

# Management of Urinary Incontinence

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## DISEASE OVERVIEW

Urinary incontinence (UI) may be defined as any involuntary or abnormal urine loss. UI is characterized by lower urinary tract symptoms (LUTS), which include both storage and voiding problems. UI can be further defined by the patient's presentations and symptoms. Urge urinary incontinence (UUI) is defined as involuntary urine leakage associated with urgency. Stress urinary incontinence (SUI) is defined as involuntary urine leakage associated with specific activities (e.g., sneezing and coughing). Mixed urinary incontinence (MUI) includes features of both UUI and SUI.<sup>1-3</sup>

Overflow incontinence (OFI) is caused by a hypotonic bladder, bladder outlet obstruction, or other forms of urinary retention. OFI may result in LUTS and in the loss of small amounts of urine; it most often occurs in men with benign prostatic hyperplasia (BPH).<sup>4</sup>

The term overactive bladder (OAB) is often used to describe UI. OAB comprises a constellation of symptoms typically characterized by urgency, with or without UUI, accompanied by frequency and nocturia.<sup>1</sup>

## Epidemiology

Approximately 10 million patients in the U.S. have UI, which is associated with significant morbidity and decreased quality of life. In 2007, it was estimated that more than 25 million people in the U.S. experienced episodes of UI. The prevalence of UI is higher in women than in men 80 years of age or younger, but both men and women are affected almost equally after age 80. UI may be associated with certain comorbidities, including hypertension and depression, although these associations are not fully understood.<sup>5,6</sup> Among women, the incidence of UI is highest in Caucasians (7.3/100 person-years), followed by Asians (5.7/100 person-years) and African-Americans (4.8/100 person-years).<sup>7</sup>

As a result of the social stigma associated with UI or the assumption that UI is a normal part of aging, the prevalence of this disorder may be underestimated because of unreported cases.<sup>8</sup> UI is also often undocumented upon hospital discharge; it is a neglected syndrome in nursing facilities; and it is underreported by health care professionals, who may view the condition as a symptom rather than as a medical problem.<sup>9,10</sup>

UI is primarily associated with aging, affecting up to 30% of elderly people. It occurs in 85% of long-term-care patients and is often the reason for admission to these facilities.<sup>11,12</sup> The prevalence of UI in nursing homes remains high, and the care of nursing-home residents with UI is the subject of clinical research.<sup>13,14</sup> In addition, UI is one of the measures used by the Centers for Medicare and Medicaid Services (CMS) to assess quality of care.<sup>15-17</sup>

Annual direct and indirect costs of managing UI in the U.S. is estimated at \$25 billion for patients over 65 years of age.<sup>18,19</sup> The direct costs of UI include diagnostic procedures and the various treatment options, including pharmacotherapy.<sup>20</sup> Indirect costs include complications and disabilities, such as insomnia, falls,

depression, caregiving, and nursing-home placement.<sup>10,21</sup> The indirect costs of UI are associated with a significant decrease in health-related quality of life, especially in women. Other "costs" of UI are difficult to measure but are significant. These include the consequences of social withdrawal or isolation resulting from the perceived stigma of UI or from the fear of leakage or odor.<sup>22-24</sup>

## Bladder Anatomy and Physiology

The anatomy and physiology of the bladder are complex, but a basic understanding of these topics is essential in order to appreciate the various types of UI and their management.<sup>25,26</sup> Figure 1 illustrates the basic anatomic structures and nervous system "wiring" involved in bladder function, including the detrusor muscle, the internal and external sphincters (bladder neck and proximal urethra, respectively), and their neurological components.

Reduced activation of the sympathetic nervous system (SNS) results in relaxation of the detrusor muscle, closure of the sphincter, and bladder filling. When the volume of urine in the bladder reaches 200 to 400 mL, the sensation of urge to void is relayed via the spinal cord to the brain centers. Voluntary voiding (micturition) involves the parasympathetic nervous system and the voluntary somatic nervous system. Influences from these systems cause contractions of the detrusor muscle and corresponding somatic nervous activity, leading to sphincter relaxation.<sup>26-31</sup>

## Etiology and Risk Factors

Multiple factors, including age-related physiological changes, may result in or contribute to the various syndromes of UI. Both genitourinary and non-genitourinary factors may contribute to incontinence in aging patients. Age-related functional changes in the urinary tract (detrusor overactivity, impaired bladder contractility, decreased pressure in urethra closure, atrophy of urethral areas, and prostatic hypertrophy) may contribute to UI.<sup>32</sup> In women, risk factors for these genitourinary changes include multiple or complex vaginal deliveries, high infant birth weight, a history of hysterectomy, and physiological changes related to the transition to postmenopause. Smoking, a high body mass index, and constipation are also associated with an increased risk of UI.<sup>33-37</sup>

Pathophysiological causes of UI include lesions in higher micturition centers, in the sacral spinal cord, and in other neurological areas as well. UI may also be associated with numerous comorbidities, such as Parkinson's disease, Alzheimer's disease,

### Key Abbreviations

BPH	benign prostatic hyperplasia
LUTS	lower urinary tract symptoms
MUI	mixed urinary incontinence
OAB	overactive bladder
OFI	overflow incontinence
SUI	stress urinary incontinence
UI	urinary incontinence
UTI	urinary tract infection
UUI	urge urinary incontinence

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cerebrovascular disease, diabetes, hypertension, obstructive sleep apnea, and normal-pressure hydrocephalus. Functional factors, including mobility and dexterity, along with reaction time and lack of access to a bathroom facility, may also contribute to UI.<sup>33-37</sup>

Reversible causes of UI, often described by the mnemonic DIAPPERS, include urinary-tract infections (UTIs), stool impaction, and drugs (Table 1).<sup>35-44</sup> Incontinence in older adults may or may not be associated with the genitourinary system. Pharmacological causes and contributors should be considered in patients with UI, especially if they are taking multiple medications (Table 2).<sup>32,38-44</sup> Primary care providers and specialists should work as a team to manage patients with UI and to evaluate the broad spectrum of factors that may contribute to incontinence in older adults.<sup>32,38,40</sup>

### Diagnosis and Evaluation

Patients with signs and symptoms of UI should undergo a complete medical evaluation to rule out reversible causes of the disorder. Formulating an accurate diagnosis may require the participation of clinicians with specialized training in urology. Clinically, patients with UI present with a variety of symptoms, depending on the type and severity of the condition. Patients with UUI usually experience urgency episodes that result in loss of urine. Women with SUI usually experience small amounts of leakage related to external stimuli, such as coughing or sneezing. Men with OFI sec-

ondary to BPH usually experience LUTS, including difficulty initiating a urine stream, the presence of a weak stream, a sense of incomplete emptying, nocturia, and dribbling.<sup>1,4,25,38</sup> The importance of a correct diagnosis cannot be overemphasized. A complete review of the patient's history, including comorbidities, is necessary for the development of an appropriate treatment plan.<sup>47,48</sup>

Urodynamic studies assist clinicians in determining the precise cause of UI and are an important part of the diagnostic process. Urodynamic assessments include a variety of measures that evaluate urine flow, including flow rate, post-void residual urine, filling cystometry, bladder pressure, and urethral pressure. These assessments provide an extensive description of lower urinary tract function and are helpful in determining the appropriate management strategy or in evaluating treatment failures.<sup>1,49-51</sup>

Because UI in older adults is associated with a high risk of institutionalization and comorbidities, including depression and UTIs, appropriate assessment of transient UI is essential. Transient UI may have an abrupt onset and may last less than 6 months. Because caregivers and health care professionals may erroneously consider UI an inevitable consequence of aging, failure to identify transient forms of the disorder may result in a permanent diagnosis and poor patient outcomes. Various tools, including bladder diaries and the mnemonic described in Table 1, should be helpful in identifying and treating underlying causes of transient UI.

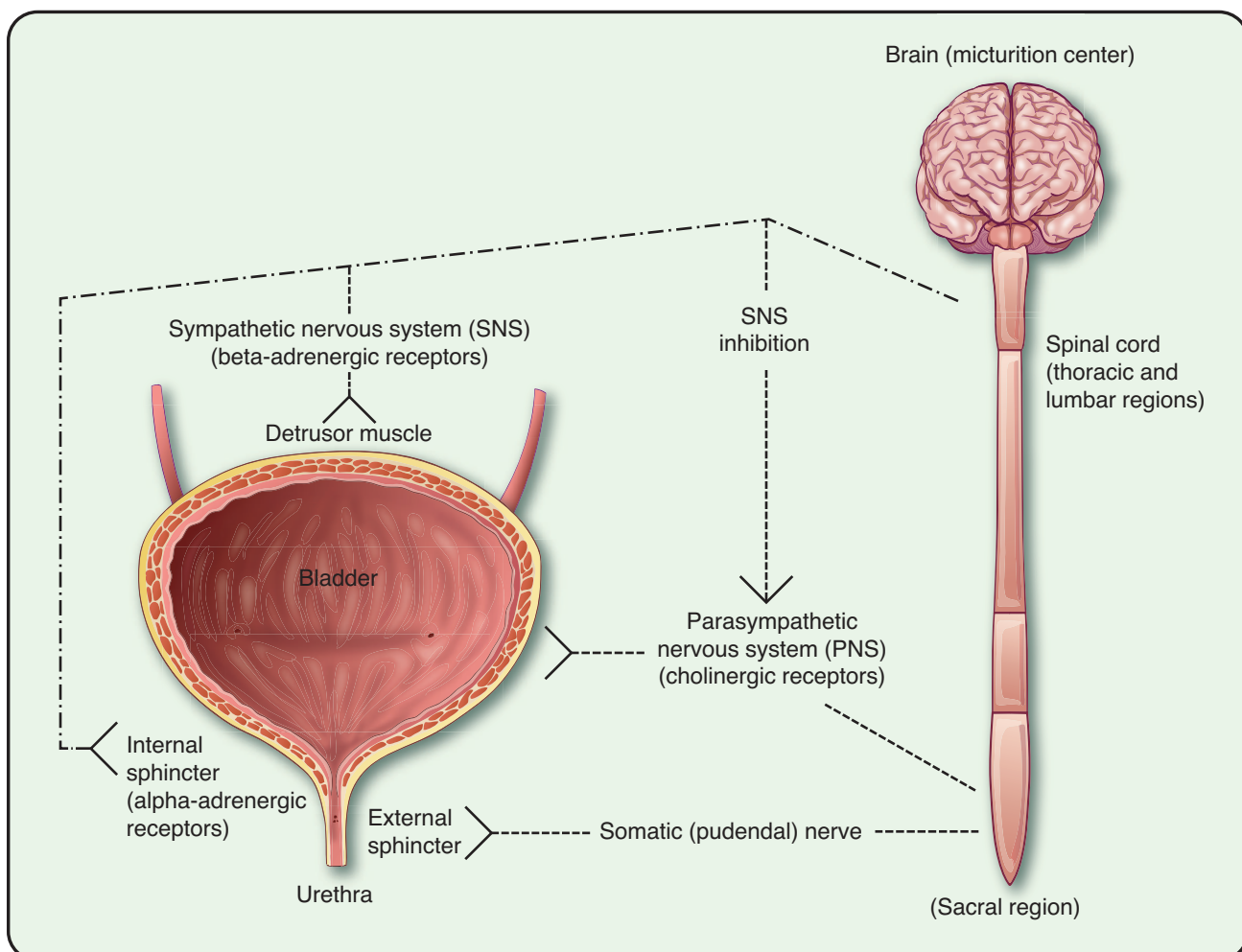


Figure 1 Bladder anatomy and physiology.

Illustration by Alison Schroeer

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Initial questions for patients suspected of having UI may include “Have you ever leaked urine?” or “Have you lost bladder control?” Bladder diaries may be used to assess patterns of voiding, frequency, and volume. Questionnaires may also be helpful, although they depend on the patient’s or the caregiver’s memory.<sup>45–49</sup>

Because only approximately 20% of women with UI seek medical attention, and because there is the misconception that urinary leakage is a normal part of aging, health care practitioners should aim discussions at identifying women who are experiencing UI and need further evaluation.<sup>7,41,51,52</sup> Pharmacists should have a thorough understanding of UI and its pharmacotherapeutic management. A comprehensive understanding of UI is necessary to optimize pharmacotherapy and to allow the pharmacist to review the patient’s medical profile for medications that might be causing or exacerbating the disorder.<sup>33,34,25,42</sup> Because many patients with UI are older, it is often necessary to make dosage adjustments in their medications. Because of changes in both pharmacokinetics and pharmacodynamics in elderly populations, additional monitoring to avoid drug-related adverse events is required.<sup>52</sup>

### Nonpharmacological Management: Conservative Measures and Exercises

The management of UI should include an evaluation of potential reversible contributors and trials of nonpharmacological interventions, which depend on the type of UI identified. Clinical studies support proper nutrition, the avoidance of constipation, weight loss, and physical activity as beneficial in improving symptoms.<sup>53–61</sup> A study of weight loss in overweight women reported a clinically relevant reduction in the frequency of both stress and urge incontinence episodes.<sup>58</sup> Women who are able to engage in regular daily exercise of moderate intensity are reported to have a lower incidence of UI than sedentary women, although the ability to exercise may be limited by physical disabilities in elderly women.

Other non-drug interventions for UI include prompted or timed voiding, habit retraining, and praises for appropriate toileting. Success with these interventions requires the patient’s awareness of the need to void and the ability to delay voiding if necessary. These interventions, along with exercise, are associated with modest

**Table 1 Reversible Causes of Urinary Incontinence (DIAPPERS)**

D	Delirium
I	Infection (urinary tract)
A	Atrophic
P	Pharmacological
P	Psychological
E	Endocrine/excess urine output
R	Restricted mobility
S	Stool impaction
Data adapted from references 38–46.	

and short-term improvements in daytime UI. Absorbent products or pads may also be helpful to some patients; the use of these products should be based on the needs of the patient rather than on the convenience of the caregiver or facility staff. The drugs listed in Table 2 are often problematic in these patients and may contribute to or exacerbate UI; thus, evaluation may be necessary.<sup>62–68</sup>

Pelvic floor (Kegel) muscle training and bladder training have been beneficial in resolving or improving UI.<sup>69,70</sup> Kegel exercises involve strengthening and retraining the detrusor bladder muscle to regain some control of urinary function. Evidence supports the use of this behavioral intervention in the treatment of UUI, SUI, and MUI. Choi et al. suggested that these exercises might be most effective in younger women with predominantly stress-related incontinence.<sup>71</sup>

The training process involved in learning these exercises may be complex for some patients, especially older adults with memory disorders.<sup>69–71</sup> Comparisons of various conservative techniques, using a device that monitors compliance and the performance of exercises, showed that pelvic floor exercises, alone or in combination with biofeedback or electrical stimulation, may be beneficial for patients with SUI or MUI.<sup>53,54,56,72</sup>

The treatment of UI in older adults living in the community is

**Table 2 Medications That Can Cause or Exacerbate Urinary Incontinence**

Classification	Medication	Activity
Alpha-adrenergic agonists	Nasal decongestants	Urinary retention in men with overflow incontinence related to BPH
Alpha-adrenergic antagonists	Prazosin, terazosin, doxazosin, silodosin, alfuzosin	Urethral relaxation; may cause or exacerbate stress incontinence in women
Anticholinergic drugs	Antihistamines, tricyclic antidepressants, some antipsychotics	Anticholinergic actions; urinary retention in overflow incontinence or impaction
Antineoplastic drugs	Vincristine	Urinary retention
Calcium-channel blockers	Dihydropyridines (e.g., nifedipine)	Urinary retention; nocturnal diuresis resulting from fluid retention
Diuretics	Furosemide, bumetanide	Polyuria; frequency; urgency
Narcotic analgesics	Opiates	Urinary retention; sedation
Sedatives/hypnotics	Long-acting benzodiazepines (e.g., diazepam, flurazepam)	Sedation; delirium; immobility
BPH = benign prostatic hyperplasia. Data adapted from references 25, 33, 34, and 42–46.		

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often overlooked, but if the disorder is identified in these individuals, it can be successfully managed with conservative measures. The use of nonpharmacological interventions, including Kegel exercises and bladder retraining, can be effective even in frail older adults, especially with caregiver assistance. Medications may be necessary in some patients, however, and treatment outcomes may be less successful in patients with advanced age and severe UI.<sup>73</sup>

### Pharmacotherapy: Estrogen Replacement

The loss of estrogen during menopause has multiple effects on postmenopausal women, including atrophic tissue changes in the urogenital tract. These physiological changes may result in dryness, burning, itching, dyspareunia, and infections along with additional LUTS, including frequency and urgency.<sup>74-77</sup> Hormone therapy (HT) has always been considered a therapeutic option for the management of postmenopausal symptoms. HT offers significant benefits in the management non-urogenital features, such as hot flashes, and may relieve the vaginal dryness associated with menopause. In addition, HT has been used to improve LUTS because of its effect on estrogen receptors in the urogenital area.<sup>78,79</sup>

During the past decade, the use of exogenous estrogen in postmenopausal women has become controversial because of concerns about increased rates of breast cancer and the risk of vascular disease-related morbidity (e.g., clotting and stroke).<sup>80</sup> The role of estrogen in the management of UI is also controversial because data have suggested that HT provides only minimal benefit in UI and may even exacerbate the disorder.<sup>81-85</sup> The basis for the assumption that estrogen would be beneficial in UI is the presence of estrogen and progesterone receptors throughout the genital tract, bladder, and vaginal epithelium. The presence of these receptors led investigators to theorize that HT could be a useful treatment for UI, especially stress urinary incontinence (SUI).<sup>74-77,85-92</sup>

Some clinical trials, however, have not supported the use of oral HT for managing UI.<sup>84,93</sup> In a meta-analysis of 28 clinical studies of approximately 3,000 women with UI and in controlled trials of estrogen in more than 700 women with features of UUI and SUI, greater improvement of symptoms was reported for estrogen-treated patients with UUI than for the control groups; however, no beneficial effects were observed among patients with SUI.<sup>94</sup>

Other controlled studies showed that the use of estrogen alone or in combination with progestin may contribute to or increase the incidence of UI, especially SUI, in postmenopausal women.<sup>95-102</sup> The Nurse Health Study reported an increased risk of UI associated with the use of estrogen, with or without progestin therapy, in younger postmenopausal women (37-54 years of age).<sup>95</sup> Additional retrospective data from this study suggested an association between the use of oral contraceptives and UI in premenopausal women.<sup>96</sup>

The Women's Health Initiative (WHI), a randomized controlled trial involving more than 23,000 postmenopausal women 50 to 79 years of age, reported that HT increased the incidence of UI at 1 year; the highest incidence was in women with SUI. Estrogen alone or taken with progestin increased the risk of UI among continent women and worsened the features of UI among symptomatic women after 1 year.<sup>97-100</sup> The Heart Estrogen/Progestin Replacement Study (HERS), a randomized, placebo-controlled, double-blinded trial, evaluated conjugated estrogen plus progestin for the secondary prevention of heart disease in 1,200 women. Estrogen plus progestin increased the risk of UUI and SUI within 4 months after initiation of treatment.<sup>101,102</sup>

These trials showed that conjugated estrogen alone and in combination with progestin increased the risk of UI and exacerbated

existing UI in postmenopausal women. HT, therefore, should not be used for the prevention or treatment of UI. Additional associations between HT and cerebrovascular disease and breast cancer in postmenopausal women should further increase the reluctance to use HT in postmenopausal women with UI.<sup>103,104</sup>

The role of topical estrogens in the management of UI is unclear; more study is needed to investigate these formulations in UI.<sup>78,105</sup> Evidence supports the use of topical or localized estrogen in treating UUI caused by postmenopausal atrophic changes, which result in the loss of urethral support and in symptoms of UI.<sup>74,106</sup> Topical estrogen formulations may include creams or estradiol-impregnated vaginal rings. The mechanisms of topical estrogen in this setting may include an increased blood supply and increased mucosal thickness, resulting in improved function of the lower urogenital system. Although these benefits have been reported in elderly women with atrophic changes and concurrent OAB, they have not been reported in women with SUI.<sup>107-109</sup>

### Classification and Treatment

Urinary incontinence is usually classified in the format described in Table 3, although many patients may experience symptoms that suggest a mixed disorder. An overview of the various types of UI is presented in Table 3.<sup>3,4,30,31,110-112</sup> The next sections discuss urge UI, stress UI, overflow incontinence, and mixed UI.

### URGE URINARY INCONTINENCE

Urge (urgency) urinary incontinence (UUI) is a common cause of incontinence in elderly people. It is characterized by urgency, followed by involuntary loss of urine. UUI is sometimes referred to as OAB. However, the terms are not interchangeable, because about two-thirds of patients with OAB do not have UI.<sup>1,31</sup>

UUI occurs primarily as a result of detrusor muscle overactivity, resulting in uninhibited or involuntary muscle contractions.<sup>26-28</sup> Patients with UUI describe a sudden desire to urinate that is difficult to defer, resulting in leakage of urine. These episodes may occur at various times during the day or night.<sup>31,114</sup> The primary causes of UUI (see Table 3) include idiopathic detrusor overactivity (resulting from UTIs) and neurogenic detrusor overactivity (resulting from stroke, trauma, neurological diseases, or medications).<sup>25-28,43-46,112</sup> The severity of age-related volumetric changes in the brain's white matter may be associated with urinary urgency, and this process may have implications for future UI therapies.<sup>115,116</sup>

### Nonpharmacological Management

The nonpharmacological management of UUI includes bladder training, behavioral treatments; pelvic floor exercises; the avoidance of caffeine; the use of pads for temporary bladder support; and, in some cases, surgery.<sup>117,118</sup> Behavioral therapy in combination with drug therapy has produced variable results. Behavioral interventions, including educational brochures with verbal reinforcement, were beneficial in UUI patients who were dissatisfied with anticholinergic drug therapy.<sup>118</sup> Behavioral training, including Kegel exercises and urge-suppression techniques, was found to be ineffective in improving outcomes in women with UUI.<sup>53,54,119</sup>

### Pharmacotherapy

#### Anticholinergic (Antimuscarinic) Agents

The current focus of pharmacotherapy for UUI is control of detrusor muscle overactivity through the inhibition of M2 and M3 muscarinic (acetylcholine) receptors on the bladder.<sup>120-122</sup> Numerous drugs that act as acetylcholine antagonists (anticholinergic agents) are available for the treatment of UUI and can reduce

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symptoms of urgency and improve bladder control. Because muscarinic receptors are located in other organ systems throughout the body, their inhibition can have a variety of physiological and adverse effects.

The five most commonly used types of muscarinic receptors, their anatomic locations, and the adverse effects that can result from their inhibition are presented in Table 4. Table 5 lists the available antimuscarinic (anticholinergic) agents used to treat UUI. Each of these agents is discussed on the following pages.<sup>123-126</sup>

Antimuscarinic side effects are associated with both central and peripheral adverse reactions (see Table 4). Central adverse

effects include delirium, confusion, and exacerbation of existing memory loss; these effects are especially concerning in elderly patients. Peripheral adverse effects include constipation, dry eye, and urinary retention.<sup>25,120,127,128</sup>

Contraindications to the use of anticholinergic agents include uncontrolled narrow-angle glaucoma, a risk of urinary or gastric retention, the presence of underlying delirium or dementia, and a hypersensitivity to these drugs. Cautious use of anticholinergic drugs is recommended in patients with myasthenia gravis and with some gastrointestinal (GI) disorders, such as ulcerative colitis, intestinal atony, and gastroesophageal reflux disease.<sup>129-134</sup>

**Table 3 Causes, Symptoms, and Treatment of Urinary Incontinence**

Type of Incontinence	Common Causes	Common Symptoms	Treatment Options
<b>Urge urinary incontinence (UUI)</b>			
Idiopathic detrusor overactivity	Urinary tract infections	Urgency and frequency, day or night	<ul style="list-style-type: none"> <li>• Anticholinergic drugs               <ul style="list-style-type: none"> <li>• Oxybutynin</li> <li>• Tolterodine</li> </ul> </li> <li>• Surgery               <ul style="list-style-type: none"> <li>• Intravesical Botox</li> <li>• Sacral nerve stimulation</li> </ul> </li> </ul>
Neurogenic detrusor overactivity	<ul style="list-style-type: none"> <li>• Neurological disorders</li> <li>• Parkinson's disease</li> <li>• Alzheimer's disease</li> <li>• Cerebrovascular accidents (e.g., stroke)</li> <li>• Trauma</li> <li>• Medications</li> </ul>		
<b>Stress urinary incontinence (SUI)</b>			
Stress incontinence (outlet incompetence)	<ul style="list-style-type: none"> <li>• Pelvic surgery</li> <li>• Parity (childbirth)</li> <li>• Constipation</li> </ul>	Small volumes of urine loss with coughing or sneezing	<ul style="list-style-type: none"> <li>• Weight loss</li> <li>• Kegel (pelvic floor) exercises with or without biofeedback</li> <li>• Sling procedures</li> <li>• Transurethral collagen denaturation (Renessa procedure)</li> <li>• Transurethral bulking agents</li> </ul>
<b>Mixed urinary incontinence (MUI)</b>			
Mixed UUI and SUI	<ul style="list-style-type: none"> <li>• Pelvic surgery</li> <li>• Parity (childbirth)</li> <li>• Constipation</li> </ul>	Symptoms may include urge and stress features	Treatment depends on predominant symptoms
<b>Overflow incontinence (OFI)</b>			
Overflow incontinence	<ul style="list-style-type: none"> <li>• Benign prostatic hyperplasia (BPH)</li> <li>• Bladder outlet obstruction</li> <li>• Fecal impaction</li> <li>• Hypotonic/neurogenic bladder</li> <li>• Urethral stricture disease</li> </ul>	Poor stream, incomplete emptying, and dribbling	<ul style="list-style-type: none"> <li>• Alpha-adrenergic blockers</li> <li>• 5-alpha-reductase inhibitors</li> <li>• Intermittent catheterization</li> <li>• Surgical options</li> </ul>
<b>Other types of incontinence</b>			
Post-prostatectomy incontinence	Disruption or denervation of pelvic floor muscle fibers	Stress incontinence and dribbling	<ul style="list-style-type: none"> <li>• Kegel pelvic floor exercises</li> <li>• Male urethral sling</li> <li>• Artificial urinary sphincter</li> </ul>
Fistula (e.g., colovesical or vesicovaginal)	<ul style="list-style-type: none"> <li>• Postsurgical complications</li> <li>• Crohn's disease</li> <li>• Diverticulitis</li> <li>• Cancer</li> </ul>	Continuous, steady incontinence	Surgical repair
Functional incontinence	<ul style="list-style-type: none"> <li>• Limited mobility</li> <li>• Change in mental status</li> </ul>	Symptoms vary	Eliminate causes

Data compiled from references 1, 4, 20, and 110, 112

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