midurethral slings.²⁶

DIAGNOSIS

Women with frequent UTI may experience diagnostic delay if clinicians do not review the UTI history; clinicians should order pretreatment urine cultures to document rUTI (culture-proven UTI ≥ 2 in 6 months or ≥ 3 in 12 months).³ Although infrequent UTI can be assessed with less rigor and treated empirically, women with frequent UTI who are being formally assessed for rUTI should have detailed symptom assessment and pretreatment urine culture and sensitivity.⁴

Symptoms

Dysuria is a key symptom of bacterial cystitis. Frequency, urgency, hematuria, and suprapubic pain are variably present. Symptoms of flank pain, fever and chills, and nausea and vomiting should prompt consideration of pyelonephritis. In young women, there is a 90% probability of a UTI when she reports dysuria and frequency in the absence of vaginal discharge or irritation.⁶ The accuracy of history and physical examination for UTI diagnosis in women suggests an increased UTI probability with dysuria (likelihood ratio [LR], 1.5; 95% confidence interval [CI], 1.2–2), frequency (LR, 1.8; 95% CI, 1.3–3), hematuria (LR, 2.0; 95% CI, 1.3–2.9), back pain (LR, 1.6; 95% CI, 1.2–2.1), and costovertebral angle tenderness (LR, 1.7; 95% CI, 1.1–2.5). The probability of UTI diagnosis is reduced with a history of vaginal discharge (LR, 0.3; 95% CI, 0.1–0.9) or vaginal irritation (LR, 0.2; 95% CI, 0.1–0.9).²⁷

With aging, symptoms potentially associated with a UTI may be less clear. Acute dysuria remains a reliable symptom, new-onset frequency or urgency has been found to correlate with UTI, and new-onset urinary incontinence should prompt evaluation for UTI.^{28,29} Nontraditional symptoms, such as urinary odor or urinary appearance, may be triggers for urogynecologic patients to seek care for presumed UTI.^{2,3,30} Women with cognitive limitations may have difficulty reporting symptoms; family/caregivers may alert health care providers to changes in mentation or energy levels, which may indicate UTI, although this is a diagnostic challenge.² Despite the common clinical observation, worsening of chronic incontinence or other urinary symptoms are not reliably associated with UTI.^{2,31}