Geriatric Giants Lecture Series
Urinary Incontinence in the Elderly

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Definition

Urinary incontinence is a symptom and not a disease. A standardized definition of urinary incontinence has been produced by the International Continence Society, which states that urinary incontinence is the involuntary loss of urine, which is objectively demonstrable and is a social or hygienic problem.

Prevalence

Accurate assessment of the prevalence of urinary incontinence is not readily available. It is widely under diagnosed and underreported. Two main contributing factors for this are lack of education of healthcare professionals and embarrassment experienced by the individuals suffering from this problem. The prevalence of this condition in community dwelling elderly women is reported as anywhere from 10-30%. It is twice as prevalent in women as compared to men. The prevalence increases to over 50% and becomes equal between the two genders in long term care institutions. In acute care facilities, the prevalence is less well reported and varies from 30-60%. What is most unfortunate is that around 50% of patients do not seek evaluation. This may be partly due to the commonly held *belief* that urinary incontinence is a normal part of aging.

Impact

Though the areas impacted are categorized below, it is important to ask the patient, from their perspective, how the bladder symptoms are affecting them. Each patient's experience is unique. It has been suggested, in several studies, that the main impact of incontinence is psychosocial in nature[1].

1) **Clinical** - This area includes personal discomfort, skin irritation, premature use of supplies and catheterizations. Also there is an associated increased risk of urinary tract infections, urosepsis, falls and restricted mobility.

2) **Psychosocial** - In particular, feelings of shame and embarrassment, loss of self-esteem and confidence as well as a sense of loss of control can be associated with incontinence. There is an increased risk of depression. Some of the social implications are restriction of social activity, negative impact on relationships (including sexual) and a major risk of early institutionalization. It often contributes to caregiver burden and, in one study, it was perceived as a problem by 40% of caretakers of noninstitutionalized elderly[2].

3) **Financial** - In the USA, in 1994, it was reported that direct costs of caring for patients with urinary incontinence, of all ages, were $11.2 billion annually in the community and 5.2 billion in nursing homes. These cost estimates were up 60% from 1990. These are considered conservative numbers. A Canadian study from 1992 reported an annual cost of 9,771 dollars per patient in a long-term care setting[14].

Neurophysiology / Micturition Cycle

Voiding can be thought of as two phases: one of bladder filling and storage and one of bladder emptying[3]. The first phase involves the storage of increasing volumes of urine at low pressure. It involves a closed urethral sphincter, at rest and during increased abdominal pressures, and the absence of involuntary bladder contractions or overactivity. Bladder emptying requires an adequate, sustained bladder contraction with relaxation of the urethral sphincter and absence of any obstruction. See the schematic diagram below for the normal micturition cycle.

The control of this cycle involves innervation from several areas. The parasympathetic nervous system controls bladder smooth muscle (detrusor) contraction and sphincter relaxation; in other words, the PNS controls bladder emptying via pelvic nerves (S2-4). On the other hand, the sympathetic nervous system allows relaxation of the detrusor muscle and sphincter contraction. This results in the urine storage phase. The urethral sphincter mechanism involves innervation from several sources. The proximal urethral smooth muscle contracts with sympathetic stimulation from spinal levels T11 to L2. The distal urethra is composed of striated muscle and contracts via cholinergic somatic stimulation from spinal levels S2-4. There is also innervation of the pelvic floor support muscles via the sacral nerves roots S2-4. Pelvic floor muscle involvement is also a key component of the micturition cycle as seen in the schematic. See Diagram 1 for details of the innervation of the lower urinary tract.

There is a key coordinating role of the central nervous system. Urination, after about the age of two years old, becomes a function for which voluntary control occurs. The frontal lobes and basal ganglia may impart inhibitory signals that prevent micturition at inopportune times. The parietal lobes and thalamus receive and coordinate detrusor afferent stimuli. The pontine micturition center will integrate these inputs into socially appropriate voiding.

Aging and the Urinary Tract

The lower urinary tract and micturition cycle undergo changes associated with aging. These changes can be found in both continent and incontinent seniors. Thus, they do not cause incontinence but rather predispose to it. It is when the ability to compensate for bladder dysfunction is inadequate that urinary incontinence may develop[16]. Bladder capacity and force of contractility decrease and the post void residual volume (PVR) may increase[3]. There are age associated changes in the secretion of vasopressin and atrial natriuretic hormone that lead to the elderly excreting most of their fluids later in the day and at night[16]. This, compounded with the higher prevalence of sleep disturbance, results in one to two episodes of nocturia in the majority of *healthy* seniors. The detrusor muscle shows more overactivity with age and this can result in frequency, urgency, nocturia and UI. There seems to be a reduced ability to postpone voiding.

Types of Urinary Incontinence

When approaching a patient with incontinence, first consider if this is transient or established incontinence. This is the key initial step in evaluating incontinence. A transient cause should be sought in every patient because, if identified, continence can be restored in the majority.

1) **Transient**: Transient causes probably account for 1/3 of cases in community-dwelling seniors, up to half of cases of acutely hospitalized patients and a significant proportion of cases in nursing home patients[16]. There is an acute onset of incontinence and it is often that you will find a treatable cause. One must also include in this category the worsening of established incontinence, as these patients can also develop the problems listed below. The pneumonic "DIAPPERS" is used to recall possible causes[15].

Delirium
Infection – Urinary (symptomatic)
Atrophic urethritis/vaginitis
Pharmaceutical/Prostate
Psychological, especially depression
Endocrine (or excess fluid intake/output)
Restricted mobility
Stool impaction

Delirium, an acute confusional state, may cause incontinence that resolves when the cause of confusion is treated. Symptomatic UTI causes frequency, urgency and dysuria; all of these symptoms could lead to incontinence. Asymptomatic bacteruria, present in 10-30% of elderly patients, usually does not cause incontinence[3]. Atrophic vaginitis/urethritis can also cause urgency, dysuria and dyspareunia. The vaginal mucosa is often pale, thin and friable on examination.

Medications should always be reviewed. Diuretics can cause polyuria, frequency and urgency. Many prescription and over-the-counter medications have anticholinergic properties and may cause urinary retention, frequency and overflow incontinence. Benzodiazepines, especially long-acting agents such as diazepam, can accumulate in seniors and cause confusion and resultant incontinence. Alcohol can cloud the senses, impair mobility and induce diuresis. An elderly man with BPH may experience acute urinary retention and overflow incontinence if he takes a "cold" over-the-counter medication containing alpha agonist and anticholinergic components. Calcium channel blockers relax smooth muscle and can cause urine retention and overflow. ACE inhibitors can cause cough with resultant leakage. Opiates can cause urine retention and sedation. Severe depression may rarely be associated with incontinence.

Excessive urine production may be secondary to excess fluid intake or endocrine conditions (e.g. hypercalcemia, hyperglycemia, diabetes insipidus). This diuresis can result in frequency, nocturia and incontinence. Volume overload and fluid redistribution from congestive heart failure may also cause transient UI. Low albumin states or drug-induced ankle edema (e.g. nifedipine, indocid) can create polyuria. Stool impaction may result in overflow or urge urinary incontinence as well as fecal incontinence. Disimpaction should restore normal function. Lastly, restricted mobility is often a key issue in frail, hospitalized elderly. By providing a urinal or a bedside commode with scheduled toileting, you can provide simple solutions to help resolve the problem. Medical conditions, such as reduced eyesight or Parkinson's disease, can also restrict mobility and lead to functional incontinence.

2) **Established**: In this case, the incontinence is of a more chronic nature. A daily voiding diary may help to clarify the type and severity. There are four major types to consider. These are

urge (overactive bladder), stress, overflow and DHIC (detrusor hyperactivity with impaired contractility).

a) Urge (overactive bladder) incontinence:

This is thought to be the most frequent type of established incontinence in the elderly[16]. Symptoms include a sudden, uncontrollable need to void. It can result in the loss of large or small amounts of urine on the way to the washroom. It may include frequency, nocturia and enuresis. Occasionally patients identify a trigger, such as running water or cold temperature. This generally results from abnormal detrusor muscle contractions. The underlying etiology can be idiopathic or secondary to neurologic problems such as dementia, stroke or normal pressure hydrocephalus. It can also be due to local bladder irritation from an infection, stone, tumor or inflammation (e.g. interstitial cystitis). Other terms that are used in this context are detrusor hyperreflexia, which refers to detrusor overactivity associated with CNS lesions. Detrusor instability may refer to detrusor overactivity with no detected central nervous system lesion.

b) Stress incontinence:

This type is characterized by losses of small volumes of urine with increases in intraabdominal pressure (e.g. sneezing, coughing, lifting). There are two key types. One is termed anatomic stress incontinence. This is caused by anatomical changes resulting in bladder and bladder neck hypermobility. It is most often seen in women due to past vaginal childbirth or postmenopausal status. It is commonly seen in elderly women in ambulatory clinic settings and nursing homes[16]. Risk factors include pelvic prolapse, cystocele or urethrocele. The second type is referred to as intrinsic sphincteric deficiency and is caused by functional damage to the urethral sphincter mechanism. This is often a result of prior pelvic or bladder surgery, radiation or trauma.

In the office, you can observe the patient during straining (e.g. coughing) to confirm stress incontinence. This is best done with a full bladder (200cc). A patient with pure stress UI should have normal voiding habits (e.g. $\leq$ eight times/day and $\leq$ two times/night).

c) Overflow incontinence:

This is thought to be the second commonest type in elderly men. The bladder cannot empty properly and becomes overdistended. It has a variety of presentations: including dribbling, weak urinary stream, intermittency, hesitancy, straining, frequency and nocturia. Often, it results in the loss of continual, small volumes of urine. The most common cause is bladder outlet obstruction due to prostatic enlargement (e.g. BPH or prostate cancer). Rarely in women, cystoceles or uterine prolapse can cause obstruction. Finally, there could be a urethral or bladder neck stricture. A second, less common, mechanism can cause overflow incontinence: that is hypocontractility of the detrusor muscle. The detrusor may

be underactive from a neurogenic or nonneurogenic cause. The detrusor may have become fibrotic and replaced by connective tissue. Neurogenic causes include: peripheral neuropathy from diabetes mellitus, pernicious anemia and alcoholism or mechanical damage to the spinal nerves from a herniated disc, spinal stenosis or a tumor. These patients may require clean intermittent catheterization (CIC) or an indwelling foley catheter.

Here is a good place to mention the **postvoid residual**[7]. It can be divided into three categories: normal, acceptable and overflow (abnormal). A normal value is less than 50 mL. An acceptable range is considered between 50-199mL. Above 200 mL is considered abnormal in adults. The PVR can be measured by in and out catheterization or bladder scanning. Given the intra-individual variability, repeat determinations of PVR are recommended[16]. There is no clear evidence in the published literature on a maximal normal or a minimal abnormal PVR in seniors[16]. These values represent expert opinion and clinical judgment prevails in each individual case.

d) DHIC (detrusor hyperactivity with impaired contractility):

This type of incontinence combines symptoms of urge UI (e.g. urgency, frequency) with findings of overflow UI (e.g. weak flow rate and elevated PVR). One source suggests that DHIC accounts for the greatest proportion of established incontinence in frail elderly[16]. These patients may be at increased risk of urinary retention if treated with anticholinergic or antispasmodic medications (e.g. ditropan). Such bladder relaxing medications can help relieve the symptoms of detrusor hyperactivity and, if treatment is initiated, one should document the PVR prior to treatment and monitor regularly for increasing residual urine. Behavioral strategies, such as habit and bladder training, may also be tried. Double voiding (wait and try to void again before leaving the bathroom) can be useful. The Valsalva's maneuver and Crede`s maneuver (pressure applied to the bladder) may help to empty the bladder. Of course these should be done gently and only in appropriate patients (e.g. not at risk of syncope or bladder rupture). If the residual volumes are consistently elevated, the patient may require clean intermittent catheterization (CIC).

e) Mixed incontinence:

Often patients will present with a combination of symptoms (e.g. stress and urge). In this case, focus on the type that seems to predominate and trouble the patient.

Treatment

There are three main approaches to treatment: behavioral, pharmacological and surgical. There is evidence in the literature that monotherapy, such as behavioral or medication alone, is often not sufficient. It is advised, especially in frail seniors, to treat all remediable contributing factors outside the urinary tract prior to initiating medication therapy[16].

Behavioral techniques include: toilet assistance, bladder education/retraining, pelvic floor muscle exercises, biofeedback and electrical stimulation. Toilet assistance can include scheduled toileting or prompted voiding. Bladder education involves delayed and timed voiding, urge suppression and fluid/diet alterations. Bladder training may be useful for urge and stress UI. Habit training can help with urge UI. Prompted voiding is often used in frail or cognitively impaired patients. For stress incontinence, pelvic floor muscle exercises or Kegel exercises are used. Vaginal cones, weights that are inserted into the vaginal vault and held in place, can also be used to strengthen the pelvic floor muscles. Encourage patients to consume six to eight cups of fluid per day and limit intake of caffeine and alcohol.

Pharmacological therapy can be useful in many of the types of UI. The anticholinergic or antimuscarinic agents help relax the bladder and increase bladder capacity. These are used for incontinence with detrusor overactivity (e.g. urge). Several medications and formulations are available for urge UI : oxybutynin, tolterodine, solifenacin, darifenacin and trospium. Oxybutynin (Ditropan) is the first-choice drug in most centers for the treatment of the unstable bladder.[6] It has anticholinergic and local anesthetic properties. It is well absorbed and reaches maximal plasma concentrations 30min after ingestion. Excretion is via the kidneys with a plasma half-life of ~ 3 hours. Side-effects include dry mouth, constipation, dry skin, visual accommodation problems and reflux esophagitis. The initial dose is 2.5mg twice daily. Titrating the dose to 5mg twice daily can be done according to efficacy, side-effects and post-void residual. Before initiating these meds, one should ensure a normal post-void residual as urinary retention may ensue. There is some suggestion that you should wait 6-8 weeks between dosage changes[6]. There are new formulations available including : oxybutynin ER (Ditropan XL), oxybutynin patch (Oxytrol) and oxybutynin CR (Uromax). The patch appears to have comparable efficiency to oral formulations but with fewer anticholinergic side effects. Controlled release and immediate release oxybutynin have similar efficacy with better tolerability at higher doses with the CR formulation. Tolterodine (Detrol); it is a potent muscarinic receptor antagonist. The commonest side-effect is dry mouth and this is dose-related. One study compared tolterodine 2mg twice daily with oxybutynin 2.5-5mg twice daily and found equivalent efficacy but fewer adverse events and less dry mouth with tolterodine[7]. The study involved 378 patients over the age of fifty. There is also an extended release forumaltion of tolterodine (Detrol LA). Both of these medications should be avoided in patients with acute-angle glaucoma, and should be regarded as possible causes of delirium in patients presenting with acute confusion and recent drug initiation. Newer agents, the selective antimuscarinics, include solifenacin, darifenacin and trospium. There may be fewer cognitive side effects with these medications due to M3 and M2 versus M1 (CNS) receptor selectivity.

The role of estrogen replacement therapy in urinary incontinence treatment remains somewhat unclear. Traditionally, it has been used in postmenopausal women for stress incontinence. There is widespread anecdotal evidence but the literature is less clear. Another nonsurgical treatment often used in elderly women for prolapse is the vaginal pessary. The local pressure effect of these can cause erosions and thus they should be used with estrogen (e.g. local)[6.] Other local measures that are rarely used include intravesical oxybutynin (studies only), urethral occlusion (Impress, FemAssist), bladder neck prosthesis, periurethral collagen, and intravesical capsaisin.

In men with overflow incontinence, two classes of medication have been shown to decrease symptoms. The alpha-adrenergic antagonists terazosin, tamsulosin, prazosin, or doxazosin are marketed as Hytrin, Flomax, Minipres, and Cardura, respectively. These medications do not reduce the size of the prostate gland. The recommended dose of terazosin is 1 mg hs titrated to a maximum of 10 mg, while doxazosin and prazosin also start at 1 mg daily but can be titrated up to 8 mg and to 15 mg. Tamsulosin is generally started at 0.4 mg daily and can be increased to 0.8 mg; it is the most prostate specific and has the least vascular effects of the alpha-adrenergic antagonists. Patients on these medications must be monitored for postural hypotension, dizziness, peripheral edema, tachycardia, nasal congestion, impotence, and first-dose syncope. The 5-alpha reductase inhibitor finasteride (Propecia, proscar) can also be quite helpful. It is prescribed as 5 mg daily, and can cause decreased libido, impotence, breast tenderness, and gynecomastia.

Finally, surgical options can be used for various clinical scenarios. Retropubic suspension and sling can be used for stress incontinence. If overflow incontinence is due to obstruction (e.g. benign prostatic hypertrophy) then surgery may be required (e.g. transurethral prostatectomy).

A bit About Catheters

An indwelling catheter should be reserved for short-term use in decompressing urinary retention. Typically the catheter is left in place for one week and a voiding trial is then tried. Clamping the catheter is not generally advised. Occasionally they are used in other settings: to protect skin wounds from urine, in end-stages of life for comfort and quality of life, or as a last resort if medical and surgical management fails. Often you will see frail hospitalized elderly with catheters, usually due to restricted mobility.

Indwelling catheters can lead to significant morbidity. Bacteruria, usually polymicrobial, is almost universal after 30 days of catheter use. There is a risk of symptomatic urinary tract infection as a catheter is a foreign body. One reference suggests febrile episodes from catheter use occur in 1 per 100 patient days. Other complications include bladder stones, kidney stones, chronic renal inflammation and pyelonephritis[16.]

If a catheter is deemed necessary, there are a few tips to remember. Bacteruria and infection can be reduced with closed drainage systems. Little evidence supports the use of topical antibacterial agents, special catheters with antimicrobial coating or collection bag disinfectants. Routinely using antibiotics is not recommended to decrease the risk of infection and/or bacteruria. It can induce resistant bacteria and cause secondary infection (e.g. *Clostridium difficile* colitis). Bacteriuria is very common in catheterized patients and is not an indication for treatment unless there are obvious symptoms (e.g. fever, delirium, dysuria, pyuria). Culturing routinely in catheterized patients is also not recommended, as the flora are polymicrobial and fluctuating, not often predictive of infection. If a patient is symptomatic, cultures should be taken after a new catheter is placed. There are some cases where prophylactic antibiotics might be considered with catheterization (e.g. patient with prosthetic heart valve)

Occasionally, patients require indwelling catheters beyond short-term decompression (e.g. BPH awaiting TURP or not a surgical candidate). One option is clean intermittent self-catheterization. Of course, this requires sufficient dexterity and cognitive function. Proper

hygienic technique needs to be taught and regular decontamination and replacement of catheters is required. A frequency of catheterization that keeps the bladder volume at less than 400 mL can help minimize bacteriuria. If an indwelling catheter is the only option, then it should be frequently monitored for blockage. Changing catheters every 30 days is reasonable if a patient cannot be actively monitored (e.g. at home without homecare). If blockage is a problem, the catheter may require more frequent replacement. If patients are frequently monitored, then the catheter may be changed even less frequently than once per month (i.e. once every 3 months). One last problem that may occur is leakage around the catheter. This can be caused by several things: irritation by a large balloon, constipation/impaction, improper positioning or size of catheter, material blocking the catheter and bacteriuria.

When to Refer and/or When to consider Urodynamics[11]

If the diagnosis is uncertain or if treatment has been unsuccessful, one could consider referral for urodynamics. If there is persistent hematuria, not in the setting of infection, the patient may require cystoscopy. Another reason is if surgery is being considered and one needs to clearly identify the underlying type of UI (e.g. TURP or gynecological).

Further testing can be done with urodynamics. Tests for detrusor contractility are the voiding CMG (pressure flow) study and videourodynamics. Tests for urethral function include stress cystourethrogram, leak point pressure and dynamic profilometry.

Key points[13]

- ✓ Question patients about continence (e.g. continence questionnaire)
- ✓ Investigate patients who complain of incontinence
- ✓ Evaluate the patient with a history, physical and urinalysis
- ✓ Identify and manage transient cause of UI and exclude serious underlying conditions
- ✓ Identify the type of UI
- ✓ Identify the need for further evaluation by a specialist
- ✓ Identify treatment options

We must remember that incontinence is not a *normal* part of aging and it warrants thoughtful evaluation and treatment.

Diagram 1: Innervation of the Lower Urinary Tract

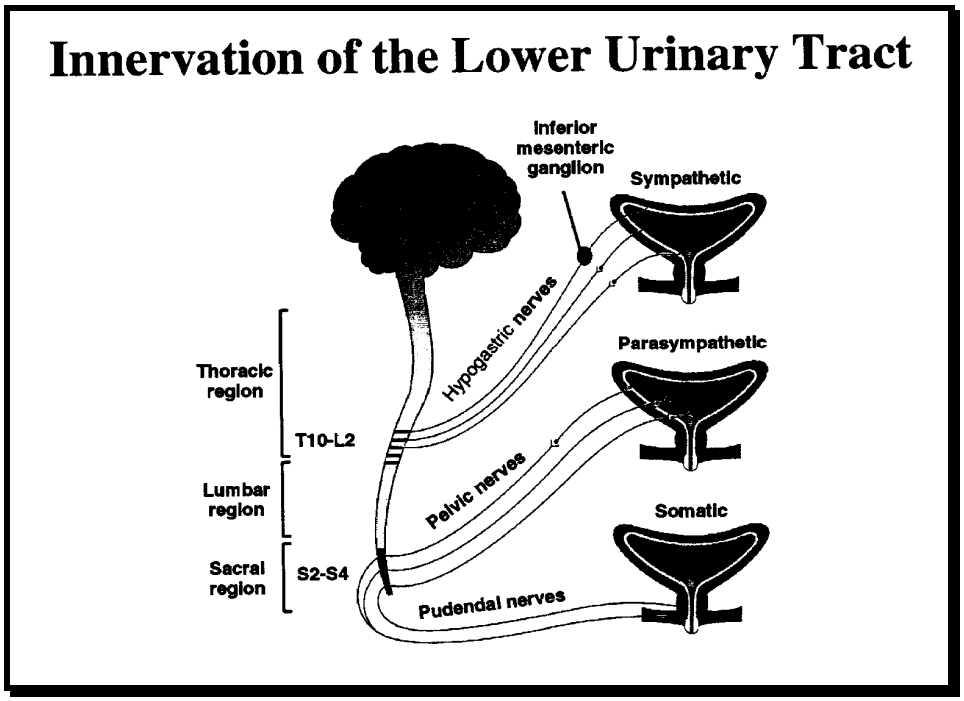

Diagram 2: Normal Micturition Cycle

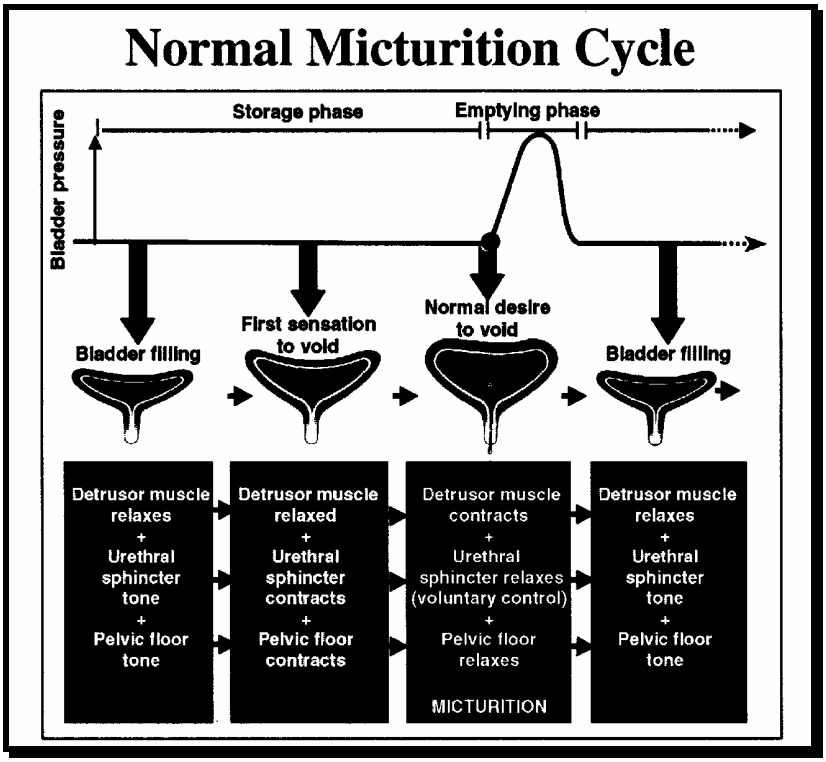

Table 1[9]

Pharmacotherapy of urinary incontinence

Type of Incontinence	Drug	Mechanism of Action	Adverse reactions
Urge incontinence	Oxybutynin IR: 2.5-5mg bid-tid XL: 5-30mg qd Tolterodine IR: 1-2mg bid LA: 2-4mg qd	Antagonize muscarinic cholinergic receptors to decrease strength of detrussor contractions Increase bladder volume before contraction, and increase maximum bladder capacity	Xerosis, constipation, dyspepsia, tachycardia, abnormal vision, headache, urinary retention, confusion
	Tricyclic antidepressants 25-100mg (caution in seniors)	Decrease bladder contractility, increase urethral resistance	Anticholinergic, postural hypotension, weakness, cardiac arrhythmia's, high risk of overdose
	Estrogen 0.5g vaginal cream Vaginal ring Oral Alpha-antagonists Only if BPH	Increase periurethral vasculature and tone, Increase urethral closing pressure	Endometrial and breast cancer, nausea, vaginal bleeding, mastodynia, headache
Stress incontinence (not used in seniors)	Alpha-agonists Ephedrine 25mg bid Pseudoephedrine 15-45mg tid Phenylpropanolamine 25-100mg bid SR	Increase urethral resistance by increasing tone in bladder trigone, base, and proximal urethra	Anxiety, agitation, restlessness, insomnia, headache, tachycardia, hypertension, diaphoresis, cardiac arrhythmia's
Obstructive Overflow (BPH)	Long-acting selective alpha1-antagonists Doxazosin 1-5mg qhs Tamsulosin 0.4-0.8mg pc Terazosin 1-5mg qhs	Relax smooth muscle in bladder neck and proximal urethra Decrease urethral pressure	Dizziness, peripheral edema, fatigue, postural hypotension, first dose syncope, headache, hypertension, dyspnea
	Finasteride 5mg qd	Decrease prostate volume by inhibition of conversion of testosterone to dihydrotestosterone	Decreased libido, erectile impairment, impotence, gynecomastia
Overflow with Neurogenic Bladder	Bethanechol 10-30mg bid-qid (short-term only)	Acethycholine agonist increases bladder cramps, contractility	Diarrhea, abdominal bradycardia, bronchoconstriction, hypotension, dizziness, headache, aggravates peptic ulcers, seizures, Parkinson's disease, hyperthyroidism

URINARY INCONTINENCE: Assessment Questionnaire

How long have you been having the problem with incontinence?
How often are you incontinent (wet yourself) and how often are you voiding in the toilet?
Do you wet yourself during the day and /or night?
Do you leak small or large amounts of urine?
When you feel the urge to go, do you have trouble getting to the bathroom in time?
Do you wake up wet at night?
Do you leak urine with coughing/sneezing/activity
Do you have to strain to pass urine?
Do you have the feeling that your bladder is not empty after passing urine?
Do you have difficulty getting to the toilet?
Do you have burning when you pass urine?
Are you constipated?

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