Management of Urinary Incontinence in Women

Scientific Review

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Context  Urinary incontinence is a common health problem among women that negatively impacts quality of life. Therefore, it is important that primary care physicians have an understanding of how to manage urinary incontinence effectively.

Objective  To review the most recent, high-quality evidence regarding the etiology and management of urinary incontinence in women.

Data Sources and Study Selection  Searches of MEDLINE, EMBASE, The Cochrane Library, and the ACP Journal Club were performed to identify English-language articles published between 1998-2003 that focused on the etiology or treatment of urinary incontinence in adult women. The references of each retrieved article were reviewed and an expert in the field was contacted to identify additional relevant articles.

Data Extraction  Using a combination of more than 80 search terms, we included articles of etiology that were cohort studies, case-control studies, cross-sectional studies, or systematic reviews of cohort, case-control, and/or cross-sectional studies. Studies of treatment had to be randomized controlled trials or systematic reviews of randomized controlled trials. The quality of each article was assessed independently by each author and inclusion (n=66) was determined by consensus.

Data Synthesis  Multiple factors have been found to be associated with urinary incontinence, some of which are amenable to modification. Factors associated with incontinence include age, white race, higher educational attainment, pregnancy-related factors, gynecological factors, urological and gastrointestinal tract factors, comorbid diseases, higher body mass index, medications, smoking, caffeine, and functional impairment. There are several effective nonpharmacological treatments including pelvic floor muscle training, electrical stimulation, bladder training, and prompted voiding. Anticholinergic drugs are effective in the treatment of urge urinary incontinence. Several surgical interventions are effective in the management of stress incontinence, including open retropubic colposuspension and suburethral sling procedure.

Conclusion  Urinary incontinence in women is an important public health concern, and effective treatment options exist.

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areas of a woman's life, including socio-
cial, physical, occupational, and leisure
sue can be impacted by urinary inconti-
tence. Therefore, an understanding of the etiology and effective management options for urinary incontinence in women should be an important consideration to the practicing physician. This article reviews the recent, relevant literature.

METHODS

Searches of MEDLINE, EMBASE, The Cochrane Library, and the ACP Journal Club were performed by using more than 80 relevant search terms (available from the authors). We identified English-language articles about the origin or treatment of urinary incontinence in adults, in which the majority of the participants were women. We accepted the urinary incontinence definitions used by the studies. To be included, studies of etiology had to be cohort studies, case-control studies, cross-sectional studies, or systematic reviews of cohort, case-control, and/or cross-sectional studies. Studies of treat-
ment had to be randomized controlled trials or systematic reviews of randomized controlled trials. Given the recent results from the Women's Health Initiative,8 we excluded treatment studies of estrogen or hormone replacement therapy. The literature search fo-
cused on recent evidence in the field (January 1998-March 2003). In addition, the reference lists of retrieved articles were reviewed. A primary care physician researcher, with research ex-
pertise in the field of urinary incontinence, was also contacted in an attempt to retrieve additional articles. For this attempt 236 articles were retrieved and 66 were included. The quality of each article was independently as-
sessed by evaluating blinding, random allocation, and concealment; by the description of withdrawals; by the presence of clinically relevant outcomes; and by determining whether intention-to-treat analysis was performed. We focused on reporting clinical outcomes instead of urody-
namic outcomes.

RESULTS

Clinical Issues

What Factors Increase the Risk of Developing Urinary Incontinence? Multiple factors have been found to be associated with urinary incontinence. Although many of these factors are not modifiable, some are amenable to modifi-
cation, so clinicians can focus on iden-
tifying and addressing these.

Pregnancy, Mode of Delivery, and Parity. After adjusting for the length of the second stage of delivery, episiotomy, vacuum extraction, fetal weight, and sphincter rupture, the risk of having stress incontinence 5 years postpar-
tum was increased in women who de-
veloped stress incontinence during the first pregnancy (odds ratio [OR], 3.8; 95% CI, 1.9-7.5) and in women who de-
veloped stress incontinence during the first 6 weeks postpartum (OR, 4.5; 95% CI, 1.5-13.2). Increased parity also ap-
ppears to be independently associated with urinary incontinence10-17 (OR, 1.62; 95% CI, 1.31-2.01). After adjust-
ing for age, parity was also associ-
ated with subsequent stress inconti-
tinence surgery.18

Mode of delivery is associated with development of urinary incontinence. In 15307 women enrolled in the EPIN-
CONT study,19 age-adjusted analysis found that both cesarean sections and vaginal deliveries, compared with no deliveries, were associated with higher rates of stress incontinence (OR, 1.4; 95% CI, 1.0-2.0 and OR, 3.0; 95% CI, 2.5-3.5, respectively) and mixed inconti-
tinence (OR, 1.7; 95% CI, 1.2-2.5 and OR, 2.1; 95% CI, 1.7-2.6, respectively). After adjustment for age, parity, years since last delivery, and body mass in-
dex, the risk of stress incontinence was higher with vaginal delivery than with cesarean delivery (OR, 2.4; 95% CI, 1.7-3.2). There was no difference in the rates of mixed incontinence between vaginal delivery and cesarean section, or in the risk of urge incontinence among nulliparous women, women who had cesarean delivery, and women who had vaginal delivery. This association between vaginal delivery and stress urinary incontinence was present regard-
less of the age of the patient at the time of childbirth.21

In a cohort study of 315 women, for-
ceps delivery was associated with a higher risk of stress incontinence compared with spontaneous vaginal delivery (hazard ratio [HR], 3.5; 95% CI, 1.1-11.4) and compared with the combi-
dination of spontaneous and vacuum de-
liveries (HR, 3.5; 95% CI, 1.2-9.8) after adjustment for age, infant birth weight, and duration of labor.22 The risk of stress incontinence was not significantly dif-
f erent between forceps and vacuum delivery (HR, 3.5; 95% CI, 0.7-16.1) nor between vacuum and spontaneous de-
livery (HR, 1.1; 95% CI, 0.2-3.7). These results are consistent with a case-
control study in which vacuum delivery, vaginal laceration or episiotomy, and length of the second stage of labor were not found to be risk factors for develop-
ing stress incontinence, whereas force-
ceps delivery was an independent risk factor (OR, 10.43; 95% CI, 1.17-93.42).23

A cohort study that looked at overall urinary incontinence rates in 491 women found no independent associa-
tion between fetal weight and urinary inconti-
tinence. Another cohort study of 549 women that adjusted for augmentation of labor, epidural usage, mode of delivery, perineal trauma, duration of la-
b or, and fetal head circumference found that fetal birth weight was associated with stress incontinence 3 months post-
partum (OR, 2.5; 95% CI, 1.1-6.1) but was not associated with urge inconti-
tinence.25 There also appears to be an in-
dependent association between high-
birth weight and subsequent surgery for stress incontinence.18
Hysterectomy and Other Gynecological Factors. A systematic review found that hysterectomy was associated with developing urinary incontinence in women aged 60 years or older (OR, 1.6; 95% CI, 1.4-1.8) but not in women younger than 60 years (OR 1.1; 95% CI, 0.9-1.3).29 These results were supported by a large cohort study (n=1299) that found, after adjusting for race, income, and reason for hysterectomy, women 50 years or older were less likely to experience improvement in urinary incontinence 2 years after hysterectomy than women younger than 50 years (OR, 0.7; 95% CI, 0.5-1.0).27 This age-related difference may be explained by differing effects of hysterectomy on the development of different types of incontinence. Urge and mixed incontinence predominate in older women, whereas stress incontinence predominates in younger women. After adjusting for age, parity, and educational level, a cross-sectional study revealed that hysterectomy was associated with urge incontinence (OR, 1.93; 95% CI, 1.40-2.63) but not with stress incontinence (OR, 1.18; 95% CI, 0.88-1.59).28 There was no apparent association between mode of hysterectomy (vaginal or abdominal) and urge incontinence or between mode of hysterec-
omy and stress incontinence.29

Urinary incontinence has been found to be independently associated with the presence of a cystocele and/or the absence of urethrovesical crease (OR, 2.49; 95% CI, 1.48-4.18),15 and with uterine prolapse (OR, 4.11; 95% CI, 2.15-7.86).30 However, prolapse surgery with and without hysterectomy has also been independently associated with urinary incontinence.14,31 Other factors independently associated with urinary incontinence include a not-normal gynecological examination (OR, 2.86; P=.001),31 and poor pelvic floor muscle contraction15,31 (OR, 3.48; P<.001).31

Urological and Gastrointestinal Factors. Recurrent urinary tract infection appears to be independently associated with urinary incontinence.12,16,30,32,33 In one study, recurrent urinary tract infection was associated with urge incontinence (OR, 1.98; 95% CI, 1.10-3.57) and mixed incontinence (OR, 2.44; 95% CI, 1.51-3.92) but not with stress incontinence (OR, 1.51; 95% CI, 0.77-2.97).33 Another study found that, after adjustment for confounders, women with urinary incontinence were more likely to report having experienced dysuria in the past 12 months.14 This study, however, does not report what percentage of women reporting dysuria had also been given a diagnosis of urinary tract infection. Childhood enuresis has also been found to be independently associated with urge urinary incontinence in middle-aged women (OR, 2.7; 95% CI, 1.3-5.6).21 Urinary incontinence is independently associated with fecal incontinence32,34 (OR, 10.4; 95% CI, 1.40-20.2),32 which may be because both can be caused by the same process. Constipation and other bowel problems were also independently associated with urinary incontinence.14,16,31 The relationship between constipation and urinary incontinence may also be bidirectional, and may be associated with pelvic organ prolapse.

Medications, Smoking, Alcohol, and Caffeine. Several medications have been independently associated with urinary incontinence in women including: diuretics (OR, 2.2; 95% CI, 1.2-3.9),15 estrogen (OR, 2.91; 95% CI, 1.44-5.89),14,15,24 benzodiazepines (OR, 1.44; 95% CI, 1.12-1.83),32 tranquilizers (OR, 1.65; 95% CI, 1.06-2.37), antidepressants (OR, 1.75; 95% CI, 1.04-2.94), hypnics (OR, 1.52; 95% CI, 1.07-2.16), laxatives (OR, 1.67; 95% CI, 1.18-2.37), and antibiotics (OR, 1.64; 95% CI, 1.25-2.16).36 Although study results are somewhat inconsistent, being either a current or an ex-smoker may be independently associated with urinary incontinence.13,15,37 The association between alcohol and urinary incontinence is less clear.13,37 One study reported an association between daily alcohol intake and urinary incontinence (age-adjusted RR, 1.83; 95% CI, 1.27-2.63).13 However, when stratified by incontinence frequnency, another study did not find an association between daily alcohol intake and urinary incontinence.37 After controlling for age and smoking, high caffeine intake (>400 mg/d) was associated with urge incontinence (OR, 2.4; 95% CI, 1.1-6.5).38

Comorbid Diseases. The presence of 2 or more diseases has been associated with urinary incontinence (OR, 4.38; 95% CI, 2.50-7.68).30 Poor overall health status has also been independently associated with mixed incontinence (OR, 1.43; 95% CI, 1.14-1.79).33 Women with stress urinary incontinence had visited their general physician more frequently in the past year, even after adjusting for confounders (OR, 1.4; 95% CI, 1.0-1.9).21 Specific diseases found to be independently associated with urinary incontinence in women include diabetes,10,31,36 stroke,34,36,37 elevated systolic blood pressure,13 cognitive impairment,32,34 Parkinsonism,39 arthritis,36,37 back problems,36 hearing and/or visual impairment,36,37 and possibly chronic obstructive pulmonary disease.36,39 Vitamin B12 level has not been found to affect continence.40

Age. Advancing age is associated with urinary incontinence,10,15,30,32,39 however, this may not be true for all types of urinary incontinence. A large cross-sectional study of 2763 women found that the prevalence of urge incontinence increased slightly with age (adjusted OR per 5-year interval, 1.19; 95% CI, 1.09-1.31), as did the prevalence of mixed incontinence (adjusted OR per 5-year interval, 1.10; 95% CI, 1.02-1.18).33 However, no association between age and stress incontinence was found (adjusted OR per 5-year interval, 0.93; 95% CI, 0.85-1.03). This would suggest that with age the prevalence of urge incontinence increases while the prevalence of stress incontinence remains unchanged.

Race. After adjustment for educational attainment, financial assets, age, functional status, vision and hearing capability, stroke, body mass index, smoking, alcohol use, parity, and proxy respondent, a large cross-sectional study
of 3991 women found that compared with black women white women had higher rates of moderate (OR, 2.06; 95% CI, 1.10-3.89) and severe urinary incontinence (OR, 2.10; 95% CI, 1.49-2.96).37 A second study of 2763 women similarly found that white race was associated with higher rates of stress incontinence (OR, 2.84; 95% CI, 1.60-5.03) and mixed incontinence (OR, 2.14; 95% CI, 1.48-3.08) but was not so for urge incontinence (OR, 1.26; 95% CI, 0.83-1.91).33

Socioeconomic Status. Higher levels of educational attainment appear to be associated with urinary incontinence, particularly mild incontinence and stress incontinence.10,21,37 Although the reason for this association is unclear, it remains present even after adjustment for factors such as age, race, assets, comorbidity, and obstetrical and gynecological factors. There is no clear association between a person’s financial assets and urinary incontinence.37

Body Mass Index. Many studies have found that increasing body mass index (BMI) is associated with increasing rates of urinary incontinence10,14,16,21,30,31,33,37 (OR per unit increase, 1.05; 95% CI, 1.04-1.07).10

Functional Status. Functional impairment appears to be independently associated with urinary incontinence.32,34,37,39 The presence of trunk restraints has also been found to be independently associated with urinary incontinence.34 Prevalence rates of stress incontinence and urge incontinence are not significantly different between elite athletes and control participants.43

What Nonpharmacological Management Strategies Are Effective? There are several nonpharmacological treatments for urinary incontinence. These include the physical therapy techniques of pelvic floor muscle training, weighted vaginal cones, and electrical stimulation. Pelvic floor muscle training, or Kegel exercise, is a program of repeated voluntary pelvic floor muscle contraction. Pelvic floor muscle training can be done with or without biofeedback techniques to help an individual isolate the relevant muscles.

Weighted vaginal cones are weights that theoretically require contraction of the pelvic floor muscles to prevent the cones from slipping out of the vagina. Electrical stimulation can be used to improve pelvic floor musculature or to inhibit detrusor overactivity. Other nonpharmacological techniques include bladder training, which aims to increase the time interval between voiding, and prompted voiding, which teaches dependent individuals when and how to initiate their own toileting or to respond when prompted to toilet.

Pelvic Floor Muscle Training. Studies of pelvic floor muscle training varied in terms of the duration of each contraction, the number of contractions performed per session, the number of sessions performed per day, and the type of instruction provided. A Cochrane systematic review that included studies of stress, urge, and mixed incontinence, found that pelvic floor muscle training was more effective than no treatment or placebo (TABLE 1).42 The placebo intervention used in the different trials varied and included placebo drug, sham electrical stimulation, and placebo pelvic floor training (ie, having the participant perform exercises that will not alter the pelvic floor musculature). Patients allocated to placebo groups in these studies showed improvement in symptoms. The health status of participants in randomized trials can improve during the course of the trial, independent of the intervention. The improvement may be due to a number of factors (eg, natural history of the disease), but the placebo effect might have a small effect on this outcome. A recent systematic review found that use of a placebo (compared with no treatment) had a moderate effect on subjective, continuous outcomes.43

A recent trial of 200 women, all of whom had stress or mixed incontinence, found that pelvic floor muscle training using a comprehensive clinic-based program was more effective at reducing the frequency of incontinence episodes than using a self-help booklet.44 There were no significant differences between pelvic floor muscle training alone and other physical therapy regimens, except for a significant reduction in urinary leakage with pelvic floor muscle training compared with vaginal cones.45,46 Of note, more adverse events (such as difficulty using the devise and maintaining motivation) were reported with electrical stimulation and with vaginal cones than with pelvic floor muscle training.42 Trials published subsequent to the Cochrane review that included women with stress incontinence have confirmed that there does not appear to be any clear advantage to combining pelvic floor muscle training with biofeedback over pelvic floor muscle training alone.46,47 Another recent trial of 222 women 55 years or older, all of whom had urge or mixed...
incontinence, also found that pelvic floor muscle training with biofeedback was no more effective than pelvic floor muscle training with verbal feedback or than pelvic floor muscle training using a self-help booklet.48 However, biofeedback may be helpful for women who have difficulty isolating their pelvic floor muscles during pelvic floor muscle training.

One trial involving 204 women has suggested that there is no difference between pelvic floor muscle training and bladder training for the treatment of stress, urge, or mixed incontinence.49 However, pelvic floor muscle training combined with bladder training is better than pelvic floor training alone (relative risk [RR] for self-reported cure or improvement, 1.20; 95% CI, 1.02-1.42) or bladder training alone (RR for self-reported cure or improvement, 1.43; 95% CI, 1.17-1.74).42-49 The combination of pelvic floor muscle training and bladder training was equally effective when administered as individual therapy or as group therapy.49 Among cognitively intact individuals, a nurse practitioner-administered home-based therapy program that combined pelvic floor muscle training with biofeedback and bladder training was significantly better than regular social visits by a nurse practitioner (median percentage reduction in incontinent episodes per day: treatment group, 75.0; controls, 6.4; P<0.001).51

Among participants with urge incontinence with or without stress incontinence, there was no difference in self-reported cure rates between pelvic floor muscle training and anticholinergic medications.42,52 However, compared with anticholinergic medications, the combined subjective cure or improvement rates were marginally better with pelvic floor muscle training (RR, 1.18; 95% CI, 1.01-1.37) and pelvic floor muscle training significantly reduced the number of leakage episodes in 24 hours (weighted mean difference [WMD], −0.41; 95% CI, −0.79 to −0.03). Significantly more women receiving anticholinergic medications experienced dry mouth and inability to void. Assuming that dropouts from the study were treatment failures, investigators found that more women reported subjective cure or improvement with α-adrenergic drugs (phenypropanolamine) than with pelvic floor muscle training (RR, 1.41; 95% CI, 1.09-1.81).53 However, there was no significant difference in objective outcomes among those remaining in the study.

A trial of 50 women that compared pelvic floor muscle training to surgery (open retropubic colposuspension, vaginal repair, or a combination) for stress incontinence found no significant difference in the rates of self-reported cure or improvement, but it did find that pelvic floor muscle training resulted in fewer self-reported cures (RR, 0.20; 95% CI, 0.07-0.61).42 Both groups had a significant reduction in the number of leakage episodes, but the surgery group had a significantly greater reduction (P<0.01). All reported adverse events were postsurgical complications.

Electrical Stimulation. Electrical stimulation consists of brief electrical impulses administered via needle or surface electrodes and is used to inhibit detrusor overactivity or to improve pelvic floor musculature. The effectiveness of electrical stimulation may depend on the type of urinary incontinence. A study of 68 participants comparing electrical stimulation with sham stimulation in persons with urge incontinence revealed a number needed to treat (NNT) of 5 (95% CI, 3-42) for cure (no incontinence episodes and no detrusor overactivity on cystometry) and an NNT of 2 (95% CI, 1-4) for improvement (a reduction in the frequency of incontinence by >50% or a cystometric bladder capacity increase >50 mL).54 There was no significant difference in adverse events between the 2 groups.

In a small trial of 27 women with stress incontinence, electrical stimulation was not significantly different from sham stimulation based on an incontinence impact questionnaire or on changes in urinary leakages per week.55 Electrical stimulation alone or in combination with other therapies was also not significantly different from other physical therapy regimens in the treatment of stress incontinence.42,45 A recent trial of 200 women, all of whom had stress or mixed incontinence, found that the addition of pelvic floor electrical stimulation to an extensive pelvic floor muscle training program did not significantly reduce the frequency of incontinent episodes.44

Vaginal Cones. Use of weighted vaginal cones theoretically requires that the pelvic floor muscles be contracted, but factors other than contraction of the pelvic floor muscles may contribute to the cones’ remaining in place. The weights are generally used twice a day for 15 minutes per session, and the weight is increased as tolerated.45 The majority of trials evaluating use of vaginal cones enrolled women with stress incontinence. Participants receiving vaginal cones were more likely to be subjectively cured compared with those who received control interventions that did not involve the pelvic floor musculature (RR for failure to cure incontinence, 0.74; 95% CI, 0.59-0.93).45 However, there were no differences in objective outcomes such as leakage episodes, pad test, or pelvic floor muscle strength. There were no significant differences between vaginal cones alone and electrical stimulation. Therapy with vaginal cones appears to be inferior to pelvic floor muscle training.42,45

Bladder Training. Bladder training techniques varied between studies, but all involved strategies to increase the time interval between voids using progressive voiding schedules. In 2 small trials (n=78), the bladder training groups had fewer individuals who failed to experience a subjective cure vs those who did not receive bladder training (OR for failure, 0.07: 95% CI, 0.03-0.19).50 However, as outlined above, bladder training was not significantly better than pelvic floor muscle training, and the combination of bladder training with pelvic floor muscle training was more effective than either alone.42,45 Bladder training in combi-
nation with drug therapy (eg, calcium antagonists and anticholinergic agents) did not demonstrate significant subjective improvement rates over bladder training alone.56

Prompted Voiding. There are a number of randomized trials that have examined the role of prompted voiding initiated by caregivers at regular time intervals. Several of these trials (including both cognitively intact and impaired participants) have revealed that prompted voiding is better than usual incontinence-related care. Usual incontinence-related care includes regular checking and changing of wet garments and bedding. Compared with participants in the control groups, there was a suggestion that fewer participants who received prompted voiding experienced no improvement in the number of wet episodes (OR for no improvement, 0.59; 95% CI, 0.31-1.14) while more in the intervention groups had significantly fewer incontinent episodes in 24 hours (WMD, −0.93; 95% CI, −1.32 to −0.53).57 One trial found a statistically significant increase in incontinence-related care includes regular checking and changing of wet garments and bedding. Compared with participants in the control groups, there was a suggestion that fewer participants who received prompted voiding experienced no improvement in the number of wet episodes (OR for no improvement, 0.59; 95% CI, 0.31-1.14) while more in the intervention groups had significantly fewer incontinent episodes in 24 hours (WMD, −0.93; 95% CI, −1.32 to −0.53).57 One trial found a statistically significant increase in incontinent episodes per week or in adverse events (except for headache, which was more common among younger participants).59 The overall benefit of tolterodine compared with placebo was not different between the 2 age groups.

In direct comparison trials, tolterodine and oxybutynin did not differ in outcomes.60-62 However, oxybutynin was more commonly associated with the occurrence of at least 1 adverse event (eg, dry mouth, dyspepsia, headache) in 2 trials, with a number needed to harm (NNH) of 8 (95% CI, 5-30) in a trial of 378 participants62 and an NNH of 4 (95% CI, 3-7) in the second trial of 228 participants.61 In particular, the risk of dry mouth was higher with oxybutynin than with tolterodine (NNH, 4; 95% CI, 3-6).61,62 A comparison of extended-release oxybutynin and tolterodine demonstrated that extended-release oxybutynin was associated with a significantly lower mean number of weekly incontinence episodes, and there was no difference in adverse events between the extended-release oxybutynin and tolterodine groups.63 Transdermal and oral oxybutynin did not differ significantly in the reduction in average daily incontinent episodes.64 However, dry mouth occurred more often with oral oxybutynin (NNH, 2; 95% CI, 2-4).

Adrenergic Drugs. α-Adrenergic agonists have been used in the treat-

What Are the Risks and Benefits of Pharmacological Therapies?

There are a variety of pharmacological therapies that have been studied in the treatment of urinary incontinence (Table 2).

Anticholinergic Drugs. Anticholinergic drugs are used in the treatment of urge incontinence to inhibit involuntary detrusor contractions. A Cochrane systematic review of anticholinergics for urge incontinence found anticholinergic medications were better than placebo in subjective cure or improvement rates (RR, 1.41; 95% CI, 1.29-1.54) and in the improvement in leakage episodes in 24 hours (WMD, −0.36; 95% CI, −0.73 to −0.39).58 The most common adverse effect was dry mouth, and compared with placebo, the

Table 2. Comparison of the Pharmacological Treatments for Urinary Incontinence

<table>
<thead>
<tr>
<th>Medication</th>
<th>For Urine Incontinence</th>
<th>Benefits</th>
<th>Potential Adverse Reactions*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticholinergic drugs†</td>
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<tr>
<td>Oxybutynin</td>
<td></td>
<td>Subjective cure or improvement in leakage episodes</td>
<td></td>
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<tr>
<td>Tolterodine</td>
<td></td>
<td></td>
<td>Dry mouth, tachycardia, palpitations, edema</td>
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<tr>
<td>Calcium channel blockers</td>
<td></td>
<td>Not of proven benefit</td>
<td>ECG abnormalities, arrhythmias, Hypertension</td>
</tr>
<tr>
<td>Nimodipine</td>
<td></td>
<td></td>
<td>Headache, diarrhea, GI tract symptoms, Rash, edema, muscle pain, cramps</td>
</tr>
<tr>
<td>Magnesium hydroxide</td>
<td></td>
<td>Subjective improvement</td>
<td>Diarrhea, vomiting, GI tract cramping</td>
</tr>
<tr>
<td>Tricyclic antidepressants†</td>
<td></td>
<td></td>
<td>Seizures, dizziness, Confusion, drowsiness, Blurred vision, tinnitus</td>
</tr>
<tr>
<td>Doxepin</td>
<td></td>
<td></td>
<td>Bone marrow suppression, Hypotension, hypertension, Tachycardia, edema</td>
</tr>
<tr>
<td>Serotonin and norepinephrine agonists‡</td>
<td></td>
<td>Decreased incontinence frequency</td>
<td>Nausea, diarrhea, constipation, Headache, dizziness, dry mouth</td>
</tr>
</tbody>
</table>

*Based on information in the included trials and the Physicians’ Desk Reference, 58th ed, 2002.
†These medications need to be used with caution in elderly patients because of the increased risk of adverse events with their use in this population.
‡Phenylpropanolamine and clenbuterol have also been studied but are not approved by the US Food and Drug Administration.
ment of stress incontinence because α1-A adrenoceptors have been found to mediate the contractile response of the urethra and bladder neck. β-Adrenergic drugs have also been studied. However, many of the studied drugs are not available in the United States. Phenylpropanolamine has been removed from the US market by the US Food and Drug Administration (FDA) because of its association with hemorrhagic stroke.69 Clenbuterol has anabolic steroid properties and is not an FDA approved medication.

A recent Cochrane systematic review found that compared with placebo adrenergic drugs were associated with marginally higher combined cure or improvement rates (RR for midodrine, 1.55; 95% CI, 1.02-2.35; RR for phenylpropanolamine, 1.58; 95% CI, 0.87-2.85; RR for clenbuterol, 1.96; 95% CI, 1.26-3.05).33 More adverse events were also reported with adrenergic drugs (eg, insomnia, restlessness, and vasomotor stimulation) and, although statistical significance was not reached in any single adverse-effect category, the adverse effects were severe enough for 14 women in 6 trials (n=339) to discontinue the treatment or study.

Other Drug Treatments. Because of their smooth muscle relaxant properties, calcium channel blockers are a potential treatment for urge incontinence, but to date no trials have shown their benefit.66 A recently published placebo-controlled trial of nimodipine (n=86) revealed no significant difference in the number of incontinent episodes with this medication.67 Magnesium hydroxide may also be an effective treatment for urge incontinence, by reducing spontaneous detrusor contractions. A small placebo-controlled study (n=40) of women with sensory urgency or detrusor instability found that oral magnesium hydroxide resulted in subjective improvement of urinary symptoms (NNT, 3; 95% CI, 2-91).68 The only reported adverse effect was transient diarrhea (2/20, treatment group vs 1/20, control group).

Doxepin, a tricyclic antidepressant, has also been studied in women with detrusor instability or urinary incontinence. Doxepin as been found to result in subjective improvement compared with placebo (OR, 23.80; 95% CI, 3.99-141.97) but not in objective improvement in bladder stability.66 Serotonin and norepinephrine agonists also have putative continence-promoting properties through parasympathetic suppression and through enhancement of sympathetic and somatic activity. A controlled trial of duloxetine (a selective serotonin and norepinephrine reuptake inhibitor) for treatment of stress incontinence revealed a significant dose response in the median decrease in incontinence frequency, compared with placebo (median decrease in incontinence frequency: placebo, 40%; 20 mg, 44%; P=.6; 40 mg, 59%; P=0.02; 80 mg, 58%; P=.04).69 However, there was no significant difference in cure rates, and there was a dose response increase in discontinuations because of adverse events. The most common adverse effect was nausea.

What Are the Risks and Benefits of Surgical Interventions?

Knowledge of the different surgical procedures is important for primary care clinicians when discussing management options with their patients. For the individual patient, the choice of procedure can also be influenced by coexisting urogenital problems, bladder outlet anatomy, health status, and by the surgeon’s preference and experience performing the various procedures. Surgical procedures to treat stress incontinence are designed to correct urethral closure deficiencies and to improve support of the urethrovaginal junction. There are a variety of surgical techniques that have been evaluated including open retropubic colposuspension, bladder neck needle suspension, anterior vaginal repair, laparoscopic retropubic colposuspension, suburethral sling procedure, and periurethral injections. The potential adverse outcomes of surgery include perioperative complications (eg, infection, hemorrhage, pain, and urinary retention), de novo urgency and urge incontinence, voiding difficulties, recurrent or new pelvic organ prolapse, and need for repeat anti-incontinence surgery. Although there are clinical trials comparing the different surgical procedures, there is insufficient evidence to fully compare surgery with either pharmacological or nonpharmacological interventions. Nearly all patients should be considered for a trial of nonsurgical therapy first.

Open Retropubic Colposuspension. Open retropubic colposuspension involves making an incision over the lower abdomen and lifting the tissues near the bladder neck and proximal urethra in the pelvic area behind the anterior pubic bones.70 Three variations of the procedure are Burch, Marshall-Marchetti-Krantz, and Paravaginal defect repair or Vagina-obturator shelf repair. Based on results from a Cochrane systematic review, open retropubic colposuspension had lower failure rates than bladder neck needle suspension, anterior vaginal repair, and laparoscopic colposuspension (Table 3).10 Open retropubic colposuspension was associated with a lower risk of perioperative complications compared with anterior vaginal repair and with bladder neck needle suspension. Compared with anterior vaginal repair, open retropubic colposuspension resulted in higher rates of new or recurrent prolapse, no difference in de novo urge symptoms and urge incontinence rates, and lower rates of repeat anti-incontinence surgery. There was insufficient evidence to judge whether open retropubic colposuspension and bladder neck needle suspension differed in the rates of repeat surgery, de novo urge symptoms, or new prolapse. There were no differences between open retropubic colposuspension and laparoscopic colposuspension in adverse event rates.

There was no significant difference in failure rates between open colposuspension and suburethral sling procedure. There were also no differences in perioperative complication rates. However, open colposuspension was asso-

TABLE 3

<table>
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<tr>
<th>Procedure</th>
<th>Failure Rates (%)</th>
<th>Confidence Intervals</th>
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<tr>
<td>Open Retropubic Colposuspension</td>
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<td>Anterior Vaginal Repair</td>
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associated with an increased risk for new or recurrent prolapse (NNH, 12; 95% CI, 8-27). There was insufficient evidence to identify differences in rates of de novo urge symptoms, urge incontinence, or voiding difficulties.

Bladder Neck Needle Suspension. Bladder neck needle suspensions are performed using a vaginal or abdominal approach.† A long needle is used to thread sutures from the vagina to the anterior abdominal fascia, looping the sutures through to the paraurethral tissue on each side of the bladder neck to support it. There are 3 main types (Pereyra, Stamey, Raz) and several modified versions. As outlined above, bladder neck needle suspension appears to be inferior to open retropubic colposuspension. Although there is a paucity of data, there does not appear to be a difference in failure rates between bladder neck needle suspension and anterior vaginal repair.† There was insufficient evidence to compare bladder neck needle suspension with laparoscopic colposuspension or suburethral sling procedure.

Anterior Vaginal Repair. During anterior vaginal repair, or anterior colporrhaphy, the vaginal mucosa below the urethra is dissected and sutured(s) are placed in the periurethral tissue and pubocervical fascia to elevate and support the bladder neck. Excess vaginal tissue is removed and the dissected area is closed. A variety of techniques have been described, and examples include the Bologna procedure and Kelly plication. As already outlined, anterior vaginal repair appears inferior to open retropubic colposuspension and equivalent to bladder neck needle suspension.‡ No studies were identified that compared anterior vaginal repair with laparoscopic colposuspension or suburethral sling procedure.

Laparoscopic Colposuspension. Laparoscopic colposuspension is similar to open colposuspension; however, there are technical differences including that a laparoscopic approach is used.‡ Laparoscopic colposuspension appears inferior to open colposuspension, as outlined above. In a recent Cochrane systematic review, there were no eligible studies that compared laparoscopic colposuspension with other surgical procedures, nor were any studies found in our subsequent literature search.

Suburethral Sling Procedure. Suburethral sling procedure uses a combined abdominal and vaginal approach. Strips of material are tunneled under the urethra and attached to either the rectus muscle or ileopectineal ligaments resulting in tightening of the sling and increased bladder support every time the woman contracts her rectus muscles. Tension-free vaginal tape is a modification of the suburethral sling procedure and is considered within a Cochrane review of suburethral sling procedures. There was insufficient evidence to compare suburethral sling procedure with any procedure other than open retropubic colposuspension. As outlined previously, suburethral sling procedure appears equivalent to open colposuspension.

Periurethral Injections. The injection of bulking agents into the urethral submucosa is designed to create artificial urethral cushions that can help to restore continence. A recent Cochrane systematic review found 1 eligible study (n=68) comparing periurethral injection (injection of autologous fat) with placebo (injection of saline). There were no differences in subjective cure or improvement rates (RR, 0.98; 95% CI, 0.75-1.29), and complication rates were higher with periurethral injection (NNH, 5; 95% CI, 3-11). There was also a death in the treatment group from a fat pulmonary embolism. Another study (n=133) compared periurethral injection (collagen injection) with open surgery (open retropubic colposuspension, sling procedure, or bladder neck suspension). There was no difference in patient satisfaction (RR, 1.45; 95% CI, 0.92-2.29), but the number not cured based on objective criteria (24-hour pad test results) was higher with periurethral injection (RR, 1.69; 95% CI, 1.02-2.79).

Comment

Urinary incontinence is common in women and has a tremendous impact on their quality of life. Therefore, it is important that primary care clinicians work with their patients to identify and manage it. Several potentially modifiable factors are associated with urinary incontinence and clinicians can explore these with their patients. There are several nonpharmacological, pharmacological, and surgical treatments available that are effective in managing the symptoms of urinary incontinence. However, it is generally agreed that the first treatment choice should be the least invasive option with the lowest risk for adverse complications. Generally, nonpharmacological options should be considered before pharmacological or surgical options.

We have provided a brief overview of some of the recent developments in this field in an attempt to bridge the gap between research evidence and clinical practice. Part 2 of this series will fo-
cuses on how clinicians can use this evidence in practice.

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REFERENCES


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