Postnatal pelvic floor muscle training for preventing and treating urinary incontinence: where do we stand?

Chantale Dumoulin

Purpose of review

Postnatal pelvic floor muscle training aims to rehabilitate the pelvic floor muscles. To be effective, a certain exercise dosage must be respected. Recent trials evaluated the effect of different programs on prevention/treatment of urinary incontinence immediately after delivery and in treatment of persistent incontinence.

Recent findings

Only three systematic reviews, six trials, and four follow-up studies have been published in the past two decades. High heterogeneity in postnatal pelvic floor muscle training programs is observed throughout the literature, making comparisons difficult. In the prevention/treatment of postnatal urinary incontinence immediately after delivery and in persistent incontinence, supervised intensive programs prove more effective than standard postnatal care. Longer-term results have yet to show advantages for postnatal training programs.

Summary

Although a certain exercise dosage must be respected for a postnatal pelvic floor muscle training program to be effective, a few randomized controlled trials present such dosage. Randomized controlled trials should study the effect of supervised, intensive training protocols with adherence aids. As standard care does not seem to reduce the prevalence of postnatal urinary incontinence, obstetrics services must address delivery of postnatal pelvic floor muscle training.

Keywords

pelvic floor muscle, physiotherapy, postnatal, stress urinary incontinence

Curr Opin Obstet Gynecol 18:538–543. © 2006 Lippincott Williams & Wilkins.

School of Rehabilitation, Faculty of Medicine, University of Montreal, Montreal, Canada

Correspondence to Chantale Dumoulin, PhD, PT, School of Rehabilitation, Faculty of Medicine, University of Montreal, 2375 Chemin de la Côte Sainte-Catherine, Montreal, Quebec, H3T 1A8, Canada
Tel: +514 343 6111 ext 0233#; fax: +514 344 1991;
e-mail: Chantal.dumoulin@umontreal.ca

Current Opinion in Obstetrics and Gynecology 2006, 18:538–543

Abbreviations

PEDro	Physiotherapy Evidence Database scale
PFMT	pelvic floor muscle training
qRCT	quasirandomized controlled trial
RCT	randomized controlled trial

1040-872X

Introduction

Urinary incontinence is a common occurrence postnatally, affecting 3–38% of women [1–6]. Whether it starts during pregnancy or immediately after delivery, it is generally a transient condition and is usually resolved within the first 3 months together with the hormonal changes and acute perineum injury sustained at delivery [1,2]. For those with urinary incontinence persisting 3 months after a first delivery, however, there is a very high risk of long-term symptoms persisting [7].

Postnatal urinary incontinence has been linked with injury to the connective tissue support, vascular damage to the pelvic structures, damage to the pelvic nerves, and muscles and injury to the urinary tract [4,8–12,13••]. Several obstetric risk factors have been identified as possible contributors to the development of postnatal urinary incontinence. Growing evidence suggests that vaginal delivery may predispose to urinary incontinence more than caesarean section [1,14,15]. Other factors, such as parity, use of forceps or vacuum, induced labour, prolonged second stage of labour, fetal birth weight, and even pelvic floor muscle (PFM) strength and thickness, may also contribute, although their implication in the aetiology of incontinence is inconsistent [6,15–19]. With or without the presence of urinary incontinence symptoms, childbirth-related damage to the continence mechanism must be taken seriously and special attention should be paid to postnatal women, as they are a high-risk subgroup for urinary incontinence.

Pelvic floor muscle training is the first-line treatment for urinary incontinence [20,21,22•]. It uses graded muscle training, either alone or combined with biofeedback, electrical stimulation, and vaginal cones, to rehabilitate PFM [22•]. The objective is twofold. The first is to teach women to precontract the PFM before and during efforts when intra-abdominal pressure increases. This is thought to stabilize the bladder neck during increased abdominal pressure such as coughing, which prevents urinary leakage through a muscle timing process [23]. The second goal is to improve PFM strength in order to build up long-lasting structural support of the pelvis by elevating the levator plate to a higher location in the pelvis and by enhancing hypertrophy and stiffness of the PFM and connective tissues [24]. According to Bo [24], PFM training (PFMT) could prevent perineal descent during increased intra-abdominal pressure and facilitate automatic motor unit firing. For PFMT to be

effective, however, a certain exercise dosage must be respected. The types of exercise, frequency and intensity, and the duration of the training period in addition to adherence to the training protocol are of primary importance. Recommendations based on exercise science literature [24,25] suggest three sets of eight to 12 slow maximal contractions sustained for 6–8 seconds each, performed three to four times a week and continued for 15–20 weeks. Further recommendations [22•] concern healthcare professionals teaching the correct PFM contractions and supervising PFMT as well as adherence strategies.

After Kegel's report [26] on the positive impact of PFM exercises on urinary incontinence in middle-aged women, teaching PFMT in postnatal wards has become widespread. Yet, to date, few quality studies have evaluated the impact of PFMT on urinary incontinence in postnatal women [27–30,31•,32–36]. The present review summarizes recent studies that evaluate the effect of postnatal PFMT on the prevention and treatment of urinary incontinence immediately after delivery and in the treatment of persistent postnatal urinary incontinence.

Our comprehensive review of the English-language medical literature covered the periods from January 1966 to March 2006 using the electronic MEDLINE database, from January 1982 to March 2006 with the Cumulative Index to Nursing and Allied Health Literature (CINAHL) database, and from January 1980 to March 2006 using Excerpta Medica (EMBASE) to find articles relating to postnatal PFMT to prevent and treat urinary incontinence. The reference lists of retrieved articles were reviewed also to identity references that may not have been found in the preliminary search. All randomized clinical trials (RCTs) and quasi-RCTs (qRCTs) related to PFMT and the perinatal period were considered for inclusion and appraised for methodologic quality using the Physiotherapy Evidence Database (PEDro) Scale, developed by the Center for Evidence-Based Physiotherapy in Australia (http://www.pedro.fhs.usyd.edu.au/index.html).

Our literature search revealed three systematic reviews of PFMT for prevention or treatment of urinary incontinence in postnatal women [22•,37,38] together with five RCTs, one qRCT, and four follow-up studies. For the purpose of this review, postnatal PFMT aiming to prevent or treat urinary incontinence immediately after delivery and to treat persistent postnatal urinary incontinence are considered separately.

Pelvic floor muscle training in the prevention and treatment of urinary incontinence immediately after delivery

One qRCT [32] and two RCTs [27,33] have evaluated postnatal PFMT to prevent or treat postnatal urinary incontinence. Only one RCT published a follow-up study [34]. Table 1 summarizes the qRCTs and two RCTs. With regard to methodologic quality, the qRCT [32] did not use an adequate randomization procedure by alternating assignment to treatment group and control group. Intervention groups were similar at baseline, however, in terms of potential risk factors for urinary incontinence such as forceps delivery and infant birth weight. Other parameters of methodologic quality (power calculation and intention-to-treat analysis) were presented, making this qRCt one of moderate quality. The RCT by Sleep and Grant [27] was of moderate methodologic quality (PEDro score 6/10) with assessors unmasked to group allocation and partial intention-to-treat analysis in which analysis was done by group assignment regardless of PFMT practice but lacking data on loss to follow-up. The RCT conducted by Chiarelli and Cockburn [33] was of higher methodologic quality (PEDro score 7/10) and had adequate randomization, concealed allocation, blinding of assessors, and intention-to-treat analysis. Significant differences characterized the three trials regarding the PFMT protocol. Sleep and Grant described a protocol with a daily individual visit from the midwifery coordinator throughout the postnatal hospitalization period. In addition, a 4-week health diary including sections recommending a specific PFMT program each week was given to the subjects. Alternatively, in the study by Meyer *et al.* [32], women participated in an intensive 6-week PFMT program including two weekly visits supervised by a physiotherapist with a 20-minute biofeedback training session and a 15-minute electroneurostimulation session using an intravaginal electrode. Finally, Chiarelli and Cockburn [33] proposed a 20-minute contact with a physiotherapist on postnatal wards and a further 30-minute contact at 8 weeks postnatally. The intervention was multifaceted and incorporated a pelvic floor exercise program based on strength training along with general advice about bladder habits and care of the perineum. In addition, strategies to enhance adherence to treatment were included. Women were asked to do a maximum of six contractions three times a day. At 3 and 10 months, respectively, Chiarelli and Cockburn [33] and Meyer *et al.* [32] observed a difference in prevalence between the intervention and the control groups. Sleep and Grant [27], however, did not see any difference between the two groups at 3 months. As the quality of an intervention can affect results of RCTs, clinical heterogeneity must be taken into account when combining trials [39•]. Pooling the data from the three above trials is questionable, as their dosages of PFM training were very different. The impact of Sleep and Grant's larger trial with low-intensity intervention would dilute the effect of the other smaller, more intensive intervention trials. Based on exercise physiology principles, it is reasonable to expect that the intensive PFMT protocol supervised by a physiotherapist, as proposed by Meyer *et al.*,

Table 1 Summary of quasirandomized and randomized control trials on pelvic floor muscle training for prevention and treatment of postnatal urinary incontinence immediately after delivery

Study/PEDro score	Subjects	PFMT protocol	Outcome and results
Sleep and Grant [27], 1987 PEDro 6/10	$n = 1800$ (Treatment group 900, Control group 900) Recruited 24 hours postnatally Continence status during pregnancy Treatment = 32% UI Controls = 29% UI	*Treatment*: Standard antenatal and postnatal care + individual daily session with midwifery coordinator while in hospital + 4-week health diary including specific a PFMT program each week *Controls*: Standard antenatal and postnatal care + 4-week health diary including recommendation to do PFM contraction as often as remembered and midstream urine stop	Self-report UI at 3 months No difference between treatment and control groups
Meyer *et al*. [32], 2001 PEDro: qRCT no score	$n = 107$ Treatment group 51, control group 56 Postnatal women recruited during pregnancy Continence status during pregnancy Treatment = 31% UI Controls = 16% UI	*Treatment*: 12 sessions of PFMT with biofeedback and electroneurostimulation *Controls*: no training	Reduction of self-report UI at 10 months Treatment: UI 19% Controls: UI 2% ($P = 0.002$)
Chiarelli and Cockburn [33], 2002, and **Chiarelli *et al*. [34], 2004** PEDro 7/10	$n = 720$ Treatment group 270, control group 350 High-risk postnatal women (delivery by vacuum or forceps, high baby weight) 10% UI at baseline	*Treatment*: Individualized instructions PFMT supervised by physiotherapist + home PFMT exercise prescription + compliance aids Controls: Documentation recommending PFMT daily (standard care)	UI prevalence at 3 months according to a telephone survey Treatment: 31% UI Controls: 38.4% UI ($P = 0.0444$) At 12 months Treatment: 34.4% Controls: 36.4% No significant difference between groups

PEDro, Physiotherapy Evidence Database scale; PFMT, pelvic floor muscle training; UI, urinary incontinence; qRCT quasirandomized controlled trial.

may have been more effective in strengthening the PFM, thereby reducing urinary incontinence, than Sleep and Grant's protocol, which taught women how to contract the pelvic floor and then left them to perform the training themselves. In addition, because adherence to a training protocol affects the final outcome of PFMT, strategies to enhance adherence proposed by Chiarelli and Cockburn may explain the difference in results between their trial and Sleep and Grant's. Chiarelli *et al*.'s 1-year follow-up study [34] showed no difference in continence status between groups, but as the authors argued, it is possible that the intervention was not intensive enough.

Hence the evidence is conflicting regarding the effect of postnatal PFMT in the prevention and treatment of urinary incontinence after delivery. Supervised intensive PFMT seems to be more effective than no treatment or standard care, but it is not clear whether the effect of these PFMT protocols is sustained in the long term. Further long-term follow-up studies with a supervised intensive PFMT protocol are required.

Pelvic floor muscle training in the treatment of persistent postnatal urinary incontinence

Only three RCTs [28,30,35] addressed the treatment of persistent postnatal incontinence, recruiting women with symptoms of urinary incontinence 3 months or more after delivery. Interestingly, all three authors have published follow-up studies [29,31•,36]. In the study by Dumoulin *et al*. [36], however, control subjects were invited to join one of the treatment groups after the trial, so their follow-up data are presented for all women, rather than by original group allocation. Table 2 summarizes the RCTs. All three trials were of moderate methodologic quality (PEDro score 6) with gaps in analysis by intention to treat [35] and adequacy of follow-up [28,30]. There were important differences between the three trials in relation to participants and PFMT protocol. While Wilson and Herbison [28] and Glazener *et al*. [30] included women with symptoms of urinary incontinence regardless of type, the trial by Dumoulin *et al*. recruited only women with moderate and severe stress urinary incontinence according to a 20-minute pad test. Regarding the PFMT protocol, in Wilson and Herbison [28] the women in the treatment group saw the physical therapist on only

Table 2 Summary of randomized control trials on the treatment of persistent postnatal urinary incontinence

Study/PEDro score	Subjects	PFMT protocol	Outcome and results
Wilson, 1998 [28], 2000 [29] PEDro 6/10	$n = 230$ Treatment group 113, Control group 117 UI at 3 months postpartum Stratification (Parity, type of delivery, UI episodes)	Treatment group: Perineometer assisted PFMT instruction by physiotherapist 4 times over 9 months Home exercise program -PFMT -Cones -PFMT & cones 80–100 PFM contractions/day Control group: standard PFM exercises taught in peripartum period	UI prevalence at 12 months Treatment group: 50% Control group: 76% ($P = 0.0003$) 24-h pad test No difference At 5 to 7 years Treatment: 76% Control: 79% No differences between groups
Glazender 1998 [30], 2005 [31] PEDro 6/10	$n = 747$ Treatment group 371, Control group 376 UI at 5 months Stratification (parity, type of delivery, UI episodes)	Treatment group: Verbal teaching PFMT instructions by nurse 3 times over 7 months ± Bladder retraining Home exercises program -PFMT 80–100 contractions/day Control group: Peripartum standard information	UI prevalence at 12 months Treatment group: 59.9% Control group: 69.0% ($P = 0.037$) At 6 years No difference
Dumoulin 2004 [35], 2005 [36] PEDro 6/10	$n = 64$ Treatment group 1 = 21 Treatment group 2 = 23 Control group = 20 SUI at 3 months or more Stratification (parity, UI severity)	Treatment group 1: 1 PFMT session/week with physiotherapist over 8weeks + home PFMT exercises program (39 contractions/day) Treatment group 2: as treatment group 1+ 1 TrA training sessions/week with physiotherapist over 8 weeks + home PFMT exercises program as Treatment group 1 + TrA training Control group: 1 back massage session/week over 8 weeks	Continence according to pad test Treatment group 1: 14/20 Treatment group 2: 17/20 Control group: 0/20 ($P = 0.000$) No difference between treatment group 1 and treatment group 2 At 1 year No difference between treatment group 1 at onset and at 1 year for UDI and IIQ No difference between treatment group 2 at onset and at 1 year for UDI and IIQ

PEDro, Physiotherapy Evidence Database scale; PFMT, pelvic floor muscle training; UI, urinary incontinence; SUI, stress urinary incontinence; TrA, transversus abdominis muscle training; UDI: Urogenital Distress Inventory; IIQ: Incontinence Impact Questionnaire.

four occasions and exercised at home alone for 9 months with either PFM exercises, vaginal cones, or a combination of both, whereas those in the Glazener *et al.* [30] study saw the nurse on three occasions and exercised at home for 7 months. Home exercises comprised 80–100 voluntary PFM contractions per day, for the duration of the study for both Wilson and Glazener following an exercise protocol by Millard [40]. In the study by Dumoulin *et al.*, women participated in an intensive 8-week PFMT program including one weekly visit with the physiotherapist at which a biofeedback training session using an intravaginal electrode followed an electroneurostimulation session. Home exercise programs comprised 30 maximal voluntary PFM contractions, three contractions preceding and maintained during a cough and three PFM endurance contractions per day, for the duration of the study [35].

Immediately after PFMT, all three trials showed a significantly improved continence status in the treatment groups. PFMT proved more effective than standard postnatal care in the studies of Wilson *et al.* and Glazener *et al.* and more effective than a placebo in the study by Dumoulin *et al.* Although Dumoulin's PFMT protocol seemed to have reduced urinary incontinence in a higher percentage of subjects than the Wilson and Glazener protocols, in-depth comparison between the three trials is difficult because of heterogeneity in study population and intervention. Based on a physiopathologic rationale, it is reasonable to expect that PFMT might have been

more effective in subjects with stress urinary incontinence only in the trial by Dumoulin *et al.* than in subjects with stress, urge, or mixed urinary incontinence in the other studies. The supervised intensive PFMT protocol in the study by Dumoulin *et al.* may also explain the difference in results. Interestingly, the dropout rate was much lower in the trial by Dumoulin *et al.* (3%) than in the trials by Wilson *et al.* (52%) and Glazener *et al.* (25%), possibly because of the high number of daily PFM contractions, the absence of training supervision and reinforcement, and the duration of the home exercise programs.

A 1-year follow-up showed lasting improvement in the reduction of symptoms as measured by the Urogenital Distress Inventory questionnaire and lasting improvement in urinary incontinence–specific quality of life as measured by the Incontinence-Impact questionnaire in the study by Dumoulin *et al.* [36]. Comparison with a control group was impossible as subjects were reallocated to an intervention group after the study. In a follow-up to Wilson *et al.* [29], 5–7 years after trial entry, the initial effects of PFMT were not sustained. On average, however, women had had a further 1.5 deliveries since the trial, and analysis was not adjusted for changes in parity. Six years after the trial began, the benefits seen at 1 year were no longer apparent in the follow-up study by Glazener *et al.* [31•], even among women who had had no further deliveries.

Thus, postnatal PFMT in the treatment of urinary incontinence persisting 3 months or more after delivery is more effective than standard postnatal care and placebos. Supervised intensive PFMT seems to be more effective than unsupervised PFMT. There is conflicting evidence about the long-term effect. The need exists for more long-term follow-up studies using supervised intensive PFMT protocols.

Conclusion

To be effective, PFMT depends on dosage. Intensity of and adherence to the training program in addition to supervision by a trained healthcare professional are of primary importance.

Supervised intensive PFMT in the prevention and treatment of urinary incontinence immediately after delivery is more effective than standard postnatal care and no treatment. PFMT in the treatment of persistent urinary incontinence 3 months or more after delivery is more effective than standard postnatal care and placebo. It is not clear whether the effect of these PFMT protocols is sustained in the long term.

Standard postnatal care does not seem to reduce the prevalence of postnatal urinary incontinence as much as PFMT. This very important issue has implications for clinical practice. Obstetrics services need to reorganize their postnatal PFM exercise instructions based on exercise physiology and PFMT literature so that all women can receive up-to-date instructions on PFMT after delivery, with a reminder to exercise.

References and recommended reading

Papers of particular interest, published within the annual period of review, have been highlighted as:

- • of special interest
- •• of outstanding interest

Additional references related to this topic can also be found in the Current World Literature section in this issue (p. 578).

1 Viktrup L, Lose M, Rolff M, Barfoed K. The symptoms of stress incontinence caused by pregnancy or delivery in primiparas. Obstet Gynecol 1992; 79:945–949.

2 Viktrup L, Lose G, Rolf M, Barfoed K. The frequency of urological symptoms during pregnancy and delivery in primiparas. Int Urogynecol J Pelvic Floor Dysfunct 1993; 4:27–30.

3 Wilson PD, Herbisson RM, Herbisson GP. Obstetrics practice and the prevalence of urinary incontinence three months after delivery. Br J Obstet Gynaecol 1996; 103:154–161.

4 Meyer S, Schreyer A, DeGrandi P, Hohlfeld P. The effects of birth on urinary continence mechanisms and other pelvic-floor characteristics. Obstet Gynecol 1998; 92:613–618.

5 Morkved S, Bo K. Prevalence of urinary incontinence during pregnancy and postpartum. Int Urogynecol J Pelvic Floor Dysfunct 1999; 10:394–398.

6 Burgio K, Zyczynski H, Locher J, Richter HE, *et al.* Urinary incontinence in the 12-month postpartum period. Obstet Gynecol 2003; 102:1291–1298.

7 Viktrup L. The risks of lower urinary tract symptoms five years after the first delivery. Neurourol Urodyn 2002; 21:2–29.

8 Snooks SJ, Swash M, Henry MM, Setchell M. Risk factors in childbirth causing damage to the pelvic floor innervation. Int J Colorectal Dis 1986; 1:20–24.

9 Peschers UM, Schaer GN, DeLancey JO, Schuessler B. Levator ani function before and after childbirth. Br J Obstet Gynaecol 1997; 104:1004–1008.

10 Tunn R. MR imaging of levator ani muscle recovery following vaginal delivery. Int Urogynecol J Pelvic Floor Dysfunct 1999; 10:300–307.

11 Dietz HP, Wilson PD. Childbirth and pelvic floor trauma. Best Pract Res Clin Obstet Gynaecol 2005; 19:913–924.

12 Kearney R, Miller JM, Ashton-Miller JA, DeLancey JO. Obstetric factors associated with levator ani muscle injury after vaginal birth. Obstet Gynecol 2006; 107:144–149.

13 •• Mostwin J, Bourcier A, Haab F, *et al.* Pathophysiology of urinary incontinence, fecal incontinence and pelvic organ prolapse. In: Abrams P, Cardozo L, Khoury S, Wein A, editors. Incontinence: third international consultation on incontinence, vol 1: basics, evaluation. Paris, France: Health Publications, Ltd; 2005. pp. 423–484.

This chapter is an excellent comprehensive review of the various mechanisms by which incontinence and prolapse may occur. It includes a strong section on pregnancy and childbirth.

14 Rortveit G, Daltveit AK, Hannestad YS, Hunskaar S. Urinary incontinence after vaginal delivery or cesarean section. N Engl J Med 2003; 348:900–907.

15 Farrel SA, Alen VM, Baskett TF. Parturition and urinary incontinence in primiparas. Obstet Gynecol 2001; 97:350–356.

16 Foldspang A, Mommsen S, Djurhuus JC. Prevalent urinary incontinence as a correlate of pregnancy, vaginal childbirth and obstetric techniques. Am J Public Health 1999; 89:209–121.

17 Pregazzi R, Sartore A, Troiano, *et al.* Postpartum urinary symptoms: prevalence and risk factors. Eur J Obstet Gynecol Reprod Biol 2002; 103:179–182.

18 Thom DH, van den Heden SK, Brown JS. Evaluation of parturition and other reproductive variables as risk factors for urinary incontinence in later life. Obstet Gynecol 1997; 90:983–989.

19 Rortveit G, Daltveit AK, Hannestad YS, Hunskaar S. Vaginal delivery parameters and urinary incontinence: the Norwegian EPICONT study. Am J Obstet Gynecol 2003; 185:1268–1274.

20 Fantl J, Urinary Incontinence Guidelines Panel. Urinary incontinence in adults: clinical practice guidelines. AHCPR pub. no. 92-0038. Rockville, Maryland: Agency for Healthcare Policy and Research, Public Health Service, US Department of Health and Human Services; 1992.

21 Hay-Smith EJ, Bo Berghmans LC, Hendriks HJ, *et al.* Pelvic floor muscle training for urinary incontinence in women. Cochrane Database Syst Rev 2001; 1:CD001407.

22 • Wilson PD, Berghmans B, Hagen S, *et al.* Adult conservative management. In: Abrams P, Cardozo L, Khoury S, Wein A, editors. Incontinence, vol 2: management. Paris, France: Health Publications, Ltd; 2005. pp. 855–964.
This chapter is a very good review of the various RCTs on urinary incontinence. It includes a strong section on postnatal PFMT trials up to 2003.

23 Peschers UM, Vodusek D, Fanger G, *et al.* Pelvic floor activity in nulliparous volunteers. Neurourol Urodyn 2001; 20:269–275.

24 Bo K. Pelvic floor muscle training is effective in treatment of female stress urinary incontinence, but how does it work? Int Urogynecol J 2004; 15:76–84.

25 Wilson P, Bo K, Hay-Smith J, *et al.* Conservative treatment in women. In: Abrams P, Cardozo L, Khoury S, Wein A, editors. Incontinence: second international consultation on incontinence. Plymouth, UK: Health Publications, Ltd; 2002. pp. 571–623.

26 Kegel AH. Stress incontinence and genital relaxation. Clin Symp 1952; 2: 35–51.

27 Sleep J, Grant A. Pelvic floor exercises in postnatal care. Midwifery 1987; 3:158–164.

28 Wilson PD, Herbison GP. A randomized controlled trial of pelvic floor muscle exercises to treat postnatal urinary incontinence. Int Urogynecol J Pelvic Floor Dysfunction 1998; 9:257–264.

29 Wilson PD, Glazener CM, McGee M, *et al.* Randomized controlled trial of conservative management of postnatal urinary and faecal incontinence: long term follow-up study [abstract]. Neurourol Urodyn 2002; 21:370.

30 Glazener C, Herbison G, Wilson P, *et al.* Conservative management of persistent postnatal urinary and fecal incontinence: randomized controlled trial. BMJ 2001; 323:593–596.

31 • Glazener CM, Herbison GP, MacArthur C, *et al.* Randomized controlled trial of conservative management of postnatal urinary and faecal incontinence: six year follow up. BMJ 2005; 330:337–341.
Well designed RCT showing no benefit of low-intensity PFMT. This is the trial for postnatal PFMT for urinary incontinence with the longest follow-up.

32 Meyer S, Hohlfeld P, Achtari C, DeGrandi P. Pelvic floor education after vaginal delivery. Obstet Gynecol 2001; 97:673–677.

33 Chiarelli P, Cockburn J. Promoting urinary continence in women after delivery: randomized controlled trial. BMJ 2002; 324:1241–1247.

34 Chiarelli P, Murphy B, Cockburn J. Promoting urinary continence in postpartum women: 12-month follow-up data from a randomized controlled trial. Int Urogynecol J Pelvic Floor Dysfunct 2004; 15:99–105.

35 Dumoulin C, Lemieux MC, Bourbonnais C. Physiotherapy for persistent postnatal stress urinary incontinence: a randomized controlled trial. Obstet Gynecol 2004; 104:504–510.

36 Dumoulin C, Morin M, Lemieux MC, *et al.* Effect of adding deep abdominal training to pelvic floor muscle training to treat stress urinary incontinence: a one-year follow-up. International Continence Society Annual Meeting read by title abstract book 2004; 662.

37 Harvey MA. Pelvic floor exercises during and after pregnancy: a systematic review of their role in preventing pelvic floor dysfunction. J Obstet Gynaecol Can 2003; 25:487–498.

38 Hay-Smith J, Herbisson P, Morkved S. Physical therapies for prevention of urinary and faecal incontinence in adults. Cochrane Database Syst Rev 2002; 2:CD003191.

39 • Herbert RD, Bo K. Analysis of quality of intervention in systematic reviews. BMJ 2005; 331:507–509.
This is a very interesting paper debating the effect of intervention quality on systematic review conclusions.

40 Millard R. Bladder control: a simple self-help guide. Sydney: Maclennan & Petty; 1987. pp. 25–32.