

# Approach to urinary incontinence in women

## *Diagnosis and management by family physicians*

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### ABSTRACT

**OBJECTIVE** To outline an approach to diagnosis and management of the types of urinary incontinence seen by family physicians.

**SOURCES OF INFORMATION** Recommendations for diagnosis are based on consensus guidelines. Treatment recommendations are based on level I and II evidence. Guidelines for referral are based on the authors' opinions and experience.

**MAIN MESSAGE** Diagnoses of stress, urge, or mixed urinary incontinence are easily established in family physicians' offices by history and gynecologic examination and sometimes a urinary stress test. There is little need for formal diagnostic testing. Management by family physicians (without need for specialist referral) includes lifestyle modification, pelvic floor muscle strengthening, bladder retraining, and pharmacotherapy with muscarinic receptor antagonists. Patients with pelvic organ prolapse might require specialist referral for consideration of pessaries or surgery, but family physicians can provide follow-up care. Women with more complex problems, such as severe prolapse or failed continence surgery, require referral.

**CONCLUSION** Urinary incontinence is a common condition in women. In most cases, it can be diagnosed and managed effectively by family physicians.

### RÉSUMÉ

**OBJECTIF** Définir une méthode de diagnostic et de traitement des types d'incontinence urinaire rencontrés par le médecin de famille.

**SOURCES D'INFORMATION** Les recommandations concernant le diagnostic sont fondées sur des lignes directrices consensuelles. Pour le traitement, elles reposent sur des preuves de niveaux I et II. Les directives concernant l'orientation, sont basées sur l'opinion et l'expérience des auteurs.

**PRINCIPAL MESSAGE** Le diagnostic différentiel de l'incontinence urinaire à l'effort, par impétuosité ou mixte peut facilement être fait au bureau du médecin de famille grâce à l'histoire, l'examen gynécologique et, parfois, une épreuve de continence à l'effort. Une investigation plus poussée est rarement nécessaire. Les types de traitement que peut utiliser le médecin de famille (sans recourir à des spécialistes) incluent une modification du mode de vie, le renforcement des muscles du plancher pelvien, la rééducation vésicale et l'administration d'antagonistes des récepteurs muscariniques. Les cas de prolapsus des organes pelviens peuvent exiger l'opinion d'un spécialiste pour évaluer la possibilité d'un pessaire ou d'une chirurgie, le suivi de ces interventions pouvant être fait par le médecin de famille. Les problèmes plus complexes, tels les prolapsus sévères ou l'échec d'une chirurgie correctrice, nécessitent l'orientation de la patiente vers un spécialiste.

**CONCLUSION** L'incontinence urinaire est fréquente chez la femme. La plupart du temps, le médecin de famille est en mesure d'en faire le diagnostic et le traitement.

*This article has been peer reviewed.*

*Cet article a fait l'objet d'une évaluation externe.*

*Can Fam Physician 2003;49:611-618.*

## Case

Mrs Smith, aged 69, visits her family physician for her yearly health examination. She is postmenopausal and has a history of hypertension, chronic obstructive pulmonary disease (COPD), and obesity. Mrs Smith has had three uncomplicated vaginal deliveries. She has no history of surgery. She quit smoking 10 years ago. Her medications include hydrochlorothiazide, salbutamol, and ipratropium bromide inhalers.

Questioning during her examination reveals that she has been experiencing almost daily loss of urine associated with coughing. This has limited her social activities. She drinks five cups of coffee daily. Physical examination shows mild vaginal mucosal atrophy and a moderate cystocele.

**U**rinary incontinence (UI) is a common problem that affects women of child-bearing age and older women. Although the exact prevalence of UI is difficult to determine because women do not always report it, reported rates are generally high. The South Australian Health Survey of 1596 women aged 15 to 97 residing in the community found a 35.3% rate of UI.<sup>1</sup> Another survey of 2763 community-residing women with a mean age of 67 found 56% of those surveyed experienced UI at least once a week.<sup>2</sup>

Urinary incontinence is very costly; it represents at least 2% of direct health care costs or \$16 billion (US) annually in the United States.<sup>3</sup> Urinary incontinence affects women's health and sense of well-being. Studies have shown that women with UI report lower quality of life<sup>1</sup> and are more likely to be depressed<sup>4</sup> (level I evidence). They often avoid recreational activities and become socially isolated.<sup>5</sup>

Family physicians should be concerned about UI in women. The condition is often underrecognized. Most women can be diagnosed and treated effectively by family physicians. The objective of this paper is to guide family physicians in diagnosing and managing UI and to indicate when it is appropriate to refer patients to specialists.

### Sources of information

MEDLINE was searched using the MESH terms and single-term key words "urinary incontinence," "urge

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incontinence," "stress incontinence," "pelvic floor muscle exercises," "bladder training," and "primary care" with limits on sex (female), age (18 years and older), and language (English). Additional articles were obtained from the Cochrane Database and from reviewing the reference sections of recent articles on UI in women. Preference was given to randomized controlled trials (RCTs) and clinical trials. Studies of patients from primary care practices rather than specialist practices were preferred.

Most articles used for this paper were based on RCTs (level I evidence), particularly those focusing on management of UI. There are, however, not many original articles on the physical examination for diagnosing UI. Hence, information in this paper on physical examination is largely based on current practice found in consensus guidelines and on the authors' experience and opinions (level III evidence).

### Classification and diagnosis

The common types of UI seen by family physicians are stress, urge, and mixed stress and urge incontinence. Stress UI is the most common type affecting women. Stress UI has an overall prevalence of about 20% in women of any age, mixed stress and urge incontinence is less common with an overall prevalence of approximately 12%, and pure urge incontinence is the least common with an overall prevalence of about 3% among adult women.<sup>1</sup>

Mrs Smith suffers from stress incontinence during coughing exacerbated by her COPD.

In diagnosing UI, assessment begins with a basic history. Physicians should be aware that many women do not seek help for UI, as is the case with Mrs Smith, who mentioned the symptoms only when asked about them. A prospective RCT by Dugan et al<sup>6</sup> reported that only 31% of patients initiated discussion about UI with their primary care practitioners. The main reasons patients did not seek help were their perception that UI was not a big problem and that it was a normal part of aging. Although no studies confirm it, it seems reasonable to explore the issue of UI with women during their annual examinations. As in Mrs Smith's case, this could facilitate earlier detection and treatment.

History-taking for a patient with UI should include questions about leakage, such as precipitating factors, amount and frequency of urine loss, and protective measures (eg, pads or changes of clothing). The effects of leakage on a patient's quality of life should

be assessed. Contributing or correctable factors should be identified by determining patients' approximate daily fluid and caffeine intake and eliciting whether patients are drinking fluids before bedtime, which could contribute to nocturia.

Mrs Smith should be advised to eliminate or limit her coffee and general fluid intake.

Patients who smoke or have COPD or asthma might cough more, a factor that could contribute to stress incontinence. Medication history might identify drugs, such as angiotensin-converting enzyme inhibitors (cough), prazosin (decreased urethral resistance), and diuretics (increased urine production), that are associated with increased likelihood of UI.

Mrs Smith is taking a diuretic that could contribute to her UI; she might need to have this changed to a different antihypertensive agent if other lifestyle modifications are ineffective.

Effects of previous therapy, if any, should be determined, as well as patients' general medical and gynecologic history, including any previous gynecologic or anti-incontinence surgery. Patients should be asked to keep a diary of voids and leakage.

A basic physical examination can include a urinary stress test, and speculum and bimanual pelvic examinations. A urinary stress test can be done with patients supine in the lithotomy position with labia parted. Patients can be asked to cough or perform a Valsalva maneuver. The test can also be done with the patient standing while wearing a pad or with her legs shoulder width apart over a cloth or paper sheet on the floor (to see the leakage). Results of a urinary stress test might be negative if a patient's bladder is empty, her provocative maneuver is not strong enough, she is contracting her pelvic floor muscles, or severe prolapse is masking the leakage. Seeing stress leakage during the test helps to confirm the diagnosis and might help direct conservative treatment, but positive results are not completely necessary to initiate treatment.

A speculum examination will help assess coexisting pelvic organ prolapse. A bimanual pelvic examination (with or without rectal examination) can help assess the reproductive organs and pelvic muscles. Kegel exercises can be taught during a bimanual pelvic examination. It is important to assess patients' Kegel technique because many patients do not do

Kegel's exercises effectively, and some actually perform a Valsalva maneuver instead.<sup>6</sup> Urinalysis or urine culture should be done to rule out urinary tract infections (UTIs) because infection could cause or contribute to urinary leakage.

The consensus guidelines of the Scientific Committee of the First International Consultation on Incontinence<sup>7</sup> highly recommend taking a general history including effect on quality of life, using a voiding diary to quantify symptoms, and doing a physical examination as described above. They also recommend a postvoid residual test to screen for voiding dysfunction, but this is not always practical for family physicians to perform in their offices. A summary of diagnosis and management of UI is shown in **Figure 1**. A more detailed summary of management options can be found in the January 2002 issue of *Canadian Family Physician*.<sup>8</sup>

### Management of UI

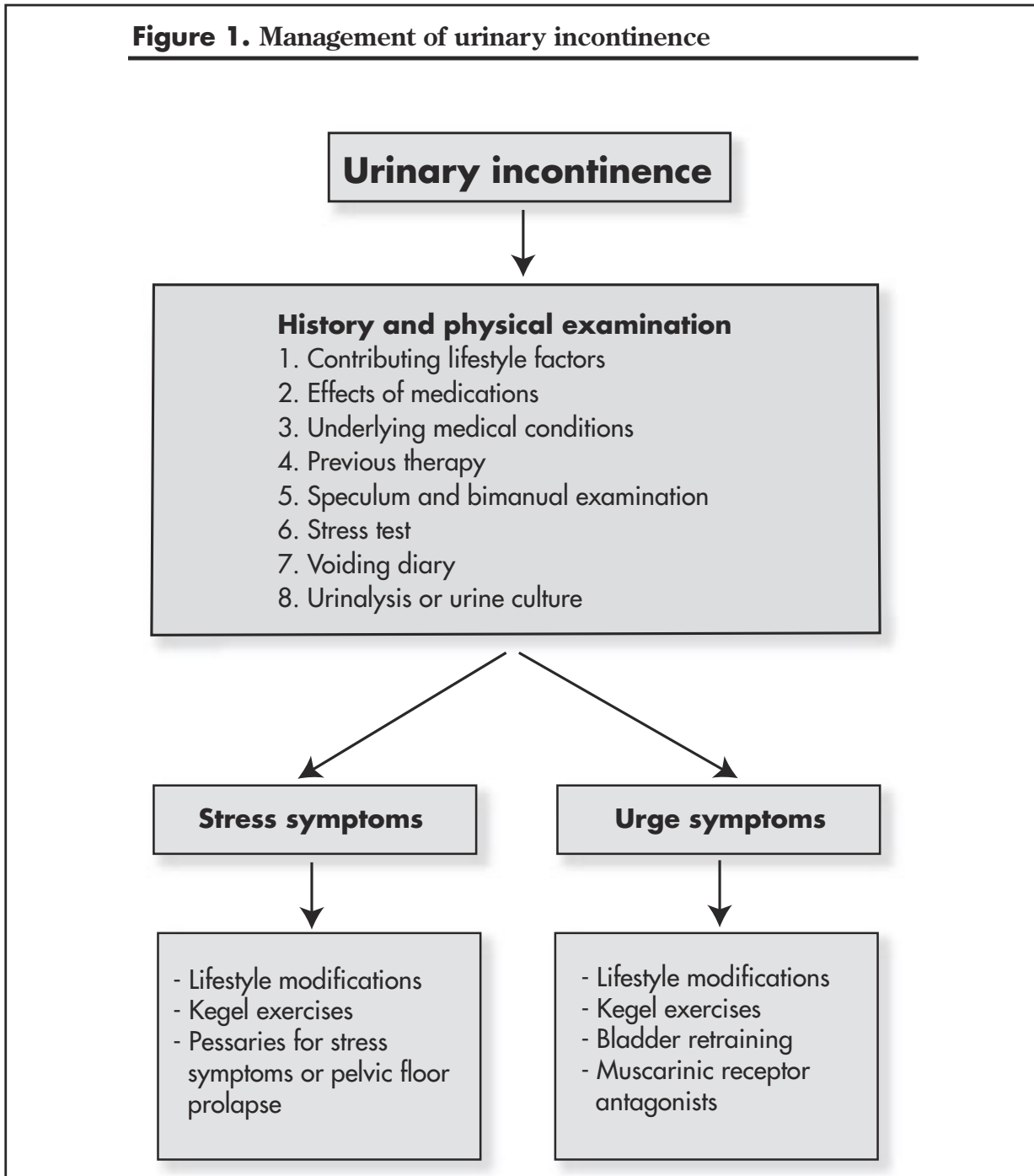
**Lifestyle modification.** The first step in managing UI is lifestyle modification. Elderly patients' UTIs and constipation should be treated. If mobility is impaired, elderly patients should be encouraged to void regularly and wear easy-to-remove clothing.<sup>9</sup> Asymptomatic bacteriuria is common in elderly people, particularly those in nursing homes. Ouslander et al<sup>10</sup> demonstrated, however, that treating asymptomatic bacteriuria in nursing-home residents with stable, chronic UI did not lead to less incontinence (level I evidence).

**Pelvic floor strengthening.** Pelvic floor muscle or Kegel exercises are an effective technique family physicians can teach patients with UI. Many RCTs have shown that they are of benefit in urge, stress, and mixed incontinence, achieving success in 50% to 90% of patients. In these studies, success was defined as either cure or significant reduction in the number of incontinent episodes such that patients were satisfied with the outcome (level I evidence).<sup>11-16</sup> Exercises can be taught during a pelvic examination; progress and technique should be assessed during follow-up visits.

Family physicians are in an ideal position to teach these exercises. A patient information handout might be helpful (**Figure 2**). If patients are unable to do exercises correctly despite teaching or are unable to contract their pelvic muscles at all, referral to a continence nurse or physiotherapist is recommended.

**Bladder training.** Bladder training can also substantially improve symptoms and quality of life in

**Figure 1. Management of urinary incontinence**



urge, stress, or mixed incontinence (level I evidence). An article by Moore et al in this issue (page 602) describes a bladder training protocol in detail.

#### Pharmacotherapy

Hormone replacement therapy in postmenopausal women should be of benefit for treating UI because

estrogen could enhance urethral mucosa coaptation and smooth muscle function.<sup>17</sup> There is no strong evidence in the literature, however, for routinely recommending systemic HRT for treating UI. The Heart and Estrogen/progestin Replacement Study<sup>18</sup> looked at the effect of systemic HRT (oral estrogen 0.625 mg and medroxyprogesterone acetate 2.5 mg daily) on 1525 women with

UI compared with placebo and actually found a worsening of the condition with HRT. Two other smaller double-blind RCTs failed to show a significant change in symptoms of UI following HRT therapy.<sup>19,20</sup>

An RCT comparing the effects of a combination of Kegel exercises and systemic estriol with exercises alone in 66 postmenopausal women with stress UI showed a slight, but significant, increase in the cure rate (measured by a questionnaire) when estriol was used (78.1% vs 67.6%).<sup>16</sup> No large RCTs have examined the effect of intravaginal or local estrogen therapy on UI.

### Levels of evidence

**Level I:** At least one properly conducted randomized controlled trial, systematic review, or meta-analysis

**Level II:** Other comparison trials, non-randomized, cohort, case-control, or epidemiologic studies, and preferably more than one study

**Level III:** Expert opinion or consensus statements

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## Figure 2. Patient information on pelvic floor (Kegel) exercises

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### How exercises work

Pelvic floor exercises are easy exercises that can help improve your bladder or bowel control. When done properly and regularly, these exercises can strengthen the muscles (the “pelvic floor”) that help you hold your urine or feces. The pelvic floor is made up of muscles that are like a hammock that runs from the pubic bone in front to the tailbone in back. They provide support to the pelvic organs (bowel and bladder). These muscles relax when you urinate or have a bowel movement and are otherwise firm to restore control of your bowel and bladder. When these muscles are weakened, there is less support for the bowel and bladder and less control, and urine and feces can leak.

### Learning to do the pelvic floor exercises

It is important that you learn to do the exercises correctly and do them regularly. If the wrong muscles are exercised, there will be no benefit. It might take several months to gain consistent control of the pelvic floor muscles.

### How to “feel” (identify) the muscles of the pelvic floor

Imagine trying to stop yourself from passing wind or diarrhea from your bowel. To do this you would squeeze the muscle around the anus. Try this now: you should feel the muscle move and the skin around the anus tightening and being pulled away from whatever you are sitting on. Do not move the buttocks and thighs or hold your breath. Do not tighten your abdominal muscles.

Next time you go to the toilet, try to stop the stream of urine about halfway through emptying your bladder. Then relax the muscles and allow the bladder to empty completely. These are the same muscles you use to do the pelvic floor exercises. Once you have identified these muscles, however, do not make a habit of interrupting voiding because that might result in incomplete emptying of your bladder.

You may place one or two clean fingers inside your vagina and tighten the pelvic floor muscles to squeeze the fingers.

### Exercise program

Squeeze the pelvic muscles tight and hold the contraction for 5 seconds. Relax for 10 seconds. Repeat this sequence 10 times each morning, afternoon, and night.

Gradually increase to 15 contractions three times daily, then to 20 contractions three times daily, then to 20 contractions four times daily, and finally to 20 contractions four times daily plus 20 extra whenever possible.

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*Adapted from patient information literature prepared by Karen Farrell at the Continence Clinic at IWK Hospital in Halifax, NS.*

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Muscarinic receptor antagonists, such as oxybutynin and tolterodine, have well established efficacy for treating urge and mixed UI. Significant improvement in incontinence episodes has been seen in about 80% of patients (level I evidence).<sup>21-25</sup> Extended-release forms of oxybutynin are available in pill and patch form; the extended-release pill has been shown to be more effective than, and the extended-release patch has been shown to be equally effective as, twice-daily oxybutynin.<sup>26-28</sup> Both extended-release preparations have reduced anticholinergic side effects and are well tolerated by both elderly and younger patients.<sup>26-29</sup>

### Pessaries

Whether a patient has stress UI alone or stress UI and pelvic organ prolapse, a pessary can be effective treatment. A pessary might be good treatment for Mrs Smith because of her moderate cystocele. Small uncontrolled studies have indicated that intravaginal devices have a 63% success rate, defined as less leakage onto a pad (level II evidence).<sup>30</sup> Bladder neck support devices have an 81% improvement rate similarly defined (level II evidence).<sup>31</sup>

Women with stress UI and pelvic organ prolapse should probably be referred to a specialist for consideration of various shapes and sizes of pessaries or surgery. While initial pessary fitting is done in most centres by specialists, family physicians can provide regular follow-up pessary care. Follow-up visits are usually scheduled about every 3 months for the first year, and if there are no problems, about every 6 months thereafter. At follow-up visits, family physicians should remove the pessary and do a speculum examination to look for vaginal erosions or infection. The pessary should be washed in warm soapy water and replaced if the patient cannot do this on her own. Common problems experienced by pessary users and treatment strategies are shown in **Table 1**.<sup>32,33</sup>

### When to refer patients

Although most women with UI can be managed effectively by family physicians, and almost all women can be offered conservative treatment, there are several circumstances in which referral is appropriate. Patients who do not respond to conservative management can be referred to gynecologists, urogynecologists, or urologists (with a special interest in UI). Patients with complex problems, such as previous prolapse surgery, previous continence surgery that has failed, or severe pelvic organ prolapse, should be referred to urogynecologists.

**Table 1. Pessary care: Issues and treatment strategies.**

UNWANTED SEQUELAE	TREATMENT STRATEGIES
Continued incontinence	Consider refitting to larger pessary Consider differently shaped pessary
Vaginal discharge	Take pessary out more frequently  Try vaginal pH cream every other night  If no contraindications, consider vaginal estrogen cream 2 to 3 nights weekly
Vaginal erosions	Rule out cervical or endometrial disease as cause of bleeding  Confirm erosion with speculum examination  Leave pessary out for 2 to 3 weeks  If no contraindications, use vaginal estrogen cream to help heal erosion  Consider fitting a different size or shape of pessary
If no contraindications exist . . .	Consider using vaginal estrogen cream regularly to prevent erosions

Patients occasionally have voiding dysfunction (due to previous surgery, neurologic causes, or other factors) that can cause substantial residual urine and possibly complications from that residual urine, such as recurrent UTIs or hydronephrosis. These patients should be referred to urologists or urogynecologists for further assessment and management (level III evidence) (**Table 2**).

**Table 2. When to refer**

No or partial response to conservative measures
Previous prolapse surgery
Previous continence surgery that has failed
Severe pelvic organ prolapse
Voiding dysfunction with high postvoid residual urine (with or without complications, such as recurrent urinary tract infections or hydronephrosis)

Physical examination of Mrs Smith showed she has fairly marked urinary stress leakage with coughing in the lithotomy position. Bimanual pelvic examination revealed that, although she isolated her pelvic floor muscles correctly during Kegel exercises, the muscle contraction seemed weak and the duration of contraction brief.

Mrs Smith could be counseled not to drink coffee and to lose weight, and could be given a handout describing Kegel exercises. Her hydrochlorothiazide should be changed to a long-acting dihydropyridine calcium channel blocker.

When she returned 3 months later, Mrs Smith had lost 9 kg and no longer drank coffee. She was doing Kegel exercises every day while doing her sit-ups as part of her exercise program. She was experiencing a small amount of urinary stress leakage only about once a week, usually when her bladder was full and if she coughed strongly. She looked and felt good. She was commended on her progress and encouraged to return in 9 months for her next annual visit.

### Conclusion

Urinary incontinence is common and likely to become more common as our population ages and as women become more aware of treatment options. Family physicians have an established trusting relationship with patients that could facilitate discussion of UI. Family physicians can diagnose and manage most cases of UI by counseling patients on lifestyle changes, teaching them pelvic floor exercises, educating them about bladder training, initiating pharmacotherapy, and providing follow-up pessary care. \*

### Acknowledgment

We thank Catherine Hamblin for her administrative expertise in coordinating and assisting the authors with this endeavour, and Dr Ryan Henneberry for assistance with the literature review.

### Contributors

**Dr O'Neil** conducted the literature review, wrote and revised the manuscript, created and developed the case, and approved the final version to be published. **Dr Gilmour** assisted with the literature review, refined the scope and approach of the article for the intended audience, critically reviewed the text, and approved the final version to be published.

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### References

- MacLennan AH, Taylor AW, Wilson DH, Wilson D. The prevalence of pelvic floor disorders and their relationship to gender, age, parity and mode of delivery. *Br J Obstet Gynaecol* 2000;107:1460-70.
- Brown JS, Grady D, Ouslander JG, Herzog AR, Varner RE, Posner SF. Prevalence of urinary incontinence and associated risk factors in postmenopausal women. *Obstet Gynecol* 1999;94:66-70.

### Editor's key points

- Most women with urinary incontinence can be diagnosed and managed by family physicians with no need for diagnostic testing or referral to specialists.
- Pelvic muscle strengthening exercises are helpful in 50% to 90% of cases of stress, urge, or mixed urinary incontinence. Bimanual pelvic examination offers a good opportunity to teach and verify exercise technique (some women perform a Valsalva maneuver rather than contract their pelvic muscles).
- Pessaries are a useful therapeutic option for stress incontinence with or without prolapse of pelvic organs. The problems of vaginal discharge and vaginal erosions associated with pessaries can be easily treated.
- Systemic estrogen replacement therapy is ineffective for treating stress or urge incontinence in menopausal women.

### Points de repère du rédacteur

- La plupart des femmes présentant une incontinence urinaire peuvent être évaluées et traitées par le médecin de famille sans avoir recours à une évaluation urodynamique.
- Les exercices de renforcement des muscles pelviens sont efficaces dans 50% à 90% des cas d'incontinence urinaire à l'effort, d'urgence ou mixte. L'examen pelvien bimanuel offre une bonne opportunité pour enseigner et vérifier cette technique puisque certaines femmes effectuent une manœuvre de Valsalva au lieu de contracter les muscles pelviens.
- Le pessaire est une option thérapeutique utile pour l'incontinence urinaire de stress avec ou sans prolapsus des organes pelviens. Les problèmes de leucorrhée et d'érosions vaginales associés aux pessaires peuvent être traités facilement.
- L'oestrogénothérapie substitutive n'est pas efficace pour traiter l'incontinence urinaire à l'effort et d'urgence chez les femmes ménopausées.

- Milsom I. The prevalence of urinary incontinence. *Acta Obstet Gynecol Scand* 2000;79:1056-9.
- Dugan E, Cohen SJ, Bland DR, Preisser JS, Davis CC, Suggs PK, et al. The association of depressive symptoms and urinary incontinence among older adults. *J Am Geriatr Soc* 2000;48:413-6.
- Dugan E, Roberts CP, Cohen SJ, Preisser JS, Davis CC, Bland DR, et al. Why older community-dwelling adults do not discuss urinary incontinence with their primary care physicians. *J Am Geriatr Soc* 2001;49:462-5.
- Bump RC, Hurt WG, Fantl JA, Wyman JF. Assessment of Kegel pelvic muscle exercise performance after brief verbal instruction. *Am J Obstet Gynecol* 1991;165:322-9.
- Scientific Committee of the First International Consultation on Incontinence. Assessment and treatment of urinary incontinence. *Lancet* 2000;355:2153-8.

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8. Borrie MJ, Valiquette L. Managing adults with urinary incontinence. *Can Fam Physician* 2002;48:114-6.
9. Resnick NM. Urinary incontinence. *Lancet* 1995;346:94-9.
10. Ouslander JG, Shapira M, Schnelle JF, Uman G, Fingold S, Tuico E, et al. Does eradicating bacteriuria affect the severity of chronic urinary incontinence in nursing home residents? *Ann Intern Med* 1995;122:749-54.
11. Berghmans LC, Hendriks HJ, Bo K, Hay-Smith EJ, de Bie RA, van Waalwijk van Doorn ES. Conservative treatment of stress urinary incontinence in women: a systematic review of randomized clinical trials. *Br J Urol* 1998;82:181-91.
12. Burns PA, Prankoff K, Nochajski TH, Hadley EC, Levy KJ, Ory MG. A comparison of effectiveness of biofeedback and pelvic muscle exercise treatment of stress incontinence in older community-dwelling women. *J Gerontol* 1993;48(4):167-74.
13. Cammu H, Van Nuyen M, Amy JJ. A 10-year follow-up after Kegel pelvic floor muscle exercises for genuine stress incontinence. *BJU Int* 2000;85:655-8.
14. Bo K, Talseth T, Holme I. Single blind, randomised controlled trial of pelvic floor exercises, electrical stimulation, vaginal cones, and no treatment in management of genuine stress incontinence in women. *BMJ* 1999;318:487-93.
15. Holtedahl K, Verelst M, Schiefloe A. A population based, randomized, controlled trial of conservative treatment for urinary incontinence in women. *Acta Obstet Gynecol Scand* 1998;77:671-7.
16. Ischiko O, Hirai K, Sumi T, Tatsuta I, Ogita S. Hormone replacement therapy plus pelvic floor muscle exercises for postmenopausal stress incontinence. *J Reprod Med* 2001;46:213-20.
17. Weinberger MW. Conservative treatment of urinary incontinence. *Clin Obstet Gynecol* 1995;38(1):175-88.
18. Grady D, Jeanette S, Brown S, Vittinghoff E, Applegate W, Varner E, et al. Postmenopausal hormones and incontinence: the Heart and Estrogen/progestin Replacement Study. *Obstet Gynecol* 2001;97:116-20.
19. Fantl JA, Bump RC, Robinson D, McClish DK, Wyman JF, the Continence Program for Women Research Group. Efficacy of estrogen supplementation in the treatment of urinary incontinence. *Obstet Gynecol* 1996;88:745-9.
20. Jackson S, Shepherd A, Brookes S, Abrams P. The effect of oestrogen supplementation on post-menopausal urinary stress incontinence: a double-blind placebo-controlled trial. *Br J Obstet Gynaecol* 1999;106:711-8.
21. Chapple CR. Muscarinic receptor antagonists in the treatment of overactive bladder. *Urology* 2000;55(Suppl 5A):33-46.
22. Dmochowski RR, Appell RA. Advancements in pharmacologic management of the overactive bladder. *Urology* 2000;56(Suppl 6A):41-9.
23. Thuroff JW, Chartier-Kastler E, Corcus J, Humke J, Jonas U, Palmtag H, et al. Medical treatment and medical side effects in urinary incontinence in the elderly. *World J Urol* 1998;16(Suppl 1):S48-61.
24. Szonyi G, Collas DM, Ding YY, Malone-Lee JG. Oxybutinin with bladder retraining for detrusor instability in elderly people: a randomized controlled trial. *Age Ageing* 1995;24:287-91.
25. Drutz HP, Appell RA, Gleason D, Kimberg I, Radomski S. Clinical efficacy and safety of tolterodine compared to oxybutinin and placebo in patients with overactive bladder. *Int Urogynecol J* 1999;10:283-9.
26. Dmochowski RR, Davila GW, Zinner NR, Gittelman MC, Saltzstein DR, Lyttle S, et al. Efficacy and safety of transdermal oxybutynin in patients with urge and mixed urinary incontinence. *J Urol* 2002;168:580-6.
27. Davila GW, Daugherty CA, Sanders SW. A short-term, multicenter, randomized double-blind dose titration study of the efficacy and anticholinergic side effects of transdermal compared to immediate release oral oxybutynin treatment of patients with urge urinary incontinence. *J Urol* 2001;166:140-5.
28. Appell RA, Sand P, Dmochowski R, Anderson R, Zinner N, Lama D, et al. Prospective randomized controlled trial of extended-release oxybutynin chloride and tolterodine tartrate in the treatment of overactive bladder: results of the OBJECT Study. *Mayo Clin Proc* 2001;76(4):358-63.
29. Zinner NR, Mattiasson A, Stanton SL. Efficacy, safety, and tolerability of extended-release once-daily tolterodine treatment for overactive bladder in older versus younger patients. *J Am Geriatr Soc* 2002;50(5):799-807.
30. Vierhout ME, Lose G. Preventive vaginal and intra-urethral devices in the treatment of female urinary stress incontinence. *Curr Opin Obstet Gynecol* 1997;9:325-8.
31. Kondo A, Yokoyama E, Koshiba K, Fukui J, Gotoh M, Yoshikaya Y, et al. Bladder neck support prosthesis: a nonoperative treatment for stress or mixed urinary incontinence. *J Urol* 1997;157:824-7.
32. Bash KL. Review of vaginal pessaries. *Obstet Gynecol Surv* 2000;55(7):455-60.
33. Wu V, Farrell SA, Baskett TF, Flowerdew G. A simplified protocol for pessary management. *Obstet Gynecol* 1997;90:990-4.