

Urinary Incontinence in the Geriatric Population

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Abstract

Background: Urinary incontinence is a widespread, yet potentially treatable, problem in the geriatric population.

Methods: We reviewed the geriatric and urologic literature to provide an update on the definition, diagnosis, and treatment of geriatric urinary incontinence.

Results: Urinary incontinence affects 15–30% of elderly individuals in the community and 50% of those living in nursing homes. Both age and gender affect bladder function, and incontinence affects females and males in a ratio of 2:1. Incontinence can be classified as urge, stress, overflow, functional, or mixed. There are many reversible causes of incontinence, and a thorough history and physical examination, including a complete voiding history and a tailored neurourologic examination, are required for accurate diagnosis. Treatment options include behavioral modification, medical therapy with anticholinergics or hormone replacement, and surgical intervention.

Conclusions: Urinary incontinence, due to many causes, is a widespread problem among the elderly. Yet many of these causes are reversible with appropriate treatment, often by the primary care provider. Some patients may require urologic referral for sophisticated urodynamic studies and possible surgical intervention, in select cases.

Key Words: Incontinence, voiding dysfunction, geriatric.

Introduction

INCONTINENCE is a widespread, yet potentially treatable, condition in the geriatric population. It affects 15–30% of elderly individuals living in the community and is even more prevalent in nursing homes, where approximately 50% are affected by incontinence (1). It is frequently underreported and undertreated because of the mistaken belief that incontinence is part of the normal aging process. The true incidence is probably much higher. The economic and social costs of incontinence are staggering. Annually, more than \$3 billion is spent managing incontinence in nursing homes alone (2). Furthermore, there are tremendous personal and social costs, including effects on the morale of patients and

their caregivers, social isolation, immobility, and unnecessary institutionalization. Some problems may arise because incontinent individuals adapt their behaviors to avoid public embarrassment due to urine leakage.

Effects of Age and Gender on Bladder Function

Bladder function is altered in many ways by the aging process. More than half of normal elderly individuals experience the symptom of nocturia. Overall bladder capacity is reduced, as is the urethral closure pressure (a measure of urinary sphincteric function). Post-void residual urine volumes are elevated, and patients tend to produce larger volumes of urine as a result of a reduction in renal concentrating ability. Uninhibited detrusor contractions may be seen in 10% of women and 30% of men (3). Aging can lead to slowed reaction times and limited mobility, which may affect a patient's ability to get to bathroom facilities in a timely manner. In addition, benign prostatic hyperplasia (BPH), with resultant bladder outlet obstruction, becomes more prevalent in elderly men (4).

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Older women have an even higher predisposition to develop urinary incontinence than older men, in a ratio of 2:1. Histologically, hypertrophic changes in bladder smooth muscle, collagen, and elastic tissue occur more frequently in elderly women. Furthermore, there may be degeneration and fibrosis of the bladder wall and decreased bladder capacity, as well as diminished muscle tone in the bladder, internal and external sphincters, and pelvic floor musculature. There is also a reduction in bladder contractility. The exact reasons for these gender-related changes are not entirely known. However, contributory factors include: a history of childbearing, gynecologic procedures, hormonal changes occurring after the onset of menopause, and obesity.

Classification of Urinary Incontinence

As defined below, incontinence may be classified as urge, stress, overflow, functional, or mixed:

- Urge incontinence** is defined as leakage of urine associated with a sudden, strong desire to void. This is often associated with bladder overactivity on cystometric analysis, but it is not specific for this condition. Urodynamically documented bladder overactivity has traditionally been subdivided into two categories, based on the presence or absence of associated neurologic conditions. Detrusor instability was the term used to describe bladder overactivity occurring in the absence of neurologic conditions, while detrusor hyperreflexia was used to describe bladder overactivity associated with known neurologic conditions. The International Continence Society has recently changed the terminology, and the preferred terms are idiopathic detrusor overactivity and neurogenic detrusor activity (Figure) (5). Idiopathic detrusor overactivity may be seen with bladder irritation from urinary tract infection (UTI), vaginitis, fecal impaction, stones, and other local causes, while neurogenic detrusor overactivity is seen in upper motor neuron lesions, stroke, multiple sclerosis, Parkinson’s disease and spinal cord injury.
- Stress incontinence** is defined as leakage of urine that occurs with increases in intra-abdominal pressure from coughing, sneezing, laughing, straining, or exercising. It is

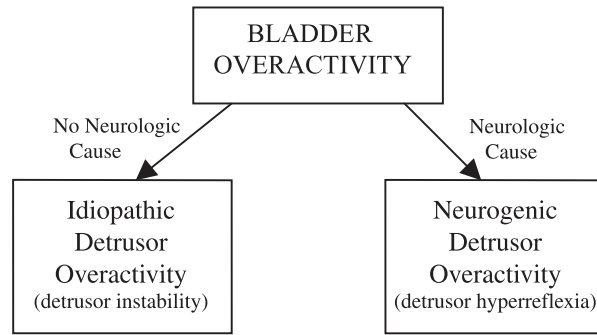


Fig. Subclassification of bladder overactivity.

associated with pelvic floor muscle laxity, neuropathy, and prior urologic surgery. Risk factors include multiple childbirths and traumatic deliveries (Table 1).

- Overflow incontinence** is defined as leakage of urine associated with an overfilled bladder. This has also been termed “paradoxical incontinence,” because symptoms of urgency and frequency occur despite the

TABLE 1
Work-up of Female Stress Urinary Incontinence

History	Number of childbirths Delivery type Prior pelvic surgery
Physical Examination	Vaginal speculum examination –atrophic vaginitis –urethral prolapse –cystocele –uterine prolapse –rectocele –enterocele
Specialized Tests	Marshall test Q-Tip test (positive if >30 degrees) Urodynamics
Treatments	Behavioral modification –Kegel exercises –biofeedback Medical therapy –hormones (atrophic vaginitis) –alpha-agonists Surgical treatments –retropubic/vaginal suspensions –pubovaginal slings –artificial sphincters –submucosal bulking agents

presence of a full bladder. The causes include outlet obstruction, poor detrusor contractility, and impaired sensation of fullness.

- **Functional incontinence** is defined as leakage of urine that occurs in the setting of normal bladder and urethral function in an individual who has poor mobility or mental confusion. This type is quite common in elderly, debilitated, and institutionalized patients.
- **Mixed incontinence** is defined as leakage of urine attributed to multiple factors, as defined above.

Recently, the term “overactive bladder” was added to the classification scheme. This entity, which may or may not be associated with urge incontinence, is a condition in which an individual voids at least eight times during the day and/or twice at night. The term, however, is very nonspecific and gives no insight into the underlying pathophysiology. It may imply detrusor overactivity, or it may simply reflect patient habit. A patient with genuine stress urinary incontinence, for example, may void frequently in order to reduce the probability of incontinence episodes. Classifying this patient as having an overactive bladder oversimplifies the problem and could potentially delay both proper diagnosis and treatment. The term “overactive bladder” should therefore be used with caution by physicians and patients alike.

Finally, a common problem seen almost exclusively in the elderly is detrusor hyperactivity with impaired contractility (DHIC) (6). This condition is perhaps the most common cause of incontinence in the frail elderly (7) and can be very difficult to diagnose and treat. Diagnostically, this disorder may mimic either stress or urge incontinence. Treatment with anticholinergic agents may be difficult because of the risk of precipitating urinary retention.

Reversible Causes of Geriatric Incontinence

In the elderly population, there are many non-urolgic conditions which predispose individuals to urinary incontinence. Treatable causes may best be remembered by the acronym DIAPPERS and are listed in Table 2.

History and Physical Examination

In order to make the correct diagnosis, a thorough history and physical examination is

TABLE 2
Reversible Causes of Geriatric Incontinence:
*“DIAPPERS.”**

D	Delirium /Dementia
I	Infections (urine, vagina)
A	Atrophic vaginitis
P	Psychological causes (especially depression)
P	Pharmaceutical agents
E	Endocrine conditions (diabetes)
R	Restricted mobility
S	Stool impaction

*Modified with permission from Resnick NM, Yalla SV. Geriatric incontinence and voiding dysfunction. In: Walsh PC, Retik AB, Vaughan ED, Wein AJ, editors. *Campbell's urology*. 7th ed. Philadelphia (PA): W.B. Saunders Co.; 1998. p. 1045 (7).

imperative for patients in this age group. Comorbid medical problems may contribute to incontinence and should be carefully noted. Conditions such as diabetes mellitus, Parkinson's disease and cerebrovascular accident (CVA) commonly affect voiding function in a variety of ways. A history of all active pharmacotherapy is also important, since medications such as diuretics, anticholinergics and narcotic analgesics can affect voiding function.

A voiding history must be obtained, and patients or caretakers should be questioned about obstructive and irritative symptoms. Obstructive symptoms include straining, decreased force of stream, intermittent flow, and hesitancy. Irritative symptoms include urgency, frequency, and urge incontinence. A history of prior surgery, especially pelvic or spinal surgery, is important, as disruption of nerve pathways supplying the bladder and urethral sphincter can sometimes occur during these types of procedures. A history of prior trauma is also important. A voiding diary is a means for patients to provide objective data, by documenting the number of bathroom visits, the number of protective pads used, and even the volume of urine per void (Table 3). This may be a difficult task for some patients to perform, especially those with cognitive impairment. However, caregivers can be extremely helpful in providing this valuable information. From these sources, data can be collected at baseline and during treatment, to document an objective response to treatment.

A tailored physical examination is also required when evaluating the geriatric patient with incontinence. The abdomen should be inspected for scars, and palpated for masses,

TABLE 3
Sample Voiding/Incontinence Record

Date	Time	Voids Wet/Dry	Volume	Pads	Severity of Leakage (mild, moderate, severe)	Comment
11/1	7:45am	Wet	Approx 150 cc	3	moderate	Running for the bus
	11:20am	Dry	100 cc	*	*	*
	2:30pm	Dry	100 cc	*	*	*
	4:15pm	Wet	Approx 200 cc	*	mild	Coughing
	7:00pm	Wet	Approx 100 cc	*	mild	Coughing
	11:15pm	Dry	300 cc	*	*	*
11/2	7:30am	Dry	400 cc	2	*	1st am void
	11:15am	Dry	200 cc	*	*	(no coffee today)
	4:10pm	Wet	Approx 150 cc	*	moderate	Laughing
	7:00pm	Wet	Approx 100 cc	*	mild	Sneezing
	11:30pm	Dry	300 cc	*	*	*

* = not recorded

bladder distension and costovertebral angle tenderness. In men, a rectal examination gives information about the size and consistency of the prostate. A neuro-urologic examination should be performed, in which perianal sensation (including the sacral S2-4 dermatomes), anal sphincter tone and voluntary pelvic floor contractions are tested (Table 4). Furthermore, the bulbocavernosus reflex should be elicited. In this test, the examiner pinches the glans penis or clitoris (or pulls gently on an indwelling urethral catheter) while the index finger of the opposite hand is inserted in the rectum. A contraction of the anal sphincter demonstrates that the bulbocavernosus reflex is intact. While this reflex may be absent in more than 30% of normal individuals, its presence rules out significant sacral neuropathy and proves that the sacral reflex pathways are intact.

In women, a vaginal examination can detect mucosal friability, petechiae, telangiectasia, and vaginal erosions, which are the hallmarks of atrophic vaginitis. A pelvic bimanual examination can also identify pelvic floor descent or prolapse of pelvic organs, including urethrocele, cystocele, enterocele, uterine, vaginal, and rectal prolapse. Simple objective tests for stress urinary incontinence can also be performed. To document hypermobility of the bladder neck

and urethra, the posterior blade of a vaginal speculum is inserted and the posterior vaginal wall retracted. By asking the patient to bear down or cough, the degree of support anteriorly can be assessed. If leakage of urine through the urethral meatus is observed, the diagnosis of stress incontinence is confirmed.

When anterior vaginal wall hypermobility and stress incontinence are documented, a Marshall test can be performed. A clamp with a folded gauze pad is used, and the base of the bladder and urethra are supported and lifted retropubically, making sure not to actually occlude the bladder outlet. A positive Marshall test occurs when previously demonstrated incontinence is eliminated after this pressure is applied. This indicates that bladder neck suspension procedures may potentially cure the incontinence. Likewise, the Q-Tip test is a simple measure of urethral hypermobility. In this test, a well-lubricated, sterile, cotton-tipped applicator is inserted into the urethra with the bladder full. The patient is then asked to perform a Valsalva's maneuver, and the change in the angle of the applicator is noted. An angle change of greater than 30 degrees is suggestive of urethral hypermobility.

Laboratory Work-up

Laboratory investigations are sometimes necessary to aid in the diagnostic process. For all patients, a urinalysis and culture as well as a serum blood urea nitrogen and creatinine level should be obtained. A finding of microscopic hematuria (usually defined as more than five red blood cells per high-powered microscopic field in the spun urinary sediment) warrants fur-

TABLE 4
Tailored Neuro-urologic Examination

S2-S4 dermatomes — Pinprick sensation
Lower extremity reflexes
Bulbocavernosus reflex test
Anal sphincter tone
Voluntary pelvic contractions

ther investigation, including imaging studies of the urinary tract, urinary cytology, and cystoscopic examination of the bladder. In this way, the presence of potentially treatable entities such as urinary calculi, renal masses, urothelial malignancies, and carcinoma-*in-situ* of the bladder can be identified.

A large number of elderly patients, especially those with indwelling catheters or external collecting devices, have pyuria (usually defined more than 10 white blood cells per high-power microscopic field in the spun urinary sediment) or bacteriuria (8). In general, however, asymptomatic pyuria or bacteriuria in these patients should not be treated. In this setting, treatment selects for more pathogenic strains of bacteria and bacterial resistance. Furthermore, long-term cure rates are no different than for those receiving placebo therapy, due to common re-infections and the occurrence of spontaneous cures (9). The exception to this rule is the presence of asymptomatic infections with proteus species. Because of its urease activity, this bacterium is associated with the formation of infection or struvite stones. Therefore, proteus infection, symptomatic or asymptomatic, should always be treated. Also, the physician should be aware that urinary tract infections may not present in the typical manner in the elderly population. Lethargy and confusion, for example, may replace the more common presenting symptoms of fever and dysuria. A high index of suspicion is therefore required.

Radiologic Work-up

Imaging studies may be necessary in the work-up of certain patients with incontinence. Renal sonography is useful for men with post-void residual urine volumes greater than 100 mL, to rule out hydronephrosis or other upper tract lesions. Likewise, for any patient with associated hematuria (either microscopic or gross), evaluation of the status of the upper urinary tract is mandatory. This evaluation would include sonography, intravenous urography or occasionally computed tomography or magnetic resonance imaging. A cystogram can provide information regarding the lining of the bladder or the presence of stones, tumors, diverticulae, or fistulae. A voiding cystourethrogram (VCUG) is used to identify urinary reflux and to evaluate for urethral lesions. These imaging studies should only be used in a select subset of patients.

Urodynamics

Formal urodynamic testing is not mandatory for all incontinent individuals, but it is useful to help clarify the diagnosis for patients with complicated histories. Formal urodynamics is also indicated for patients for whom empiric therapy is unacceptable or has failed, or for whom surgical intervention is planned (10). An example is an elderly male patient with Parkinson's disease in whom bladder outlet obstruction from BPH as well as neurologic voiding dysfunction may contribute to his overall clinical picture.

Cystoscopy

The need for a cystoscopic evaluation is by no means universal and should be tailored to the individual patient. In selected cases, cystoscopy may identify the presence of tumor and bladder trabeculations, and evaluate urethral integrity. Certain types of fistulae such as colovesical fistulae, which can occur as a complication of sigmoid diverticulitis, or vesicovaginal fistulae, which may occur after complicated gynecologic surgeries or after radiotherapy for cervical carcinoma, can often be identified through the cystoscope. In addition, cystoscopy provides valuable information about the size and configuration of the prostate and is useful in men with BPH who are candidates for transurethral resection of the prostate.

Treatment of Incontinence in the Elderly

Behavioral Approaches

Behavioral therapy has been shown to be an effective tool in managing several types of incontinence experienced by the elderly. Techniques include bladder training, pelvic floor muscle exercises, and biofeedback. "Bladder training" refers to a regimen of gradually increasing the intervals between voiding episodes. "Pelvic floor rehabilitation," also called Kegel maneuvers or Kegel exercises, refers to a regimen of exercises designed to strengthen the urethral sphincter and levator muscles of the pelvic floor. Biofeedback combines Kegel maneuvers with computer or other technologies which are used to translate physiological information into visual or audible signals. All of these techniques have been shown to reduce the degree of urinary incontinence of both the urge and stress varieties.

In the geriatric patient population in nursing homes and similar facilities, simple behavioral interventions have been quite effective in the treatment of incontinence. Hu et al. (11) performed a study in which demented and dependent nursing home patients were checked hourly and prompted to void. With this regimen, there was a 26% overall reduction in incontinence, and 38% of the patients improved by more than 50%. While many studies have confirmed the effectiveness of prompted voiding techniques in elderly nursing home patients, the available data indicates that these effects are primarily seen in the short term (12).

Medical Approaches

Drug therapy for geriatric incontinence includes anticholinergics, hormones, alpha-antagonists, and several miscellaneous agents. Practitioners sometimes avoid use of these medications for the elderly for fear of heightened side effects. This question was addressed in a study examining the effects of oxybutynin pharmacokinetics in the elderly population (13). In this study, serum oxybutynin levels were tested in 21 elderly patients being treated with oxybutynin at 2.5 mg or 5.0 mg three times daily, and compared with a control population of healthy young men treated similarly. The results demonstrated that there were no differences in mean peak plasma levels between the two age groups. Overall, two-thirds of the patients experienced minor side effects, usually dry mouth. The authors therefore concluded that this anticholinergic medication in normal doses is safe for use by the elderly.

Newer anticholinergic medications with improved side-effect profiles and less frequent dosing schedules have recently become available. An example is tolterodine tartrate (Detrol®), available at 1 mg and 2 mg and administered twice daily. Long-acting forms of tolterodine tartrate (Detrol LA®, available as a once-daily dose of 4 mg) and oxybutynin (Ditropan XL®, available as a once-daily dose of 5–15 mg) are now on the market and approved for use. These agents are generally well tolerated and seem to be associated with improved patient compliance.

Oral and topical estrogen therapy have been mainstays in the treatment of urgency and frequency caused by atrophic vaginitis and urethritis. Preparations include low-dose, unconjugated oral estrogens or topical, intravaginal, conjugated estrogen cream. A course of treatment should be administered for one to two

months. The estradiol vaginal ring (Estring®) is a 90-day, sustained-release form of estradiol consisting of a silicone ring that is impregnated with estradiol. Women with an intact uterus should have cyclic progesterone therapy added to their hormone regimens. Because estrogen therapy is a known risk factor for the development of endometrial cancer, the risks and benefits of therapy should be discussed with all patients, and patients with a history of breast cancer should not receive this treatment. There have been many articles on the use of both oral and topical estrogen supplementation in the postmenopausal patient. The rates of cure or improvement ranges from 0–65%. Many other studies have been carried out under less than ideal circumstances. In a meta-analysis, it was concluded that estrogen did provide substantial subjective improvement (14).

However, for stress incontinence, the role of hormone therapy is less well established. Some studies show increases in urethral closure pressure with use of estrogen therapy (15). In addition, the use of combination therapy with alpha-agonists and estrogen therapy has had some success, but the results appear to be similar to those for patients treated with behavioral therapy (16). Furthermore, estrogen may be useful in the preoperative period, to maximize the benefits of surgical therapy.

Alpha-blocker therapy is a mainstay of treatment for BPH in elderly men. Smooth muscle of the prostate is rich in alpha receptors (17) and alpha blockade provides symptom relief for a majority of patients (18). Notable side effects include dizziness, hypotension, and sexual dysfunction. Patients are therefore advised to take these medications (including terazosin and doxazosin) at bedtime, and gradual dose escalation is often required. Recently, a newer prostate-selective alpha-blocking agent, tamsulosin, has become available. The advantage of this agent is that hypotension does not occur. Morning dosing is therefore possible and dose escalation is not necessary. In men with large prostates (over than 40 grams), 5-alpha-reductase inhibition therapy with finasteride can be prescribed. This agent causes a reduction in prostate volume, but takes up to three months to achieve maximal effects (19).

Surgical Approaches

Surgical therapy is available for correction of incontinence for appropriate patients. Bladder neck suspension and sling procedures are

used for treatment of stress urinary incontinence in female patients. Urethral hypermobility is corrected during common retropubic bladder neck suspensions such as the Marshall-Marchetti-Krantz procedure, in which the anterior paravaginal fascia is attached to the posterior pubis, and the Burch colposuspension, in which the anterior paravaginal fascia is attached to Cooper's ligament. Transvaginal needle suspension procedures such as the Raz and Stamey procedures produce similar results. However, these procedures do not treat intrinsic sphincter deficiency, which is a common cause for primary post-operative failures. Pubovaginal sling procedures, in which a piece of autologous fascia, donor fascia, or synthetic material is placed under the urethra and secured, have been developed to address the problem of intrinsic sphincter deficiency. The creation of a "backboard" under the urethra and bladder neck treats both hypermobility and sphincter deficiency, and explains why this procedure has grown in popularity among practicing urologists.

Artificial urinary sphincters are sometimes used to correct incontinence in male patients who have post-prostatectomy incontinence or neurologic causes of intrinsic sphincter deficiency. Some medical centers implant artificial sphincters occasionally in women in order to correct severe forms of intrinsic sphincter deficiency. BPH can be effectively treated with transurethral resection of the prostate or simple prostatectomy in patients who fail medical therapy.

Miscellaneous Treatments

Newer treatments for incontinence include electrical stimulation of sacral nerve roots via an internal or external device or injection of bulking agents such as collagen around the urinary sphincter. For patients not helped by medical therapy for overactive bladder and/or urge incontinence, sacral nerve stimulation (Interstim[®], Medtronic, Minneapolis, MN) is a relatively new option that is available. In this technique, one of the sacral nerve roots is stimulated percutaneously using an insulated needle, in the outpatient setting. A thin stainless steel wire is left in place, and the patient wears a small stimulator for 3–7 days. If a greater than 50% reduction in symptoms is achieved during this test stimulation, the patient becomes a candidate for placement of a permanent stimulator. In this surgical procedure, a permanent electrode is inserted into the sacral foramen and is secured in place along with an implantable pulse generator which can

provide years of stimulation. This technique has been quite successful in some of the most difficult cases (20). A good response to short-term percutaneous stimulation predicts a successful permanent implant, and long-term data demonstrates durable results (21).

Transurethral injections of collagen and other bulking agents such as Durasphere[®] (Carbon Medical Technologies, Inc., St. Paul, MN) (silicone-coated carbon particles) have been used for women with intrinsic sphincter deficiency in whom poor urethral coaptation is the most relevant etiologic factor. Placement of the bulking agents in a submucosal plane improves coaptation of the urethral mucosa, allowing for an improved "seal effect." The principal advantage of these agents is that the procedure can be done on an outpatient basis using local anesthesia or light sedation, and it can be repeated if necessary. Although the short-term results with injectables are quite promising, durable long-term results and prospective comparison to formal anti-incontinence surgery are not available (22). However, the lack of morbidity and the ability to repeat the procedure make it especially attractive for the geriatric population.

Indications for Urological Referral

Incontinence is a complicated and often debilitating condition in the geriatric population. Many, if not most, patients can be easily treated by primary care physicians and geriatricians. However, some challenging clinical situations warrant referral to a urologist. Referral is indicated for patients with high post-void residual volume (>200 cc), severely limited bladder capacity (<100 cc), recent pelvic surgery or irradiation, frequent UTIs, hematuria, and marked pelvic prolapse. In addition, men and women with stress urinary incontinence who are candidates for surgical correction should be referred.

Conclusions

Incontinence is a widespread condition in the elderly population. However, many treatable causes can be identified with a thorough history and physical examination, which include a voiding history and a tailored neurourologic examination. Treatment options for geriatric incontinence include behavior modification, medical therapy, and surgical intervention. Complicated cases may require urologic referral for sophisticated urodynamic evaluations, cystoscopy, or surgical therapy.

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