# Chapter 3
# Diagnosis of Urinary Incontinence in Women


**Elizabeth Dray and Haritha Pavuluri**

## Introduction

Urinary incontinence is a widely prevalent disorder in women which negatively impacts patient quality of life and leads to significant societal and personal costs [8]. On average, a symptomatic woman will spend $750 per year out of pocket on incontinence management [20]. This burden can be substantially reduced by treatment of a patient's incontinence [21]. In order to effectively treat, a clinician must first accurately diagnose. In this chapter, we will review the differential diagnosis of incontinence in women and how history and physical exam findings can help discriminate between these etiologies. We will review noninvasive tests that can strengthen this data. We will then identify when it is appropriate to pursue more invasive or resource-intensive studies for the characterization of incontinence.

## Differential Diagnosis

The first step in determining the cause of urinary incontinence is establishing that the perceived wetness is, in fact, urine. Non-urinary causes of wetness include physiologic or pathologic vaginal discharge and peritoneal fluid or dialysate. The quantity and quality of normal vaginal discharge can vary widely amongst women. Increased vaginal discharge can be caused by infection or malignancy, and vaginal wet prep, STD testing, and imaging if indicated can be used to differentiate between

E. Dray (✉) · H. Pavuluri
University of South Carolina School of Medicine Greenville, Greenville, SC, USA
e-mail: elizabeth.dray@prismahealth.org



A. P. Cameron (ed.), *Female Urinary Incontinence*,
https://doi.org/10.1007/978-3-030-84352-6_3

these sources. Some individuals may find normal discharge distressing, and, once infectious or other pathologic etiologies are ruled out, can be educated and reassured. In the setting of prior pelvic surgery, radiation, or malignancy, peritoneovaginal fistulae can form, leading to continuous leakage of peritoneal fluid per vagina. Rarely, patients may develop fistulae between the fallopian tube and the vagina as well. Ascites or the use of peritoneal dialysis should also raise suspicion for a non-urinary cause of wetness in the setting of continuous leakage.

An ectopic ureter beyond the continence mechanism or other congenital anatomic abnormality should be investigated in the setting of lifelong incontinence, specifically continuous urinary incontinence.

Transient causes of incontinence should always be considered in a patient's workup. Causes of transient incontinence can be remembered by the mnemonic DIAPPERS (Delirium, Infection, Atrophic vaginitis, Psychologic, Pharmacologic, Excess urine production, Restricted mobility, Stool impaction) [14]. History taking specifically correlating incontinence onset with other health events or new medications is integral in making these diagnoses. Often, these conditions do not require urologic intervention, but rather deductive reasoning and interspecialty communication (i.e., referral to endocrinology, stool disimpaction, etc.). Functional incontinence, while not always transient, is a prime example of a situation where a urologist can easily overtreat to a patient's detriment. Functional incontinence is when an individual has a normal urologic function but may experience incontinence due to decreased ability to access a bathroom in a timely fashion. This is typically secondary to underlying comorbidity, such as dementia or Parkinson's disease. The "treatment" may be as straightforward as providing the patient with a bedside commode or having them work with physical therapy to improve mobility.

Urinary incontinence should be classified as urgency urinary incontinence (UUI), stress urinary incontinence (SUI), or mixed incontinence (MUI). Overflow incontinence is the presence of incontinence in an overfull bladder [3]. Continuous leakage of urine, coital incontinence, and post-void dribbling are not in and of themselves discrete forms of incontinence but instead manifestations of urgency or stress incontinence, urinary retention, or anatomic abnormalities such as urologic fistula or urethral stricture/stenosis. All forms of incontinence require evaluation beyond history taking, and in the view of many experts, the leakage should be directly observed prior to the patient undergoing invasive therapies.

## History and Physical Exam

When evaluating urinary incontinence in a female, taking a complete history is essential. Past medical history should include surgical history (specifically prior pelvic, obstetric, or back surgeries), medical history (neurologic conditions, endocrine dysfunction, connective tissue disorders, radiation, trauma), and gynecologic and obstetric history, including parity and pre- or postmenopausal status. Current medications, as well as any prior pharmacotherapies for incontinence, should be

assessed. Exogenous hormones, sympathomimetics, sympatholytics, anticholinergics, and diuretics may all contribute to symptoms of urinary incontinence. When assessing the history of present illness, incontinence can be subjectively characterized by asking whether the patient leaks with activity or cough/sneeze, with urgency, or both. If the answer is both, the patient should be asked which is more bothersome to them. An attempt should be made to evaluate the severity and frequency of a patient's leakage, which can be determined by the number of pads or briefs a patient uses per day or the number of times they change clothes due to incontinence. It is important to ask the degree of saturation of a patient's briefs or pads as some patients may be bothered by relatively small amounts of urine loss and change pads frequently even if they are not saturated. Voiding frequency, both during the day and at night should be assessed, as well as the presence or absence of dysuria, pelvic pain, urinary tract infections, and hematuria. The patient should be evaluated for obstructive lower urinary tract symptoms (straining, subjective incomplete emptying, weak stream), gastrointestinal symptoms (i.e., fecal incontinence or constipation), and prolapse complaints, as pelvic floor disorders frequently coexist [9]. Patients should be asked about neurologic symptoms, particularly, if there is new-onset urge urinary incontinence in a young woman, as urinary incontinence may be the harbinger of a neurologic condition such as multiple sclerosis. Lastly, it is extremely important to assess the impact that incontinence has on a patient's quality of life. In the vast majority of cases, incontinence is not life-threatening and therefore should only be intervened on if it is bothersome to the patient.

The characteristics of a patient's urinary incontinence can also be assessed using a variety of validated questionnaires. Commonly used metrics include the Urogenital Distress Inventory short form [UDI-6], the Incontinence Impact Questionnaire short form [IIQ-7], the International Consultation on Incontinence Questionnaire Urinary Incontinence short form [ICIQ-SF], the King's Health Questionnaire [KHQ], Patient Global Impression of Severity Scale [PGI-S], and the Michigan Incontinence Symptoms Index (M-ISI). These questionnaires assess SUI, UUI, severity, and quality of life and appear to be mostly well-correlated [10]. In addition to incontinence symptoms, prolapse and colorectal symptoms can be assessed using the pelvic floor distress inventory (PFDI).

History alone is not entirely reliable in evaluating urinary incontinence, and a physical exam should always be performed. Age, weight, and debility should be evaluated, as these factors are correlated with incontinence and may affect whether the patient is an operative candidate [24]. An abdominal exam can provide important information, such as the presence of incisions and suprapubic fullness or tenderness. Every patient undergoing an initial evaluation of incontinence should have a pelvic exam. This should assess the external genitalia (including estrogenic status), urethra, uterus, and adnexa, and the presence or absence of pelvic organ prolapse (POP). The supine cough stress test (CST) is the gold standard for the diagnosis of stress urinary incontinence in women. This is performed with the patient in lithotomy position and the bladder filled to a comfortable degree and is considered positive if incontinence is shown with cough or Valsalva. If incontinence cannot be demonstrated in the supine position, the test can be repeated standing. The

correlation of a positive CST with urodynamic-proven SUI is >90% [6]. Urethral position and mobility may be evaluated at rest and with straining and coughing to assess for urethral hypermobility. Mobility beyond 30° is generally considered abnormal. This may be aided by the "Q-tip test," where a lubricated Q-tip is placed in the urethra prior to Valsalva, which is only needed if there is uncertainty on the physical exam. While the presence of urethral hypermobility may help determine whether a patient is a good candidate for a specific surgical intervention, such as a midurethral sling, it does not appear to have any significant predictive value in diagnosing the presence of stress incontinence [5]. POP should be evaluated using a split speculum exam and documented using a standardized and reproducible classification technique, such as the Baden-Walker or Pelvic Organ Prolapse Quantification (POP-Q) system. If there is a known or suspected history of a neurologic condition, a brief neurologic exam can be performed to assess rectal sphincter tone and the presence or absence of the bulbocavernosus reflex (Table 3.1).

## Noninvasive Testing

A variety of noninvasive tests can be used to gain further information and rule out potential causes of urinary incontinence. Urinalysis is usually the first lab test that is ordered in a patient with urinary incontinence. An abnormal urinalysis, such as the presence of blood, glucose, or leukocyte esterase (LE), can indicate secondary causes of incontinence. If unexplained hematuria is noted (≥3 rbc/hpf), cystoscopy should be pursued (AUA Guideline on hematuria). Glucosuria should prompt endocrine or internal medicine referral for diabetes workup if this has not yet been diagnosed or communication with the primary care provider regarding blood glucose control if this is known comorbidity. A urine culture should be sent if LE or nitrites are found, as a urinary tract infection may be the source of a patient's incontinence or an exacerbating factor in their symptoms.

A postvoid residual (PVR) should be obtained to rule out incomplete bladder emptying and to assess the appropriateness of interventions (i.e., urinary antispasmodics or sling). PVR may be obtained by noninvasive ultrasound or sterile in and out catheterization, as they are considered equivalent [22]. There is no universal definition of elevated PVR; however, the vast majority of women have a PVR <100 cc [22]. While PVRs greater than or equal to 300 cc may be acceptable in asymptomatic individuals without high-risk features, incontinence is, by definition, a symptom [18]. The author would therefore suggest that a PVR > 100 cc prompt a more invasive workup prior to irreversible interventions.

Bladder diaries, or frequency volume charts, are useful methods of both characterizing incontinence and revealing nonadaptive patient behaviors. These can be kept for 24–72 h. There is significant recall bias in patient-reported urinary frequency, nocturia, and incontinence, with patients often overestimating the severity of their symptoms [19]. Voiding diaries give objective evidence of excessive fluid or

**Table 3.1** Common findings in the history of presenting symptoms, past medical history, physical exam, and diagnostic tests

| | SUI | UUI | Overflow incontinence | Functional incontinence | Total/anatomic incontinance | Mixed |
|---|---|---|---|---|---|---|
| History | Leak with cough, sneeze, activity, laugh | Sudden urge followed by leakage, on way to the toilet, nocturia, unaware | Mixed symptoms of both SUI and UUI + obstructive symptoms | Cognitive or physical impairment, unable to void independently | Constant leakage | Symptoms of both SUI and UUI |
| Physical exam/ diagnostic tests | Positive supine cough stress test<br>Urethral hypermobility (Q-tip test) | Large volume, high-velocity incontinence triggered by bladder filling<br>Occasionally provoked by cough (stress test) | Full bladder on palpation or PVR | Immobility or decreased independent tasks of living | Abnormal tampon test<br>Urethral erosion<br>Urinary leakage per vagina<br>Ectopic ureter on pelvic imaging | Positive supine cough stress test<br>Large volume, high-velocity incontinence |
| Past medical history | Increasing parity<br>Obesity | Neurologic disorders<br>Recurrent cystitis<br>Pelvic radiation | History of sling procedure, neurological condition<br>History of urethral instrumentation<br>Anticholinergic medication | Dementia<br>Immobility<br>Mental illness | Previous pelvic surgery, trauma, radiation, or malignancy<br>Chronic indwelling urethral catheter<br>Incontinence since childhood | Increasing parity, obesity, age |

bladder irritant consumption, allowing the clinician to provide a patient with personalized action items for behavioral intervention.

The role of pad weight tests is controversial and is largely used in academic settings for research purposes. Twenty-four-hour pad tests are more clinically relevant than one-hour pad tests and, while definitions vary, are typically considered positive if there is greater than 1.3 g of urine loss over that time period [2]. It should be noted, however, that studies have shown little difference between pad weight tests in self-reported "continent" and "incontinent" groups [15]. A more commonly used surrogate for the severity of incontinence is pads per day, which can be assessed through patient history. It is important to elicit the degree of pad saturation, as individuals may change their pads every time they urinate, even if they are relatively dry.

Dye testing is another useful test in assessing leakage—particularly in determining whether leakage is urine versus another fluid or in identifying the site of a fistula. In order to identify whether urine is the source of wetness, a patient can take 200 mg of oral Pyridium and wear a pad for several hours. If the fluid is urine, it will be orange in color. Sweat, peritoneal fluid, or vaginal discharge will remain clear. When looking for a fistula, a tampon is inserted, and dye, such as methylene blue, is instilled intravesically. Staining at the proximal aspect of the tampon is suggestive of a vesicovaginal fistula while distal staining may indicate urethral leakage. If there is concern for a ureterovaginal fistula, a double dye test is performed. In this case, the bladder is filled with a methylene blue solution, and oral Pyridium is concomitant. Orange staining of the tampon is pathognomonic of a ureterovaginal fistula while blue staining may be secondary to a vesicovaginal fistula or urethral incontinence [17].

Imaging has a limited role in the evaluation of urinary incontinence in women. If there is clinical suspicion for a urethral diverticulum or ectopic ureter, MRI pelvis is a sensitive, if potentially cost-prohibitive, means of definitive diagnosis. Renal ultrasonography is sensitive and specific for diagnosing hydronephrosis and should be obtained if high-risk features for upper tract deterioration are present. Translabial or transvaginal ultrasonography may be useful to visualize mesh that was previously placed for pelvic floor reconstruction if there is concern that this is a contributing factor in the patient's incontinence [16].

## Advanced Testing

When the etiology of a patient's incontinence is unclear, two advanced testing modalities can be considered: a cystoscopy and urodynamic studies (UDS). Neither is indicated for the initial workup of the index patient (uncomplicated SUI or UUI AUA guidelines Gormley OAB Kobashi SUI). However, there are many circumstances in which one or both may be necessary to safely and thoroughly evaluate more complex presentations.

The role of cystoscopy is to directly visualize the patient's bladder and urethra, thus ruling out pathologies that may be causing or exacerbating the patient's

symptoms. While routine cystoscopy does not appear to affect outcomes for most patients, there are clearly situations where cystoscopy is a commonsense adjunct to a patient's workup. For example, a lifelong smoker with urge urinary incontinence and dysuria with negative urine cultures should likely undergo a cystoscopy to rule out bladder cancer as the source of her irritative lower urinary tract symptoms. Furthermore, incontinence in the setting of prior transvaginal mesh, especially if there is a history of recurrent UTIs, should prompt a cystoscopy to exclude the diagnosis of mesh erosion. Cystoscopy and appropriate upper tract imaging should also be performed if the patient meets the diagnostic criteria for hematuria (AUA guideline hematuria).

Multichannel urodynamics (UDS) is the study of bladder storage and emptying. They consist of cystometry, which assesses pressure and volume during filling, and pressure-flow studies, which evaluate bladder pressure and urine flow rate during voiding. Multichannel UDS differs from uroflowmetry and simple cystometrics in that it objectively measures bladder pressures. Typically, it is accompanied by electromyography (EMG), which measures the activity of the striated urinary sphincter and pelvic floor musculature via a patch or needle electrode. In studies performed for the investigation of urinary incontinence, the primary goal is often the identification of urgency or stress incontinence. However, it is important to keep in mind that reduced compliance or incomplete bladder emptying can also contribute to leakage. Urgency urinary incontinence is often associated with detrusor overactivity (DO) on UDS. DO is a urodynamic observation of an involuntary detrusor contraction during bladder filling which may or may not be accompanied by incontinence. In the setting of a known neurologic condition, this is termed neurogenic DO [1]. It is important to keep in mind that up to 50% of individuals with urge urinary incontinence may not have DO on UDS. Furthermore, ~15% of patients *without* urge urinary incontinence can have "test-induced" DO [23]. Urodynamic findings do not outweigh a convincing history. Stress urinary incontinence is defined by the presence of an abdominal leak point pressure (ALPP) on UDS. ALPP is the intravesical pressure at which urine leakage occurs due to increased abdominal pressure in the absence of a detrusor contraction [1]. Patients without SUI do not have urinary incontinence at any abdominal pressure, and therefore do not have an ALPP. A lower ALPP is associated with worsening severity of SUI. By convention, an ALPP of <60 cm H2O is considered to be indicative of intrinsic sphincter deficiency. However, this does not take into account the presence or absence of urethral hypermobility on the exam and should therefore be interpreted with caution [11] (Table 3.2).

Patient selection and timing of UDS remains a controversial topic. Many experts have formerly advocated routine UDS prior to invasive or irreversible treatments for incontinence. This changed with the publication of the VALUE trial, a large, multicentered randomized control trial which showed no difference in outcomes between women with uncomplicated SUI who received UDS prior to sling placement and those who did not [13]. While similarly robust data does not exist for urge urinary incontinence, a recent meta-analysis did not show a clear benefit from UDS prior to third-line therapies for OAB [4]. Most experts would agree that UDS are indicated

**Table 3.2** Findings on UDS as defined by the International Continence Society

| | ICS definition |
|---|---|
| DO | Phasic contractions of detrusor muscle occurring during filling cystometry |
| | Waveform seen on cystometrogram |
| NDO | In patients with a clinically relevant neurologic disorder, phasic contractions of detrusor muscle occurring during filling cystometry |
| | Waveform seen on cystometrogram |
| Reduced compliance storage dysfunction (RCSD) | Non-phasic rise in detrusor pressure during filling cystometry |
| | Reduction in capacity/compliance |
| Reduced filling sensation | Perceived reduction in sensation during filling cystometry |
| Detrusor leak point pressure (DLPP) | Lowest pressure at which urinary leakage occurs in the absence of detrusor contraction or increased abdominal pressure |
| | >40 cm $H_2O$ in females results in increased risk for morbidity |
| Abdominal leak point pressure (ALPP) | Absence of detrusor contraction, the lowest value of increased intrabdominal pressure that results in urine leakage at fixed bladder volume (200–300 mL) |
| | *Valsalva (VLPP)* |
| | <60 cm $H_2O$ – Severe |
| | 60–90 cm $H_2O$ – Moderate |
| | >90 cm $H_2O$ – Mild |
| | *Cough (CLPP)* |

ICS Glossary. International Continence Society
McGuire EJ, Woodside JR, Borden TA, et al. Prognostic value of urodynamic testing in myelodysplastic patients. J Urol. 1981;126:205–9

before proceeding with invasive interventions in the setting of prior anti-incontinence or prolapse surgery, severe incontinence, poorly defined incontinence symptoms, elevated PVR or significant obstructive symptoms, neurologic lower urinary tract dysfunction, or inability to elicit SUI on a cough stress test or simple cystometrics [7].

## Conclusions

At least one-quarter of women suffer from some degree of urinary incontinence [12]. All urologists and urogynecologists should be adept at evaluating these conditions. Workup should include a consideration of non-urologic sources of wetness and causes of transient incontinence, as well as an assessment of prior pelvic radiation or surgeries and gynecologic or obstetric history. Incontinence should be characterized by identifying the duration of symptoms, inciting and exacerbating factors, severity, and coexisting obstructive symptoms. All patients should undergo a pelvic and abdominal exam. At a minimum, a urinalysis should be performed and PVR

assessed. Imaging and more invasive diagnostic tests should be obtained on an individualized basis.

## References


1. Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U, van Kerrebroeck P, Victor A, Wein A. Standardisation Sub-committee of the International Continence Society. The standardisation of terminology of lower urinary tract function: report from the Standardisation Subcommittee of the International Continence Society. Neurourol Urodyn. 2002;21(2):167–78. https://doi.org/10.1002/nau.10052. PMID: 11857671.
2. Al Afraa T, Mahfouz W, Campeau L, Corcos J. Normal lower urinary tract assessment in women: I. Uroflowmetry and post-void residual, pad tests, and bladder diaries. Int Urogynecol J. 2012;23(6):681–5. https://doi.org/10.1007/s00192-011-1568-z. Epub 2011 Sep 21. Review. PubMed PMID: 21935667.
3. D'Ancona C, Haylen B, Oelke M, Abranches-Monteiro L, Arnold E, Goldman H, Hamid R, Homma Y, Marcelissen T, Rademakers K, Schizas A, Singla A, Soto I, Tse V, de Wachter S, Herschorn S; Standardisation Steering Committee ICS and the ICS Working Group on Terminology for Male Lower Urinary Tract & Pelvic Floor Symptoms and Dysfunction. The International Continence Society (ICS) report on the terminology for adult male lower urinary tract and pelvic floor symptoms and dysfunction. Neurourol Urodyn. 2019;38(2):433–77. https://doi.org/10.1002/nau.23897. Epub 2019 Jan 25. PMID: 30681183.
4. Glass D, Lin FC, Khan AA, Van Kuiken M, Drain A, Siev M, Peyronett B, Rosenblum N, Brucker BM, Nitti VW. Impact of preoperative urodynamics on women undergoing pelvic organ prolapse surgery. Int Urogynecol J. 2020;31(8):1663–8. https://doi.org/10.1007/s00192-019-04084-8. Epub 2019 Aug 27. PMID: 31456030.
5. Holroyd-Leduc JM, Tannenbaum C, Thorpe KE, Straus SE. What type of urinary incontinence does this woman have? JAMA. 2008;299(12):1446–56. https://doi.org/10.1001/jama.299.12.1446. Review. PubMed PMID: 18364487.
6. Hsu TH, Rackley RR, Appell RA. The supine stress test: a simple method to detect intrinsic urethral sphincter dysfunction. J Urol. 1999;162(2):460–3. https://doi.org/10.1016/s0022-5347(05)68589-8. PubMed PMID: 10411057.
7. Kobashi KC, Albo ME, Dmochowski RR, Ginsberg DA, Goldman HB, Gomelsky A, Kraus SR, Sandhu JS, Shepler T, Treadwell JR, Vasavada S, Lemack GE. Surgical treatment of female stress urinary incontinence: AUA/SUFU guideline. J Urol. 2017;198(4):875–83. https://doi.org/10.1016/j.juro.2017.06.061. Epub 2017 Jun 15. PubMed PMID: 28625508.
8. Krhut J, Gärtner M, Mokris J, Horcicka L, Svabik K, Zachoval R, Martan A, Zvara P. Effect of severity of urinary incontinence on quality of life in women. Neurourol Urodyn. 2018;37(6):1925–30. https://doi.org/10.1002/nau.23568. Epub 2018 Mar 31. PubMed PMID: 29603780.
9. Lawrence JM, Lukacz ES, Nager CW, Hsu JW, Luber KM. Prevalence and co-occurrence of pelvic floor disorders in community-dwelling women. Obstet Gynecol. 2008;111(3):678–85. https://doi.org/10.1097/AOG.0b013e3181660c1b. PubMed PMID: 18310371.
10. Malik RD, Hess DS, Christie A, Carmel ME, Zimmern PE. Domain comparison between 6 validated questionnaires administered to women with urinary incontinence. Urology. 2019;132:75–80. https://doi.org/10.1016/j.urology.2019.07.008. Epub 2019 Jul 13. PubMed PMID: 31310769.
11. McGuire EJ, Fitzpatrick CC, Wan J, Bloom D, Sanvordenker J, Ritchey M, Gormley EA. Clinical assessment of urethral sphincter function. J Urol. 1993;150(5 Pt 1):1452–4. https://doi.org/10.1016/s0022-5347(17)35806-8. PubMed PMID: 8411422.

12. Minassian VA, Drutz HP, Al-Badr A. Urinary incontinence as a worldwide problem. Int J Gynaecol Obstet. 2003;82(3):327–38. https://doi.org/10.1016/s0020-7292(03)00220-0. Review. PubMed PMID: 14499979.
13. Nager CW, Brubaker L, Daneshgari F, Litman HJ, Dandreo KJ, Sirls L, Lemack GE, Richter HE, Leng W, Norton P, Kraus SR, Chai TC, Chang D, Amundsen CL, Stoddard AM, Tennstedt SL. Design of the Value of Urodynamic Evaluation (ValUE) trial: a non-inferiority randomized trial of preoperative urodynamic investigations. Contemp Clin Trials. 2009;30(6):531–9. https://doi.org/10.1016/j.cct.2009.07.001. Epub 2009 Jul 25. PubMed PMID: 19635587; PubMed Central PMCID: PMC3057197.
14. Resnick NM. Urinary incontinence in the elderly. Medical Grand Rounds 1984;3:281–90.
15. Ryhammer AM, Laurberg S, Djurhuus JC, Hermann AP. No relationship between subjective assessment of urinary incontinence and pad test weight gain in a random population sample of menopausal women. J Urol. 1998;159(3):800–3. PubMed PMID: 9474152.
16. Staack A, Vitale J, Ragavendra N, Rodríguez LV. Translabial ultrasonography for evaluation of synthetic mesh in the vagina. Urology. 2014;83(1):68–74. https://doi.org/10.1016/j.urology.2013.09.004. Epub 2013 Nov 12. PubMed PMID: 24231215.
17. Stamatakos M, Sargedi C, Stasinou T, Kontzoglou K. Vesicovaginal fistula: diagnosis and management. Indian J Surg. 2014;76(2):131–6. https://doi.org/10.1007/s12262-012-0787-y. Epub 2012 Dec 14. Review. PubMed PMID: 24891778; PubMed Central PMCID: PMC4039689.
18. Stoffel JT, Peterson AC, Sandhu JS, Suskind AM, Wei JT, Lightner DJ. AUA White Paper on Nonneurogenic Chronic Urinary Retention: Consensus Definition, Treatment Algorithm, and Outcome End Points. J Urol. 2017;198(1):153–60. https://doi.org/10.1016/j.juro.2017.01.075. Epub 2017 Feb 3. PMID: 28163030.
19. Stav K, Dwyer PL, Rosamilia A. Women overestimate daytime urinary frequency: the importance of the bladder diary. J Urol. 2009;181(5):2176–80. https://doi.org/10.1016/j.juro.2009.01.042. Epub 2009 Mar 17. PubMed PMID: 19296975.
20. Subak LL, Brubaker L, Chai TC, et al. High costs of urinary incontinence among women electing surgery to treat stress incontinence. Obstet Gynecol. 2008;111(4):899–907. https://doi.org/10.1097/AOG.0b013e31816a1e12.
21. Subak LL, Goode PS, Brubaker L, Kusek JW, Schembri M, Lukacz ES, Kraus SR, Chai TC, Norton P, Tennstedt SL. Urinary incontinence management costs are reduced following Burch or sling surgery for stress incontinence. Am J Obstet Gynecol. 2014;211(2):171.e1–7. https://doi.org/10.1016/j.ajog.2014.03.012. Epub 2014 Mar 11. PubMed PMID: 24631433; PubMed Central PMCID: PMC4349353.
22. Tseng LH, Liang CC, Chang YL, Lee SJ, Lloyd LK, Chen CK. Postvoid residual urine in women with stress incontinence. Neurourol Urodyn. 2008;27(1):48–51. https://doi.org/10.1002/nau.20463. PMID: 17563112.
23. van Waalwijk van Doorn ES, Meier AH, Ambergen AW, Janknegt RA. Ambulatory urodynamics: extramural testing of the lower and upper urinary tract by Holter monitoring of cystometrogram, uroflowmetry, and renal pelvic pressures. Urol Clin North Am. 1996;23(3):345–71. https://doi.org/10.1016/s0094-0143(05)70317-7. Review. PubMed PMID: 8701551.
24. Whitcomb EL, Lukacz ES, Lawrence JM, Nager CW, Luber KM. Prevalence and degree of bother from pelvic floor disorders in obese women. Int Urogynecol J Pelvic Floor Dysfunct. 2009;20(3):289–94. https://doi.org/10.1007/s00192-008-0765-x. Epub 2008 Nov 11. PubMed PMID: 19002365; PubMed Central PMCID: PMC4943873.