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An Evidenced-based Approach to Stress Urinary Incontinence in Women: What's New?

WILLIAM D. WINKELMAN, MD,*† and EMAN ELKADRY, MD*†

**Mount Auburn Hospital, Cambridge; and †Harvard Medical School, Boston, Massachusetts*

Abstract: Stress urinary incontinence is a common condition in women potentially affecting women of any age including young women who have not yet completed childbearing. It is important to consider the impact on quality of life and offer treatment to those experiencing bother. There are several effective nonsurgical treatments for women before considering more invasive or definitive intervention. There is good data on lifestyle and behavioral changes which are often first-line recommendations. Data is also strong for pelvic muscle training and strengthening. Pessary supportive devices also play a role. Additional options also exist for limited indications.
Key words: stress incontinence, urinary incontinence, nonsurgical management, pessary

Correspondence: William D. Winkelman, MD, Boston Urogynecology Associates, 330 Mt Auburn St 02138, Cambridge, MA. E-mail: william.winkelman@mah.harvard.edu

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Introduction

Stress urinary incontinence (SUI) refers to urinary incontinence that is associated with an increase in intra-abdominal pressure. Patients with SUI commonly report leakage of urine with activities such as coughing, sneezing, or laughing. Stress incontinence can have a significant impact on quality of life, and it is not uncommon for patients with SUI to modify their lives and limit their activity. Studies suggest that SUI is both underdiagnosed and undertreated[1] and can occur even at a young age so early identification, treatment, and referral is of paramount importance. Several effective treatment options are available to women, even for those who desire minimal intervention.

Diagnosing Stress Incontinence

Women should routinely be screened for urinary incontinence. It is estimated that

up to 50% of otherwise healthy patients may have undiagnosed SUI.[2,3] A simple question inquiring if a patient ever leaks urine without wanting to suffices. If the answer is yes, an inquiry into the degree of bother important. Often symptoms are isolated to particular events such as sports or sudden movement. Young athletes, even teens, may have bothersome SUI and may be reluctant to bring up this issue. The same is true for women who have occupations with heavy lifting or high impact as well as young mothers. To better identify these patients, there are a number of straightforward screening questionnaires that can be used in the primary care setting to identify patients with SUI. The 3 Incontinence Questions (3IQ), for example, is a self-administered 3-item questionnaire that can effectively differentiate SUI from urgency incontinence.[4] For the diagnosis of SUI, this questionnaire has a sensitivity of 0.86, a specificity of 0.60, and a positive likelihood ratio of 2.13.

Other screening tools can assess the impact and the degree of bother from symptoms that may help eventually guide treatment. The International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form (ICIQ-UI SF) is another excellent screening questionnaire that compares favorably to other measures of SUI.[5] This is a simple, self-administered 4-item questionnaire that assesses not only the frequency and amount of leakage but also the overall impact on everyday life.

It is not uncommon for patients with symptoms of SUI to report concurrent symptoms of urinary frequency, urgency, or urgency urinary incontinence. Those with both SUI and urgency urinary incontinence have mixed urinary incontinence (MUI). In fact, up to 36% of patients with SUI may have MUI.[6]

For some patients, MUI may actually be the result of maladaptive behavior secondary symptomatic SUI. Patients with symptomatic SUI may void frequently to maintain a relatively low bladder volume, thereby reducing leakage. MUI may also be indicative of weakness or dysfunction of the pelvic muscles that often underlies incontinence and other pelvic floor disorders. It is therefore important to understand no only the current symptoms, but also any coexisting symptoms and the trajectory and evolution of symptoms.

Patients with complaints of SUI should undergo a physical examination including a pelvic examination. During the pelvic examination, care should be taken to assess for any suburethral masses and pelvic floor muscle tenderness. Objective demonstration of SUI may also be of value. We typically recommend patients present to the clinic with a comfortably full bladder and ask them to Valsalva or cough during their pelvic examination to assess for SUI. If a patient does not have a full bladder, an empty supine stress test may be done, and if positive, this may indicate SUI of greater severity. Patients with significant pelvic organ prolapse (POP-Q stage 3 or higher), prior prolapse or anti-incontinence surgery, or neurological disorders affecting the lower urinary tract may benefit from an early referral to a specialist. Conservative treatment modalities may be initiated after a simple history and physical unless suspected underlying factors or prior surgery exist.

A referral to subspecialty care for evaluation can be helpful in identifying patients with SUI who are suspected of having intrinsic sphincter deficiency (ISD). Indicated by the severity of symptoms and sometimes by a complex history medical or surgical history, ISD refers to patients with SUI unable to maintain coaptation of the urethra even at rest and is characterized by a low intraluminal urethral pressure. It is more commonly seen among patients who have had surgical or radiation damage to the periurethral tissue. A clinical history of prior pelvic surgery or radiation should raise the suspicion for ISD. For several decades, maximum urethral closure pressure of < 20

to 30 cm H_2O on urodynamic testing or a Valsalva leak point pressure < 60 cm H_2O has been considered diagnostic of ISD. Numerical cutoffs from urodynamic studies are known to be problematic due to the difficulty with standardization of technique and equipment between providers. The data used to create this diagnostic algorithm for ISD originated from one study using pressure catheters that are no longer available. Also complicating the diagnosis is the fact that there is a natural decline in periurethral support with age[7] so the diagnosis of ISD may be less meaningful at an advanced age.

However, even in these cases, simple and conservative treatments may begin and may result in improvement in quality of life. Many patients may be reluctant to undergo a full evaluation due to perceived time commitment, financial constraints, or the perception of surgery as the only option. It is especially important for these women to be counseled about more conservative options.

Management of Contributing Factors

Before initiating treatment specifically for SUI, it is important to identify potential factors that may contribute to the severity of a patient's condition. Untreated contributing factors may mitigate the potential benefits of first-line, second-line, or third-line SUI treatment.

Obesity is a known risk factor for SUI.[8] In addition to improved cardiovascular health and glycemic control, weight loss is associated with significant improvement in SUI symptoms. A 10% loss of body weight is associated with a 70% reduction of urinary frequency, a reduction that rivals the outcomes following some of the surgical treatments for SUI.[9] It is therefore of paramount importance to address obesity with all affected patients.

Respiratory conditions such as a chronic cough, chronic obstructive pulmonary disease, uncontrolled asthma, and postnasal drip may all increase stress on the pelvic floor, both due to frequent bouts of coughing resulting in leaking but also the chronic strain on the pelvic muscles and thereby worsen SUI. These risk factors should all be addressed before or concurrently with specifically treating SUI. It is also important to take note of any pharmacologic agents that may lead to a cough. For example, angiotensin-converting enzyme inhibitors (ACE-Is) are widely used for the treatment of cardiovascular and metabolic diseases but the chronic cough is reported in ~11% of patients taking these medications.[10] In fact, ACE-I may be responsible for up to 3% of all patients with a chronic cough.[11] For patients with significant SUI on ACE-I, it may be beneficial to consider alternative agents for the management of their cardiovascular or metabolic disease. Similarly, diuretics increase the volume of urine production at specific times of the day, increasing symptoms during these times for women. Although not a direct contributor to SUI, the timing of diuretics should be considered to mitigate symptoms.

Chronic constipation is another risk factor for SUI. The exact mechanism of constipation-induced SUI is not clear, but a history of constipation and subsequent straining during defecation may weaken the pelvic floor muscles and thereby contribute to SUI.[12] It is important that patients with constipation are evaluated for underlying causes and appropriate adjustments are made to the diet to optimize stool consistency.

For postmenopausal women, urogenital atrophy is common. Estrogen receptors are present throughout the urethra, and estrogen therapy is thought to help thicken the urethral epithelium and facilitate urethral mucosal coaptation and improve vascular tone in the periurethral tissue. A Cochrane review on the use of estrogens for the treatment of urinary incontinence found that topical vaginal

estrogen was associated with a significant improvement in symptoms [risk ratio (RR) = 0.74, 95% confidence interval (CI): 0.64-0.68].[13] While there are few studies looking at the impact of estrogen specifically on SUI, nonrandomized and noncontrolled studies looking at SUI seem to suggest estrogen is associated with improved urethral parameters and subjective improvement of SUI.

Behavioral Modification and Pelvic Floor Exercises

As first-line treatment, we recommend behavioral modifications and pelvic floor muscle training (PFMT) for all patients who present with SUI. PFMT can be recommended at any point once a concern of SUI has been identified or even preemptively. Some teaching may be required as many women are not able to move their pelvic floor muscles on command. Starting with the first examination, we assess pelvic floor muscle contraction strength and the ability to isolate these muscles distinctly from the surrounding abdominal, lower extremity, and gluteal muscles. If we notice that surrounding muscles are recruited more than the pelvic floor muscles, we redirect at that time. Some women will paradoxically push out rather than contract their pelvic muscles, indicating underlying pelvic floor dysfunction. With time, most patients can be taught to correctly isolate and recruit the pelvic floor muscles. We often ask patients to imagine pulling in a marble with their vaginal muscles. This is often helpful for women to "feel" or connect with movement in the correct muscle groups. During our clinical evaluation, we also assess fluid intake and frequency of voiding with the goal of keeping bladder volume below the leakage threshold especially in mild cases of SUI. We do instruct women who have very weak PFPT to start strengthening in the supine position. This often helps them get started. similarly we discourage stopping normal voids as a method to strengthen pelvic muscles.

We routinely review the technique called "the knack maneuver" as described by Delancey's group, which consists of squeezing or clenching the pelvic floor muscles at the time of expected cough or sneeze. The knack maneuver has been shown to have an immediate improvement on the volume of urinary leakage in both pregnant and nonpregnant women, and this improvement is irrespective of baseline pelvic floor muscle strength.[14] In addition, this maneuver is beneficial for women with both long-standing SUI and those with recent-onset SUI as well as those with stress-predominant MUI. The authors noted that this movement is not as intuitive as it may seem for many women but can be effectively taught in one setting.

While some of the improvement associated with PFMT and strengthening may be attributed to the incorporation of the knack maneuver, based on anatomic and physiological studies, PFMT can help with the recruitment of both striated pelvic floor muscles as well as striated urethral sphincter muscles, which improves urethral closure pressure and urethral stiffness, thereby decreasing leak volume. However, PFMT may not provide adequate relief for all patients. The same study suggested that, which may be indicative of underlying obstetric-related pelvic muscle injuries, pudendal nerve injury, and resulting diminished strength and diminished pelvic floor architecture. For these women, PFMT can be a challenge, and referral to physical therapy by a trained specialist in women's pelvic health is advisable. This is also the case if high-tone and/or myofascial pelvic floor dysfunction also exist. This can be identified on an initial pelvic examination. In our practice, we encourage all our patients to work with specialized pelvic floor physical therapists, and we find that

even a few visits can be extremely helpful, especially for patients with obvious pelvic floor dysfunction or those with MUI. Despite the known benefits of PFMT, attending regular in-person sessions does require a substantial investment of time, and for some patients, insurance copayments are cost-prohibitive. Also, the availability of trained and experienced pelvic floor physical therapists can be limited in certain geographic regions. Recently, we also give women the patient information sheet from UpToDate on pelvic floor strengthening, the basics and beyond the basics from reputable physical therapists that may help women get started on their own. We also encourage them to find online videos from reputable physical therapists on Yoga for pelvic floor and Yoga for bladder symptoms. This is a way Women can get started on their own.

There have been many studies on the efficacy of PFMT. A recent Cochrane systematic review compared the effect of PFMT to no treatment, placebo, or sham treatment for patients with urinary incontinence.[15] The review included both randomized and semi-randomized trials. In total, 31 trials were identified which were mostly small-to-medium in size and involved 1817 women from 14 countries. In these studies, follow-up was generally <1 year. The review found that women with SUI undergoing PFMT were 8 times more likely to report symptomatic cure compared with those undergoing no treatment, placebo, or sham treatment (56% vs. 6%; RR = 8.38, 95% CI: 3.68-19.07; 4 trials, 165 women; high-quality evidence). The benefits of PFMT extend beyond SUI, and women with any type of urinary incontinence who underwent PFMT were 5 times more likely to report symptomatic cure (35% vs. 6%; RR = 5.34, 95% CI: 2.78-10.26; 3 trials, 290 women; moderate-quality evidence). In addition, quality of life, number of leakage episodes, and volume of leakage all tend to improve with PFMT. Given the safety, minimally invasive nature, and efficacy of PFMT, this is a desirable starting point in treatment. However, despite the aforementioned benefits, the long-term efficacy is unclear. We counsel women that training these muscles is similar to training other muscles at the gym: As long as you keep doing the exercises, strength increases or is maintained. Once the exercise is discontinued, muscles will weaken again.

Pelvic floor physical therapy can include more than muscle draining. Other modalities can include electric stimulation, biofeedback, muscle release techniques, and magnetic stimulation. These may help augment basic PFMT and strengthening. A systematic review attempted to explore the benefit of these different adjunctive modalities and found that in particular, there seems to be a benefit to muscle release techniques among women with pelvic floor dysfunction.[16] Other modalities such as electric stimulation, biofeedback, and magnetic stimulation may only offer marginal benefit compared with PFMT alone, although for patients considering eventual surgical treatment, these adjuvant therapies may improve the eventual success of the surgical intervention in the short term. Evidence on magnetic stimulation or total body vibration, for example, is minimal and these should not be routinely recommended. We generally counsel women that PFMT is likely to cure SUI in the long term but may improve symptoms satisfactorily for a prolonged period of time as long as a regular regimen is followed to maintain optimal muscle function. This regimen can be performed and maintained at home independently or in conjunction with a physical therapist on an intermittent basis. In the long term, if symptoms do recur, some patients choose a repeat course of PFMT with a physical therapist, while others prefer other interventions. We also recommend against paying for most devices that are marketed to help improve strength or augment PFMT. The cost may be substantial, and there is little

added long-term benefit based on the literature.

Medications

To date, there are no drugs approved by the United States Food and Drug Administration (FDA) for the treatment of SUI. Several pharmacologic agents have been trialed with variable success. These agents typically act by increasing outlet obstruction. The 4 major classifications of drugs that have been used to treat SUI include alpha agonists, beta-agonists/antagonists, tricyclic antidepressants, and serotonergic/noradrenergic reuptake inhibitors.

The proximal urethra and bladder neck contain alpha receptors, and in theory, stimulating alpha receptors should increase the muscle tone and thereby increase bladder outlet resistance. Alpha agonists such as phenylpropanolamine or midodrine have shown only modest improvement in SUI, and cure is uncommon.[17] Serious adverse effects including hemorrhagic strokes, hypertension, cardiac arrhythmias, palpitations, tremors, weakness have limited the more widespread use of these drugs for the treatment of SUI. Moreover, while in theory these are thought to increase outlet obstruction urodynamic studies have not shown a change in the MUCP at rest.

Tricyclic antidepressants are thought to improve SUI through both central and peripheral anticholinergic-mediated effects, similar to many of the medications we classically think about for the treatment of overactive bladder. These medications are thought to decrease bladder contractility and simultaneously increase urethral resistance. Unlike alpha agonists, tricyclic antidepressants seem to be associated with an increase in the urethral pressure,[18] suggesting that some of the benefits is due to an increase in outlet obstruction. The cure is the uncommon and subjective improvement of stress-specific symptoms is only modest, limiting more widespread use.

Serotonergic and noradrenergic reuptake inhibitors suppress parasympathetic activity and enhance sympathetic and somatic activity. Through this mechanism, these drugs help promote urine storage. While studies of these drugs have shown improved quality of life scores, objective measures of SUI including stress pad tests and 24-hour pad tests have failed to show any clear benefit.[19]

Vaginal Support Devices

Pessaries are vaginal support devices that traditionally were used for the treatment of vaginal prolapse. Pessaries for the treatment of prolapse date back millennia, and Hippocrates described the use of pomegranate as a pessary for the treatment of vaginal prolapse. Modern pessaries are typically made of inert material such as silicone. When used for the treatment of SUI, it is thought that pessaries provide support to the urethra by stabilizing the proximal urethra and urethrovesical junction. In our practice, we offer pessaries to those wishing to delay surgery or avoid it altogether. Also, a pessary is an option for women with situational SUI limited to athletics or physical activity. We have even used pessaries for teen athletes during competitions.

There are several pessaries available commercially. The incontinence ring is perhaps the most straightforward and involves a flexible ring with an incontinence knob that is positioned under the pubic bone to provide added urethral support. The incontinence dish is a little more rigid than the incontinence ring and similarly incorporates an incontinence knob. The Hodge pessary is reserved for patients with narrow vaginal introitus. While the Hodge pessary itself can help treat SUI, it also is available with an incontinence knob for additional urethral support. The Gehrung pessary with an incontinence knob can be used to treat patients with anterior vaginal prolapse as

well as SUI. Finally, the Cube pessary is space occupying and can be used for SUI during strenuous activity. Several pessaries, including the incontinence ring, the incontinence dish, and the Hodge are available with or without a support membrane for concurrent treatment of vaginal prolapse.

Typically, after initial fitting, patients are asked to return to the clinic within 1 to 2 weeks to ensure adequate relief of symptoms. It is not uncommon that patients need a trial of a different pessary size or type after the initial fitting. If the patient is able to remove and insert the pessary on her own, follow-up annually is recommended. For patients who rely on the provider for removal and cleaning, routine follow has traditionally been recommended every 3 months, but there is level 1 evidence that these visits can be spaced safely to every 6 months.[20]

Despite the fact that pessaries are often used as first-line therapy, the data supporting their use is somewhat sparse. A large randomized clinical trial found that anti-incontinence pessaries were associated with lower patient satisfaction compared with those undergoing behavioral therapy.[21] At 3 months, 63% were satisfied with the use of the pessary, however, only 33% reported no bothersome urinary symptoms. This difference, however, was not sustained and at 12 months, when the groups reported similar symptom burden and similar patient satisfaction. Postmenopausal status, higher education, and lower incontinence frequency are predictors of success and satisfaction with pessary use.

In addition to reusable silicone pessaries, there are also several commercially available vaginal support devices available by prescription. The Uresta is made from a thermoplastic elastomer and approved for daily use for up to 1 year. This device has a tapered tip for insertion into the vagina, a bell-shaped ring for urethral support, and a handle to facilitate removal. The Contiform intravaginal device is an elastomeric device shaped like a hollow tampon that similarly provides support to the urethra and comes with an optional silicone ribbon to facilitate device removal. This device is not currently available in the United States. There are also over-the-counter vaginal support devices available without a prescription. The Impressa is a disposable, tampon-like silicone device that can be readily purchased at most commercial drug stores. The device can be worn for up to 8 hours in a 24-hour period. The advantage of the Impressa. Since women are often hesitant to discuss symptoms of incontinence with their provider, this allows them to treat their condition independently. These devices are relatively comfortable and noninvasive. While traditional silicone pessaries come in a larger array of sizes, the Impressa, similar to the Urest and the Contiform, only comes in 3 different sizes, so finding a correct fit may be more difficult. A cost-utility analysis comparing these devices to other nonsurgical treatments for SUI in women, including PMFT and traditional incontinence pessaries, found that PFMT was the most cost-effective nonsurgical treatment option for SUI.[22,23]

Urethral Inserts

Urethral inserts are mechanical barriers that prevent leakage by sealing the urethral lumen and are typically intended for single use. They are associated with high rates of subjective and objective continence, but widespread acceptance is generally limited by difficulty with insertion and discomfort with use. Discontinuation rates are over 40%. These devices are also associated with urethral trauma and discomfort, and up to 25% of users will develop urinary tract infections.[24] The majority of urethral inserts have been withdrawn from the market.

Bulking Agents

Bulking agents help augment the natural coaptation of the urethral luminal walls which is essential for the maintenance of continence. The goal is to inject the bulking agent between the urethral submucosa and the superficial urethral muscle between the level of the mid-urethra and the bladder neck. After injection, the urethral lumen should appear closed while cystoscopic fluid is running. The materials used for periurethral bulking are ideally biocompatible, nonimmunogenic, and hypoallergic. The first periurethral bulking material was morrhuate sodium, which was described in 1938. Since that time, a number of other materials have been used including bovine collagen, pyrolytic carbon-coated graphite beads, calcium hydroxylapatite, polydimethylsiloxane macroparticles, and a polyacrylamide hydrogel.

Periurethral bulking is performed either transurethrally (injection placed through the urethral lumen) or periurethrally (injection placed from outside the urinary tract) with the assistance of a cystoscope.

Periurethral bulking is an excellent option for patients who have ISD with or without urethral hypermobility or patients with persistent SUI after a prior anti-incontinence surgery who prefer a less invasive procedure. it is also ideal for patients who are not surgical candidates since this is a procedure that can be performed in the office without sedation. In general, the efficacy of periurethral bulking is high, with around 75% reporting improvement in symptoms, but only around 40% of patients report complete continence.[25,26]

While periurethral bulking is a low-risk procedure, transient urethral discomfort including burning dysuria and mild hematuria is common. Urinary tract infections may occur in up to 25% of patients if no antibiotics are administered, and periprocedural antibiotics are generally recommended to help mitigate this risk. Occasionally, patients will develop transient urinary retention for up to 72 hours after the procedure. In these instances, clean intermittent catheterization or continuous drainage with the use of a pediatric catheter is preferred since a standard Foley catheter can cause molding of the bulking material around the catheter and thereby diminish coaptation. Rare complications including injection site necrosis or suburethral abscess occur in $< 1\%$ of patients and have only been described in case reports.

Surgery

An in-depth discussion of the surgical treatment for SUI is beyond the scope of this article, but it is important to briefly mention that there are a number of surgical procedures of the treatment of SUI since surgery is considered the gold standard for the treatment of SUI. The most frequently performed procedure in the United States is the synthetic midurethral sling. The midurethral sling with synthetic mesh was developed in the 1990s and is the most widely studied anti-incontinence procedure. There is robust high-quality evidence that women with and without medical comorbidities and those with SUI due to both urethral hypermobility and ISD benefit from the midurethral sling. These procedures have an excellent safety profile. Continence rates after synthetic midurethral slings are consistently around 90% even with long-term follow-up. Nevertheless, as with any surgical procedure, there are risks associated with the procedure. Both reoperation and readmission may be $<1\%$, although this may approach 10% with long-term follow-up.

Despite the fact that synthetic slings are commonly performed and have excellent long-term success and low morbidity, there are some patients who express reservation about having a permanent mesh implant. Biological slings either with

autologous, cadaveric, or xenografts can be used. These typically have lower success rates than traditional synthetic mesh slings but may be considered in certain clinical scenarios. Similarly, in certain clinical scenarios, a colposuspension procedure may be indicated which is another nonmesh surgical procedure for the treatment of SUI.

Conclusions

For women with bothersome SUI or stress-predominant MUI, there are a multitude of effective nonsurgical and noninvasive treatment options ranging from behavioral and lifestyle modifications, pelvic floor physical therapy, and vaginal inserts to periurethral bulking. Each of these therapies offers a unique risks and benefit profile. Given the potential quality of life improvement to women, it is important for providers to screen for SUI and to familiarize themselves about the general principles of each of the different treatment options. Most providers should feel comfortable addressing underlying contributing factors and discussing home PFMT or initiating physical therapy. When an unclear clinical picture or lack of response to preliminaty treatments occurs, referral to a subspecialist may be indicated.

References

1. Margalith I, Gillon G, Gordon D. Urinary incontinence in women under 65: quality of life, stress related to incontinence and patterns of seeking health care. *Qual Life Res*. 2004;13:1381–1390.
2. Hunskaar S, Arnold EP, Burgio K, et al. Epidemiology and natural history of urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct*. 2000;11:301–319.
3. McKenzie S, Watson T, Thompson J, et al. Stress urinary incontinence is highly prevalent in recreationally active women attending gyms or exercise classes. *Int Urogynecol J*. 2016;27:1175–1184.
4. Brown JS, Bradley CS, Subak LL, et al. The sensitivity and specificity of a simple test to distinguish between urge and stress urinary incontinence. *Ann Intern Med*. 2006;144:715–723.
5. Karantanis E, Fynes M, Moore KH, et al. Comparison of the ICIQ-SF and 24-hour pad test with other measures for evaluating the severity of urodynamic stress incontinence. *Int Urogynecol J Pelvic Floor Dysfunct*. 2004;15:111–116; discussion 116.
6. Myers DL. Female mixed urinary incontinence: a clinical review. *JAMA*. 2014;311:2007–2014.
7. Rud T. Urethral pressure profile in continent women from childhood to old age. *Acta Obstet Gynecol Scand*. 1980;59:331–335.
8. Subak LL, Richter HE, Hunskaar S. Obesity and urinary incontinence: epidemiology and clinical research update. *J Urol*. 2009;182(suppl):S2–S7.
9. Wing RR, Creasman JM, West DS, et al. Improving urinary incontinence in overweight and obese women through modest weight loss. *Obstet Gynecol*. 2010;116(pt 1):284–292.
10. Bangalore S, Kumar S, Messerli FH. Angiotensin-converting enzyme inhibitor associated cough: deceptive information from the Physicians' Desk Reference. *Am J Med*. 2010;123:1016–1030.
11. Irwin RS, Curley FJ, French CL. Chronic cough. The spectrum and frequency of causes, key components of the diagnostic evaluation, and outcome of specific therapy. *Am Rev Respir Dis*. 1990;141:640–647.
12. Lian WQ, Li FJ, Huang HX, et al. Constipation and risk of urinary incontinence in women: a meta-analysis. *Int Urogynecol J*. 2019;30:1629–1634.
13. Cody JD, Jacobs ML, Richardson K, et al. Oestrogen therapy for urinary incontinence in post-menopausal women. *Cochrane Database Syst Rev*. 2012;10:CD001405.
14. Miller JM, Sampselle C, Ashton-Miller J, et al. Clarification and confirmation of the Knack maneuver: the effect of volitional pelvic floor muscle contraction to preempt expected stress incontinence. *Int Urogynecol J*. 2008;19:773–782.
15. Dumoulin C, Cacciari LP, Hay-Smith EJC. Pelvic floor muscle training versus no treatment, or inactive control treatments, for urinary incontinence in women. *Cochrane Database Syst Rev*. 2018;10:CD005654.
16. Mazur-Bialy AI, Kołomańska-Bogucka D, Nowakowski C, et al. Urinary incontinence in women: modern methods of physiotherapy as a support for surgical treatment or independent therapy. *J Clin Med*. 2020;9:1211.
17. Fantl JA, Newman DK, Colling J, et al. Urinary incontinence in adults: acute and chronic management. Clinical Practice Guideline. Rockville, MD: US Department of Health.

18. Lin HH, Sheu BC, Lo MC, et al. Comparison of treatment outcomes for imipramine for female genuine stress incontinence. *Br J Obstet Gynaecol*. 1999;106:1089.
19. Mariappan P, Alhasso AA, Grant A, et al. Serotonin and noradrenaline reuptake inhibitors (SNRI) for stress urinary incontinence in adults. *Cochrane Database Syst Rev*. 2005;3:CD004742.
20. Propst K, Mellen C, O'Sullivan DM, et al. Timing of office-based pessary care: a randomized controlled trial. *Obstet Gynecol*. 2020;135:100–105.
21. Richter HE, Burgio KL, Brubaker L, et al. Continence pessary compared with behavioral therapy or combined therapy for stress incontinence: a randomized controlled trial. *Obstet Gynecol*. 2010;115:609–617.
22. Simpson AN, Garbens A, Dossa F, et al. A cost-utility analysis of nonsurgical treatments for stress urinary incontinence in women. *Female Pelvic Med Reconstr Surg*. 2019;25:49–55.
23. Ford AA, Rogerson L, Cody JD, et al. Mid-urethral sling operations for stress urinary incontinence in women. *Cochrane Database Syst Rev*. 2015;7:CD006375.
24. Jünemann KP. The management of female urinary stress incontinence: II. The use of devices. *BJU Int*. 2001;87:449–455.
25. Ghoniem GM, Miller CJ. A systematic review and meta-analysis of Macroplastique for treating female stress urinary incontinence. *Int Urogynecol J*. 2013;24:27–36.
26. Mayer RD, Dmochowski RR, Appell RA, et al. Multicenter prospective randomized 52-week trial of calcium hydroxylapatite versus bovine dermal collagen for treatment of stress urinary incontinence. *Urology*. 2007;69:876–880.