

Royal Dutch Society  
for Physical Therapy

Review of the evidence

# ***KNGF Guideline***

**for Physical Therapy in patients with  
Stress urinary incontinence**

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In the context of international collaboration in guideline development, the Royal Dutch Society for Physical Therapy (Koninklijk Nederlands Genootschap voor Fysiotherapie, KNGF) has decided to translate its Clinical Practice Guidelines into English, to make the guidelines accessible to an international audience. International accessibility of clinical practice guidelines in physical therapy makes it possible for therapists to use such guidelines as a reference when treating their patients. In addition, it stimulates international collaboration in the process of developing and updating guidelines. At a national level, countries could endorse guidelines and adjust them to their local situation if necessary.

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KNGF's objective is to create the right conditions to ensure that high quality physical therapy care is accessible to the whole of the Dutch population, and to promote recognition of the professional expertise of physical therapists. KNGF represents the professional, social, and economic interests of over 20,000 members.

The guideline is summarized on a flowchart; the Practice Guidelines as well as the flowchart can be downloaded from [www.fysionet.nl](http://www.fysionet.nl).

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## Review of the Evidence

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### A Introduction

The 2011 *KNGF Guideline on Stress (Urinary) Incontinence* is intended to guide the physical therapy treatment of adult men and women with stress (urinary) incontinence (SUI), and replaces the 1998 *KNGF Guideline on Stress Urinary Incontinence*.<sup>1</sup> This guideline is part of a set of guidelines on physical therapy for adult patients with urinary and/or fecal incontinence (or continence dysfunction). For pragmatic reasons, the guideline development team decided to develop separate guidelines for urinary incontinence (including guidelines for SUI, urgency (urinary) incontinence, and mixed urinary incontinence) and for fecal incontinence.

The 1998 *KNGF Guideline on Stress (Urinary) Incontinence* only described physical therapy interventions for adult women with SUI. The current guideline concerns physical therapy for adult patients with SUI and those with mixed incontinence with SUI as the dominant type of incontinence.

Monodisciplinary guidelines for diagnosing and treating urinary incontinence are currently available in the Netherlands for family physicians, urologists and gynecologists, viz. the *NHG-standaard Incontinentie voor urine* (M46) of the Dutch College of General Practitioners (NHG),<sup>2</sup> the *Richtlijn Stressincontinentie bij de vrouw* (No.15) of the Nederlandse Vereniging voor Urologie (Dutch society of urologists; NVU)<sup>3</sup> and the *Richtlijn Urine incontinentie* (No. 55) of the Nederlandse Vereniging voor Obstetrie en Gynaecologie (Dutch society of obstetricists and gynecologists; NVOG).<sup>4</sup> By and large, these guidelines offer the same advice.

In the context of the process to update the 1998 *KNGF guideline*, a working party including members of NHG and KNGF drew up a national collaboration agreement (*Landelijke Eerstelijns SamenwerkingsAfspraak (LESA) Incontinentie voor urine*) with recommendations for the collaboration between family physicians and physical therapists in the care for patients with involuntary loss of urine. The working party formulated its recommendations on the basis of the NHG guidelines (*NHG-standaard Incontinentie voor urine*) as well as the draft version of the updated *KNGF Guideline on Stress (Urinary) Incontinence*.<sup>5</sup>

### A.1 Objective of the KNGF Guideline on Stress (urinary) Incontinence

The objective of the guideline is to describe the 'best possible' physical therapy management (in terms of efficacy, efficiency and patient-centeredness) of adult patients with SUI, based on current scientific, professional, and societal opinions. The treatment described in the Guideline is intended to achieve a full recovery, or the greatest degree of recovery that is attainable if a full recovery is not possible, including the prevention of residual complaints and/or recurrence.

Research has shown that there is currently a great deal of variation in the diagnostics and treatment of urinary incontinence, in terms of treatment goals, interventions<sup>6-8</sup> and the amount of physical therapy care provided.<sup>9</sup> Hence, the present Guideline explicitly intends to:

- improve the care being delivered, based on current scientific opinion, and increase the uniformity and quality of care;
- define and clarify the tasks and responsibilities of the various professions involved, and stimulate collaboration between them;
- assist physical therapists in the process of making decisions on whether to treat patients and in the implementation of diagnostic and therapeutic interventions.

### A.2 Target Group

The present guideline is intended for physical therapists involved in the diagnostics and treatment of patients with urinary incontinence. These physical therapists must have proven specific knowledge and understanding of this group of patients, and have a suitable attitude towards them. Under current Dutch law (Medical Treatment Agreement Act [*WGBO*]<sup>10</sup> and Individual Health Care Professions Act [*Wet BIG*]<sup>11</sup>), *KNGF* regards internal examinations and treatments as 'special procedures' (including palpation via the vagina or anus or introducing an electrode into the vagina or anus), which means that they are subject to special precautionary conditions.<sup>12</sup>

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Registered pelvic physical therapists are allowed to perform internal examinations and treatments with a patient's explicit consent, after the latter has been fully informed of the proposed treatment and possible alternatives. We recommend that the patient's consent to undergo special procedures be confirmed in writing, in a signed informed consent form.

Any physical therapist who wants to perform internal examinations and treatments must have the required skills and qualifications. The relevant professional requirements are listed in a document entitled *Beroeps Competentie Profiel (BCP) Bekkenfysiotherapeut* (professional competence profile for pelvic physical therapists).<sup>13</sup> The important aspect in the context of the present guideline is that any physical therapist who is not a registered pelvic physical therapist and who is asked to treat a client with symptoms associated with the health problem of SUI should ask themselves whether they are sufficiently qualified and able to provide the patient with suitable care. The therapist should check his/her own competencies against the professional requirements for pelvic physical therapists described below.

#### Professional requirements for pelvic physical therapists

##### General knowledge and skills

- Being able to provide patients presenting with pelvic floor and bladder problems with education and treatment.
- Being able to help patients identify and train their pelvic floor muscles and the other muscle groups with which the pelvic floor interacts in everyday bodily functions.
- Having attended training courses and passed the corresponding exams on performing internal examinations of the pelvic floor muscles, for the purpose of providing relevant physical therapy diagnostics and effective feedback about the functions (contraction, endurance, relaxation, and coordination) of the pelvic floor muscles.
- Being able to use electrostimulation and feedback equipment, or devices like vaginal cones or rectal balloons. These devices are particularly used to help patients identify muscle groups or functions they may be unaware of and use them effectively.
- Being able to optimize a patient's physical fitness insofar as this has been affected by the complaint, and to provide ADL advice.
- Being able to advise and assist patients in regaining control over the filling and voiding/evacuation of their bladder (for instance through bladder training in case of mixed urinary incontinence) and rectum.
- Being able, if necessary, to advise patients about supportive devices such as pelvic belts.
- Being able to provide effective care, in terms of prevention, education, coaching, counseling, and treatment, for the following complaints:
  - involuntary loss of urine and/or feces;
  - compelling desire to pass urine and/or to defecate;

- abnormally frequent micturition;
- having to strain to defecate;
- consequences of prolapses of the bladder, uterus, or intestines;
- pain in the lower abdomen or around the anus or genitals;
- sexual problems relating to pelvic floor dysfunction;
- before and after lower abdominal surgery (including gynecological, urological, and colorectal surgery);
- pelvic floor pain and lower back pain during the pregnancy and childbirth period (with management for healthy pregnant women focusing on the prevention of pelvic pain and pelvic floor dysfunction);
- pelvic pain and lower back pain not caused by pregnancy or childbirth.

##### Specific knowledge and skills of the pelvic physical therapist

- Since pelvic floor dysfunctions can be associated with complaints of pain in the pelvic and lower back regions, it is very important for physical therapists to have specific expertise with regard to the diagnostics for these regions.
- The same goes for the relation between organ dysfunctions (bladder, rectal, and sexual dysfunctions) and dysfunctional pelvic floor muscles and associated muscle systems. The extensive knowledge and skills of the pelvic physical therapist enable them to evaluate the patients' specific problems and to diagnose and treat their complaints.

##### The pelvic physical therapist:

- must ensure that a suitable treatment room is available, which meets the requirements formulated in the guidelines and offers the patient sufficient privacy;
- knows how to keep the treatment room in good condition by implementing the necessary maintenance work, repairs, hygienic waste disposal and cleaning, or delegating these tasks to others;
- is able to collaborate (interact) with patients, their partners and/or parents or guardians and/or legal representatives, the referring doctors, and fellow physical therapists and other medical or paramedical professionals (multi-disciplinary approach);
- is aware of the potential emotional/sexual tensions between therapist and client, keeps clear of the boundaries of this area of tension and respects the client in this regard; in view of the intimacy and the physical and emotional sensitivity of the abdominal/pelvic area, the pelvic physical therapist's attitude should be one of particular insight, attention, and care;
- operates within the legal framework of the relevant Dutch legislation (*WBG0*) and acts in accordance with the recommendations issued for due care in special and restricted interventions issued by KNGF and the guidelines for hygiene in interventions in the pelvic floor area issued by NVFB.

1 Throughout this text, 'pelvic physical therapist' refers to a registered pelvic physical therapist.

Pelvic physical therapists have attended supplementary courses to specialize in the treatment of complaints of the entire abdominal, pelvic, and lower back areas. The muscles of the lower back, abdomen, and pelvis play a role in posture and movement. In addition, these muscles have important tasks in miction, coitus, and defecation. Thanks to the supplementary courses, pelvic physical therapists have special expertise in internal examination and treatment. The KNGF executive committee advises physical therapists to leave 'internal procedures in the pelvic floor area' to registered pelvic physical therapists.<sup>14</sup>

Any group treatments and counseling must be preceded by an individual intake procedure, involving history-taking and physical examination, during which the patient is also informed about possible alternatives. If, after consultations with the physical therapist and the referring doctor, the patient decides to exercise in a group setting, the treatment must be evaluated at least once in an individual session.<sup>15</sup>

### A.3 Urinary incontinence

The concepts and definitions used in this guideline are derived from the conceptual framework developed by the International Continence Society (ICS) and the International Urogynecological Association (IUGA).<sup>16</sup>

#### Conceptual framework

ICS/IUGA defines urinary incontinence as the 'complaint of involuntary loss of urine'.

- stress (urinary) incontinence: the complaint of involuntary loss of urine on effort or physical exertion (e.g. sporting activities), or on sneezing or coughing (they also suggest using the term 'activity-related incontinence' when talking to patients, to avoid confusion with psychological stress);
- urgency (urinary) incontinence: the complaint of involuntary loss of urine accompanied by or immediately preceded by urgency;
- mixed (urinary) incontinence: the complaint of involuntary loss of urine associated with urgency and also with effort or physical exertion, or on sneezing or coughing;
- urgency: the complaint of a sudden, compelling desire to pass urine, which is difficult to defer.

The present KNGF Guideline is intended for the treatment of adult patients with SUI and those patients with mixed incontinence who predominantly experience involuntary loss of urine at moments of increased intra-abdominal pressure, such as on sneezing or coughing or on physical exertion (i.e. those with SUI as the predominant form of incontinence).

Patients with mixed incontinence experience involuntary loss of urine both at moments of increased intra-abdominal pressure and loss of urine associated with or immediately preceded by a sudden compelling desire to pass urine. In the latter case, the desire to pass urine (urgency) is accompanied by loss of urine without there being any increased intra-abdominal pressure. Strictly speaking, the term mixed incontinence should not be used for those cases where involuntary loss of urine at moments of increased intra-abdominal pressure is immediately followed by urgency which is

not followed by micturition. This form of incontinence, which is accompanied by 'stress-induced urgency', is regarded as SUI in the present guideline.

All other forms of incontinence are beyond the scope of this guideline. A guideline on urgency (urinary) incontinence and evidence-based statements on the diagnostics and treatment of fecal incontinence are currently being developed.

ICS/IUGA make a distinction between urinary incontinence as a *symptom* (i.e. a subjective indication of a disease or disorder or a change in health status perceived by the patient) and urinary incontinence as a *sign* (a phenomenon observed by a care provider, including the verification and quantification of symptoms). SUI as a symptom is revealed by history-taking, when a patient reports involuntary loss of urine at moments of increased intra-abdominal pressure. SUI is regarded as a sign if passage of urine through the urethra is observed at moments of increased intra-abdominal pressure.

If urodynamic examination does not reveal any detrusor activity, the disorder is referred to as urodynamic SUI.<sup>17</sup> Since both family physicians and physical therapists (if patients contact a physical therapist directly) establish the diagnosis of SUI by means of pattern recognition and do not use urodynamic examination, this KNGF Guideline uses the term SUI for 'any SUI whose presence has been established.'

The health problem perceived by the patient involves more than just the loss of urine. Urinary incontinence nearly always has adverse effects on the patient's quality of life, including reduced social participation; patients feel lonely and unhappy, stigmatized, and hampered in nearly all activities of daily living, including their sexual relationships.<sup>18-20</sup> The way in which patients perceive and experience the consequences of urinary incontinence is important as this experience is part of the health problem. Even minor incontinence can have considerable effects on a person's quality of life.<sup>18;21-23</sup> Since it is important to be able to record these consequences of urinary incontinence, the guideline development team decided to describe the health problem in the terms used in the International Classification of Human Functioning, Disability and Health (ICF),<sup>24</sup> that is, as impairments of body functions and structures, limitations of activities, restrictions of participation, and environmental factors.

Involuntary loss of urine at moments of increased intra-abdominal pressure (symptom) implies a limitation of the activity of passing urine at the right time and place. In terms of the ICF classification, observing loss of urine at moments of exertion (sign) and observing loss of urine in the absence of detrusor contractions are regarded as observing an impairment of the body function of storing and voiding urine.

### A.4 Clinical questions

The following clinical questions were used to guide the drafting of the present guideline:

- How important is SUI as a health problem?
- What etiological factors are involved in the development of SUI?
- How is SUI diagnosed and how reliable, valid, and feasible in routine practice is the diagnostic process in physical therapy?
- What are the prognostic factors and which of them are modifiable by physical therapy?

- What types of treatment and prevention are effective and efficient in relation to the nature and severity of the health problem?

#### A.5 Composition of the guideline development team

To answer the above clinical questions, a project team was established in 2006, comprising people who had been involved in the development of the previous SUI guideline. The team was asked to collect, summarize, and evaluate the relevant scientific literature. In addition, a guideline development team was established, its composition being based as much as possible on the expertise and experience of those invited to take part. All members of the guideline development team declared that they had no conflicting interests with regard to developing the KNGF Guideline. The guideline was developed over the period from September 2005 to June 2010.

#### A.6 Werkwijze werkgroep

The previous guideline was updated in accordance with the Dutch document called '*Methode voor Richtlijnontwikkeling en Implementatie*' (method for guideline development and implementation), which offers practical recommendations for a strategy to collect the relevant literature, including the selection of search terms, sources to be consulted and the period covered by the search.<sup>25-28</sup> The document also offers recommendations on reporting the criteria used to include or exclude publications and on indicating the level (strength) of the evidence underlying the recommendations in guidelines.

An efficient updating process was achieved by evaluating and adjusting the previously formulated clinical questions on the basis of the results of an evaluation of the 1998 SUI guideline, in terms of process, outcome, and the experiences of therapists and patients. The updated clinical questions were then used as a basis for a supplementary literature study. The recommendations for the physical therapy process are based on the available scientific evidence. This evidence was discussed with the entire guideline development team and summarized, with an indication of the levels of evidence. If no scientific evidence was available, the recommendation was formulated on the basis of consensus among the team members.<sup>25-28</sup>

In addition to scientific evidence and consensus among team members, some other considerations were also used in formulating the recommendations.<sup>29</sup> Recommendations were formulated from the perspectives of clinical relevance, safety, the patient, resource availability (including funding), and organization of care, as well as from the legal and ethical perspectives.

After the draft guideline had been completed, it was sent to external experts and representatives of professional associations (acting as an external advisory group) to ensure coordination and consensus with other professions and organizations and/or with other existing monodisciplinary or multidisciplinary guidelines. Efforts were also made to coordinate the policies used by family physicians and physical therapists, on the basis of the national collaboration agreement between family physicians and physical therapists regarding the care for patients with involuntary loss of urine (*Landelijke Eerstelijns SamenwerkingsAfspraak Incontinentie voor Urine*).<sup>5</sup>

#### A.7 Validation by intended users

The updated guideline will be validated during the implementation campaign, with a cohort study to evaluate whether therapists adhere to the guideline, using web-based electronic patient files. Such files can be used to record the interventions by individual physical therapists, and to monitor and support the therapeutic process, by generating feedback on the interventions from the files and then using the feedback to evaluate the process on the basis of quality indicators.

#### A.8 Structure, products, and implementation of the guideline

The KNGF guideline consists of three components:

- The actual *KNGF Guideline on Stress (Urinary) Incontinence* (Practice Guidelines), which will be published as a supplement to the *Nederlands Tijdschrift voor Fysiotherapie* (Dutch Journal of Physical Therapy).
- A Review of the Evidence, explaining the choices that were made in producing the guideline, which will be made available through the KNGF website ([www.fysionet.nl](http://www.fysionet.nl)) and the website of the Centre of Evidence Based Physiotherapy (CEBP) in Maastricht (see [www.cebp.nl/www.PEDdro.au](http://www.cebp.nl/www.PEDdro.au)).
- A summary chart (flowchart).

This three-part structure was chosen for didactic reasons and to improve the practical suitability of the guideline. The *Practice Guideline*, *Review of the Evidence* and the *Flowchart* can be read as independent documents.

The guideline is being introduced and disseminated using a standardized implementation strategy.<sup>25-28</sup>

#### A.9 Literature search

The process of selecting and evaluating the relevant literature was prepared by the project team (NB, BB, and EH). The results of this preparation stage were then discussed with the entire guideline development team. The scientific evidence to support the epidemiological data, the etiology and the diagnostic process was gathered from publications identified through supplementary searches, covering the 1998–June 2010 period, in the following databases: MEDLINE, EMBASE, CINAHL, PEDro, the Cochrane database, the CEBP database, and the DocOnline database of the Dutch Institute of Allied Health Care's documentation center in Amersfoort.

Publications on the nature, seriousness, and importance of SUI as a health problem were retrieved using the following search terms: 'incidence', 'prevalence', 'etiology', 'risk factors', 'predictors', 'incontinence', 'urinary incontinence', 'detrusor instability', 'detrusor overactivity', 'bladder', 'overactive bladder', 'stress urinary incontinence', 'urge urinary incontinence', 'mixed incontinence', 'urgency', 'frequency', 'nocturia', 'involuntary leakage of urine', 'peri- and postpartum dysfunction', 'pelvic floor dysfunction', 'pelvic floor disorders', 'bladder neck mobility', 'vaginal pressure', 'intra-abdominal pressure', 'previous sexual abuse', 'comorbidity', 'low back pain', 'COPD', and 'depression'.

Publications about the way to diagnose SUI and about the reliability, validity, and feasibility of the diagnostic examinations for physical therapy in routine practice were retrieved by combining the search term 'urinary incontinence' with the following key



words: 'diagnosis', 'assessment', 'guidelines', 'pelvic floor assessment', 'strength', 'endurance', 'pad test', 'diary', 'ultrasound', 'manual muscle testing', 'vaginal squeeze pressure', 'palpation', 'digital assessment', 'manometry', 'pelvic floor function', 'pelvic floor assessment', 'EMG', 'validity', and 'reliability'.

Publications about the types of treatment and prevention that are effective and efficient in relation to the nature and severity of SUI as a health problem were retrieved by combining 'urinary incontinence' with: 'physiotherapy', 'physical therapy', 'conservative management', 'conservative therapy', 'conservative treatment', 'life style', 'non-surgical stimulation', 'electrostimulation', 'transcutaneous electrical nerve stimulation', 'neuromuscular stimulation', 'electrical stimulation', 'electrotherapy', 'myofeedback', 'biofeedback', 'vaginal cones', 'magnetic stimulation', 'pelvic floor', 'pelvic floor muscle training', 'pelvic floor rehabilitation', 'pelvic floor exercises', 'pelvic floor re-education', 'peri partum training', 'antenatal exercises', '(Kegel) exercises', 'post partum exercises', 'RCTs', 'controlled trials', 'evaluation', 'effectiveness', 'efficacy', and 'outcome'.

In addition, literature references from the studies thus identified were used to trace further relevant publications. The scientific evidence is briefly summarized below for each topic, including the levels of evidence according to the EBRO (Evidence-Based Guidelines Platform) list developed under the auspices of the Dutch Cochrane Center and the Dutch Institute for Healthcare Improvement (CBO).<sup>30</sup> This list indicates the scores (levels) to be used to evaluate the methodological quality of publications for the purpose of guideline development, and the other aspects – in addition to scientific evidence – that are important for formulating recommendations, such as: achieving general consensus, efficiency (costs), resource availability, the required expertise and training, organizational aspects, and efforts to harmonize the guidelines with other monodisciplinary or multidisciplinary guidelines. The methodology that the development team used to formulate its recommendations is presented in Table 1. A survey of all recommendations from the present guideline is included as Supplement 1 in the *Practice Guideline*.

Table 1. Levels of evidence: classification of methodological quality of individual studies.

intervention	diagnostic accuracy of study	damage/side-effects*, etiology, prognosis
A1 systematic review of at least two independent A2 level studies		
A2 randomized, double-blind, comparative clinical trial of good quality and sufficient sample size	study comparing with a reference test ('gold standard') with predefined cut-off values and independent assessment of the outcomes of the test and the gold standard, based on a sufficiently large sample of consecutive patients, all of whom have undergone the index and reference tests	prospective cohort study with sufficient sample size and follow-up, effectively controlled for confounding and with effective measures to prevent selective follow-up
B comparative study not meeting all criteria mentioned under A2	study comparing with a reference test, not meeting all criteria mentioned under A2	prospective cohort study, not meeting all criteria mentioned under A2, or retrospective cohort study
C non-comparative study		
D expert opinion		

\* This classification is only relevant for situations where controlled trials are impossible due to ethical or other considerations. If controlled trials are an option, the classification for interventions is to be used.

Level of conclusions

conclusion based on:	recommendations based on the level of the conclusion
1 study at A1 level or at least two independent A2 level studies	It has been demonstrated that...
2 one study at A2 level or at least two independent B level studies	It is plausible that...
3 one B or C level study	There are indications that...
4 expert opinion	In the opinion of the guideline development team, ...

**A.10 Epidemiological data**

**A.10.1 Urinary incontinence in women**

Depending on the definition used and the population investigated, the prevalence of urinary incontinence ranges from one quarter to over half of all adult women. The prevalence increases with increasing age; research has shown that it ranges from 11 to 55% among older women.<sup>31</sup> In the Netherlands, the prevalence appears to be lower among ethnic (Moroccan and Antillean) minorities.<sup>32</sup> Muijsenbergh and Lagro-Janssen concluded, however, that urinary incontinence is a serious problem of everyday life among Moroccan and Turkish minorities, partly as a result of religious beliefs emphasizing bodily cleanliness.<sup>33</sup> These women often concealed the problem because of feelings of shame, the time-consuming repeated efforts to keep their body clean and the fact that they felt they were not being taken seriously by their family doctor. This may have resulted in underreporting, which may have distorted prevalence figures.

Sandvik et al. developed an instrument to measure the severity of the incontinence problem, in order to find out what proportion of the population seeks professional help. They found that about 20% of the people with incontinence problems were sufficiently worried by the problem to seek professional help.<sup>34</sup> This percentage was found to rise with advancing age, and was also higher among women with concomitant other urogenital problems.<sup>35</sup> Research has shown that about 50% of the women below the age of 65 years with urinary incontinence had SUI, while 14% had urgency (urinary) incontinence and 36% had mixed incontinence.<sup>36</sup> Older women appear to be more likely to have urgency (urinary)

incontinence or mixed incontinence.<sup>37</sup> Incidence figures have also been found to depend on the definition used and the population investigated. Reported annual incidence rates (numbers of new cases) of urinary incontinence range from 1 to 11%, and the annual remission rate from 6 to 11%.<sup>38</sup>

**A.10.2 SUI in women**

**Prevalence**

Prevalence figures for SUI among women as reported in most studies range from 10 to 40%.<sup>38</sup> A large cross-sectional study of urinary incontinence among women (27,936 Norwegian women) found a gradual increase in prevalence with age in the group aged 30–65, with a peak between 45 and 50 years, followed by a slight decline continuing into advanced age.<sup>37</sup> The severity of SUI showed a steady increase with age.<sup>37</sup> The proportion of SUI among women with urinary incontinence ranged from 50% among those aged 20–25 to 65% among those aged 45–49 years, then declining to less than 40% (among those aged 65–69) and to about 30% among women aged 85–90. The proportion of mixed incontinence was slightly less than 30% among those aged 20–49 years, then rose to just below 50% among those aged 70–75 and eventually fell slightly to about 40% among those aged 80–90 years (figure 1).<sup>37</sup> Dutch data from 2010 show comparable values.<sup>39</sup> The prevalence of urinary incontinence in the Netherlands in the year 2000 was about 57% among those aged 45–70; 29% of them had stress urinary incontinence, 6% had urgency urinary incontinence and 23% mixed urinary incontinence.<sup>40</sup>

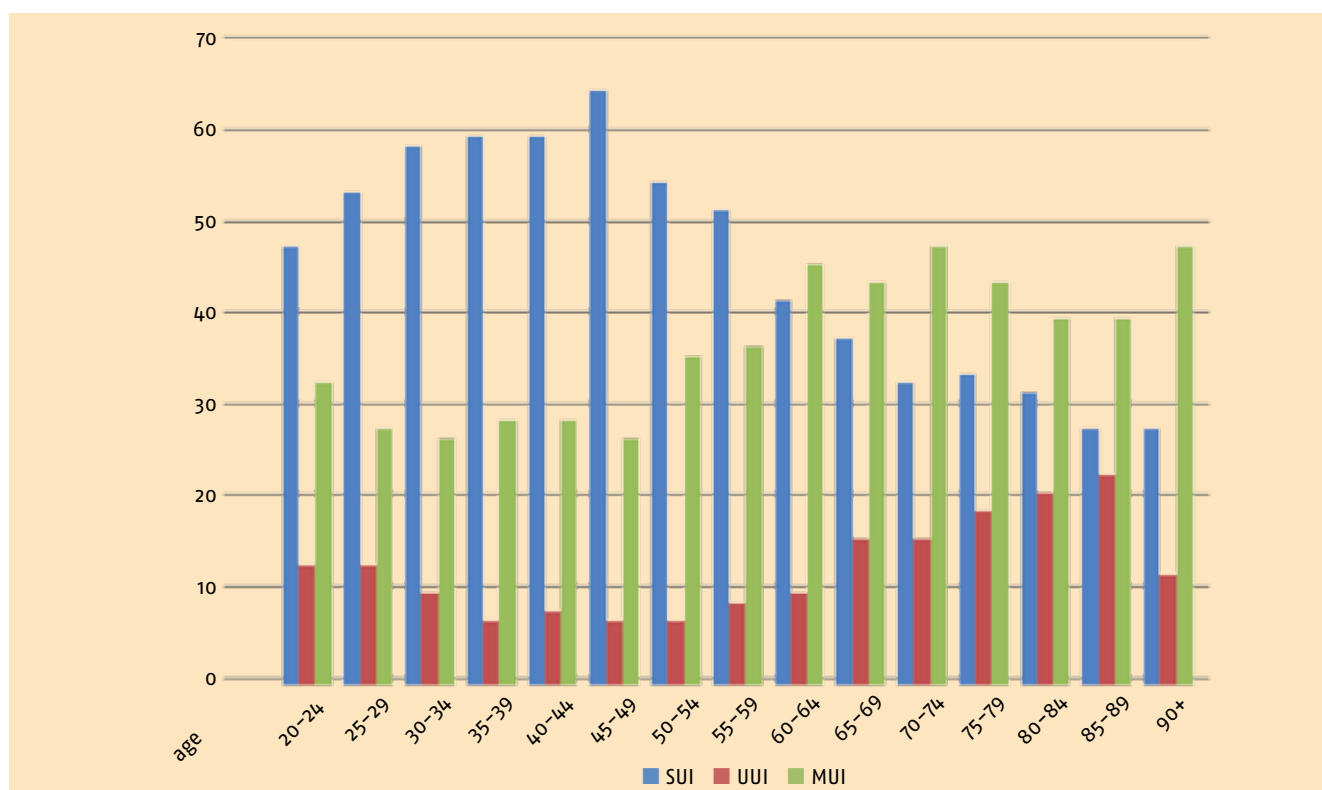


Figure 1. Prevalence of urinary incontinence among Norwegian women, summarized by age and by type of incontinence. SUI = stress (urinary) incontinence; UUI = urgency (urinary) incontinence; MUI = mixed urinary incontinence. Source: Hannestad et al., 2000.<sup>37</sup>

**Incidence**

The annual incidence of SUI in 2005 ranged from 7–11%; the annual remission rate from 5–9%.<sup>38</sup> A study by Samuelson et al. found an annual incidence of 2.9% and a remission rate of 6.8%. They found an annual net increase in the prevalence of this type of incontinence of 0.8%. They concluded from the relatively large number of spontaneous remissions that SUI among young and middle-aged women is not always a chronic disorder, but rather a dynamic condition.<sup>41</sup>

**A.10.3 Urinary incontinence in men**

Depending on the definition used and the population investigated, the prevalence of urinary incontinence among all adult men is less than 10%. Research has shown that the prevalence rises with age: prevalence figures among older men range from 3.7% to 31%.<sup>31</sup> Research has also shown that SUI among men generally occurs only as a result of internal sphincter deficits due to surgery, radiation therapy or neurological disorders.<sup>42–44</sup> Family practice data show a very low prevalence of SUI among men younger than 65 years (usually after transurethral resection of the prostate (TURP) or radical prostatectomy), the estimated prevalence being 0.9–5%.<sup>44;45</sup> Hunskar et al. found that the prevalence of urinary incontinence after radical prostatectomy for prostate cancer ranged from 5% to over 60%.<sup>38</sup>

The natural course of urinary incontinence after radical prostatectomy can be determined from the percentage of patients reporting to perceive leakage, a percentage that has been found to fall from 50% at 3 months after the operation to 20% at 12 months.<sup>44</sup> The differences between the incidence and prevalence data have been attributed to differences in the definition of incontinence (in terms of severity and frequency), differences in the methods and timing of evaluation, and inter-observer differences.<sup>44;46;47</sup> In addition, different surgical techniques may lead to different incidence rates.<sup>43;48;49</sup> The study by Hunter et al. showed that 10% of the men who had undergone TURP for benign prostate enlargement were still using incontinence pads after 3 months; no longer-term data about the use of incontinence products are available.<sup>44</sup> The problem of urinary incontinence among men appears to alleviate over time, both after TURP and after radical prostatectomy: Hunskar et al. found a decrease and stabilization within 1–2 years after surgery, with a small percentage of the men remaining incontinent for urine.<sup>38</sup>

**A.11 Costs**

The costs of incontinence care are high and continue to rise. Figures from a project on the use of medication and devices (*Genees- en hulpmiddelen Informatie project, GIP*), carried out by the Dutch

Health Care Insurance Board CVZ, reveal the costs of absorptive materials and medications to treat urinary incontinence outside hospitals. In 2003, the costs of incontinence pads amounted to 102.2 million Euros, since when they rose by 46% to 149.5 million in 2007. Over the same period, the costs of medications for urinary incontinence almost doubled, from 8.4 million to over 16.4 million Euros (Table 2).<sup>50</sup> The huge increase in costs in 2006 was caused by the introduction of a new health insurance reimbursement scheme in the Netherlands in January of that year. The cost figures for 2002–2005 are based only on patients in the former state social health insurance system, and hence represent a considerable underestimation of the real figures, as they do not include the costs reimbursed by private health insurers.

**A.12 Problem definition**

This KNGF guideline is intended for the target group of adult patients with SUI. This includes those patients with mixed incontinence for whom stress urinary incontinence is the dominant form of incontinence. All other forms of incontinence are beyond the scope of this guideline.

SUI refers to involuntary loss of urine at moments of increased intra-abdominal pressure, such as sneezing, coughing and physical exertion. The loss of urine is the result of a dysfunction of the continence mechanism, which is the physical manifestation of the health problem.

Whether physical therapy can contribute to a reduction of this health problem depends on the modifiability of the factors underlying the dysfunction of the continence mechanism.

Understanding how the incontinence arose may help to understand the nature of the underlying 'disorder' and/or the disease process that is responsible for the dysfunctional continence mechanism. And an understanding of the underlying disorder and/or the disease process that is responsible provides insight into the biological recovery potential and the modifiability of the incontinence problem.

**A.12.1 Continence**

Two mechanisms play a role in SUI, mechanisms which normally collaborate to ensure urinary continence:

1. an intrinsic urethral closure mechanism which involves the tunica mucosa, the tunica spongiosa and the tunica muscularis;
2. a supporting external mechanism, provided by the function of the pelvic floor (not only the muscles, but also the entire connective tissue skeleton).<sup>51</sup>

The thickness of the mucous membrane, the tunica mucosa, and the degree of swelling of the tunica spongiosa, determine the

*Table 2. Costs (in Euros) of incontinence products (A05 in the IS0999 classification) and pharmaceuticals used to treat urinary incontinence in the Netherlands (ATC code: G04BD) for the 2003–2007 period.*

	2003	2004	2005	2006	2007
incontinence products	102,226,000	109,495,000	113,403,000	145,346,000	149,465,000
urinary antispasmodics	8,392,100	9,173,200	11,552,600	14,017,900	16,410,200

*Source: GIPeilingen 2007, Ontwikkelingen genees- en hulpmiddelengebruik, GIP/College voor zorgverzekeringen, Diemen, August 2008, No. 29.*

intrinsic diameter of the urethra, and are responsible for about one third of the pressure in the urethra. The tunica muscularis, which consists of an inner layer of smooth muscle fibers and an outer layer of striated muscle fibers, actively contributes to the intrinsic urethral closure mechanism through its muscle tone.

At normal body posture and normal position of the pelvis, increased intra-abdominal pressure (IAP) causes increased urethral closure pressure, as a result of increased activity of the smooth muscle fibers in the urethral wall, elicited by sympathetic stimuli.<sup>52</sup> Contraction of the pelvic floor muscles during physical exertion provides active extrinsic support for the urethral closure mechanism and prevents the bladder neck and the urethra from moving downward or backward, so that increased IAP on the pelvic floor results in the urethra being compressed.<sup>51;53</sup>

The literature offers few studies on the individual contributions that the intrinsic and extrinsic components of the urethral closure mechanism make toward the total urethral closure pressure. De Boer et al. reported that 60% of the urethral closure pressure during physical exertion is determined by the intrinsic urethral closure mechanism, and 40% by active extrinsic support by the pelvic floor muscles.<sup>52</sup> Van Loenen and Vierhout reported that the levator ani muscle contributes 33–50% to the urethral closure mechanism.<sup>54</sup> Delancey suggested a 33% contribution.<sup>55</sup> Other sources report that no quantitative distinction can be made between the contributions made by the various components to the closure pressure, though they do mention these components.<sup>56;57</sup> Maintaining the urethral closure pressure at rest involves active as well as passive mechanisms.

The urinary continence mechanism in men combines the activities of the detrusor muscle tissue (smooth muscle), the trigonum and the urethral 'sphincters' (striated muscle), each of which has its own histological characteristics. The urethral closure mechanism can be divided into two components, an inner layer of smooth muscle in the wall of the proximal urethra, which is a continuation of the fibers of the detrusor muscle, and a second component, consisting of a striated external urethral sphincter, also known as rhabdosphincter, which surrounds the membranous urethra.<sup>58</sup> In men, this striated muscle does not actually constitute a real sphincter that completely surrounds the urethra, as there are hardly any striated fibers on the dorsal side of the urethra, as should be the case with a fully circular sphincter. While the fibers of the external urethral sphincter or rhabdosphincter have their insertion dorsal to the central tendon of the perineum, these fibers cover the anterior surface of the prostate in a crescent shape just above the verumontanum, forming an omega shape under the verumontanum, surrounding the anterior and lateral aspects of the membranous urethra, with no fibers on the dorsal side.<sup>59</sup> In this context, Strasser et al. stated that the existence of a urogenital diaphragm in men, and of a strong circular external urethral sphincter completely encircling the urethra caudal to the apex of the prostate, cannot be confirmed.<sup>59</sup> Striated muscle fibers run in a cranial direction from the bulb of the penis to the base of the bladder along anterior and lateral aspects of the prostate and the membranous urethra. The external urethral sphincter consists of 50–100% slow muscle fibers,<sup>60;61</sup> which are unlikely to be involved in sudden powerful contractions.<sup>61</sup> Just as in women, the total urethral closure mechanism consists of an intrinsic and an extrinsic closure mechanism. In addition to the intrinsic components described above, there is an external urethral closure mechanism,

consisting of the puboperineal muscle fibers of the anteromedial part of the levator ani muscle. These puboperineal muscle fibers form a kind of crescent-shaped 'hammock' underneath the urethra. The levator ani muscle does not support the proximal urethra.<sup>58</sup> The puboperineal muscle fibers are responsible for rapid closure.<sup>62</sup> Contraction causes effective intra-urethral compression, resulting from the simultaneous contraction of the external urethral sphincter (which is omega-shaped) and the puboperineal muscle fibers, which form an open circle or crescent surrounding the external urethral sphincter, leaving a hiatus at the anterior side of the urethra.<sup>58</sup>

Several mechanisms are involved during increased intra-abdominal pressure. The principle is the same as at rest, but this time supported by the additional contraction of the sphincter and pelvic floor muscles. The striated urethral sphincter and the pelvic floor muscles play a role especially in the middle third part of the urethra. Turner-Warwick makes a distinction between a proximal and a distal urethral closure mechanism.<sup>56</sup> The proximal closure mechanism depends on effective transmission of the abdominal pressure to the bladder neck, which remains closed as a result of continuous contraction of smooth muscle fibers. The distal closure mechanism depends on increased tonicity of the pelvic floor muscles and the striated urethral sphincter. This increased tonicity represents an involuntary contraction of the pelvic floor. The increase in the tonicity of the pelvic floor muscles normally precedes the increase in intra-abdominal pressure, and the increased intra-abdominal pressure is normally the result of simultaneous contraction of the back and abdominal muscles, the diaphragm and the pelvic floor.<sup>63</sup> The strict distinction between insufficient extrinsic support and insufficient intrinsic urethral closure as causes of stress urinary incontinence is an unduly simplified representation of reality. Both closure mechanisms may well dysfunction simultaneously.<sup>56</sup>

#### A.12.2 Etiological factors

##### *Etiological factors for SUI in women*

Etiological factors (risk factors) are factors that can promote the development of a health problem. The team has identified the etiological factors for the development of SUI in women by means of a systematic review of the literature, including only prospective cohort studies. We excluded cohort studies which described the etiological factors for urinary incontinence without specifying the type of incontinence. Thirty-nine studies were found to meet the inclusion criteria. These studies were first evaluated in terms of quality, using the EBR0 criteria (Table 3), after which the results of this evaluation were summarized. The etiological factors identified from these studies are listed in Table 4, by level of evidence.

The etiological factors for SUI that have been identified give rise to the following argumentation.

Involuntary loss of urine on straining or effort, or on sneezing or coughing arises if the functional resilience of the pelvic floor is insufficient to resist the resulting increased pressure. In this sense, SUI can be regarded as a dysbalance between strain and resilience, which may be due to increased strain and/or decreased resilience. In the context of continence, the functional resilience of the pelvic floor is determined by a combination of anatomical characteristics and physiological functions.

Table 3. Quality of studies into etiological factors for SUI.

study	no. of cases	cohort	1	2	3	4	5	6
Dolan et al., 2003 <sup>64</sup>	96	1st pregnancy	x	x	-	-	x	C
Arrue et al., 2010 <sup>65</sup>	396	1st pregnancy / delivery	x	x	x	x	x	A2
Eftekhar et al., 2006 <sup>66</sup>	1.000	1st pregnancy / delivery	x	x	-	-	x	C
Ekström et al., 2007 <sup>67</sup>	435	1st pregnancy / delivery	x	x	x	x	x	A2
King & Freeman, 1998 <sup>68</sup>	103	1st pregnancy / delivery	x	x	x	-	x	B
Meyer et al., 1998 <sup>69</sup>	149	1st pregnancy / delivery	x	x	x	-	x	B
Meyer et al., 2000 <sup>70</sup>	107	1st pregnancy / delivery	x	x	x	-	x	B
Viktrup et al., 1992 <sup>71</sup>	305	1st pregnancy / delivery	x	x	x	-	x	B
Viktrup & Lose, 2001 <sup>72</sup>	278	1st pregnancy / delivery	x	x	x	x	x	A2
Viktrup et al., 2006 <sup>73</sup>	241	1st pregnancy / delivery	x	x	x	-	x	B
Dimpfl et al., 1992 <sup>74</sup>	350	pregnancy / vaginal delivery	x	x	x	-	x	C
Eason et al., 2004 <sup>75</sup>	949	pregnancy / delivery	x	x	x	x	x	A2
Groutz et al., 1999 <sup>76</sup>	300	pregnancy / delivery	x	x	x	-	x	C
Herrmann et al., 2009 <sup>77</sup>	340	pregnancy / delivery	x	x	-	-	x	C
Mason et al., 1999 <sup>78</sup>	717	pregnancy / delivery	x	x	-	-	x	C
Lewicky-Gaupp et al., 2008 <sup>79</sup>	74	teenage pregnancy	-	-	-	-	x	C
Altman et al., 2006 <sup>80</sup>	309	1st delivery	x	x	x	x	x	A2
Arya et al., 2001 <sup>81</sup>	315	1st delivery	x	x	x	-	x	B
van Brummen et al., 2007 <sup>82</sup>	344	1st delivery	x	x	-	x	x	B
Yip et al., 2003 <sup>83</sup>	276	1st vaginal delivery / 2nd vaginal delivery	x	x	-	-	x	C
Baydock et al., 2009 <sup>84</sup>	143	delivery / subgroup	x	x	x	x	x	A2
Benassi et al., 2002 <sup>85</sup>	58	delivery	x	x	-	-	-	C
Torrisi et al., 2007 <sup>86</sup>	562	vaginal delivery	x	x	x	-	x	B
Krue et al., 1997 <sup>87</sup>	194	obesity / delivery / birth weight	x	x	x	-	x	B
Kristiansson et al., 2001 <sup>88</sup>	227	pregnancy / hormone	x	x	x	x	?	B
Townsend et al., 2009 <sup>89</sup>	21.864	oral contraception	x	x	x	x	x	A2
Altman et al., 2003 <sup>90</sup>	120	hysterectomy	x	x	x	-	x	B
Engh et al., 2006 <sup>91</sup>	1.218	hysterectomy	x	x	x	-	x	B
Gustafsson et al., 2006 <sup>92</sup>	120	hysterectomy	x	?	x	-	x	C
Heliövaara-Peippo et al., 2010 <sup>93</sup>	236	hysterectomy / RCT	x	x	x	x	x	A2
Hendrix et al., 2005 <sup>94</sup>	27.347	postmenopausal hormone therapy / RCT	x	x	x	x	x	A2
Waetjen et al., 2009 <sup>95</sup>	1.529	SWAN / menopause	x	x	x	x	x	A2
Kuh et al., 1999 <sup>96</sup>	1.333	age 48 years	x	x	-	x	x	B
McGrother et al., 2006 <sup>97</sup>	12.570	age 40+	x	x	-	x	x	B
Waetjen et al., 2007 <sup>98</sup>	3.302	SWAN / age 40-52	x	x	x	x	x	A2
Townsend et al., 2010 <sup>99</sup>	76.724	NHS and NHS II / age 37-79 / ethnicity	x	x	x	x	x	A2
Mishra et al., 2008 <sup>100</sup>	1.201	NSHD / age 54 years / BMI	x	x	-	x	x	B
Townsend et al., 2008 <sup>101</sup>	35.754	NHS / age 54-79 BMI / waist circumference	x	x	-	x	x	B
Townsend et al., 2007 <sup>102</sup>	30.982	NHS II / age 37-54 years / BMI	x	x	x	x	x	A2
Deitel et al., 1988 <sup>103</sup>	138	obesity / surgery	x	x	x	-	x	B
Subak et al., 2005 <sup>104</sup>	24	obesity / slimming RCT	x	x	-	x	x	B
Danforth et al., 2009 <sup>105</sup>	71.650	NHS and NHS II / age 37-79 years / type 2 diabetes	x	x	x	x	x	A2
Dallosso et al., 2003 <sup>106</sup>	7.046	LMRCIS / age 40+ diet and lifestyle	x	x	x	x	x	A2
Dallosso et al., 2004 <sup>107</sup>	5.816	LMRCIS / age 40+ diet	x	x	x	x	x	A2
Danforth et al., 2007 <sup>108</sup>	121.701	NHS / age 30-55 years / physical activity	x	x	x	x	x	A2
Townsend et al., 2008 <sup>109</sup>	30.135	NHS II / age 37-54 years / physical activity	x	x	x	x	x	A2

1 = reproducible inclusion/exclusion criteria.

2 = reproducible description of etiological factors.

3 = follow-up including at least 80% of participants.

4 = analysis adjusted for confounders.

5 = reproducible description of outcome measures.

6 = level of evidence (A, B, C, D); quality levels: A2 = meeting all 5 criteria; B = meeting 4 of 5 criteria; C = meeting ≤ 3 criteria.

BMI = body mass index; LMRCIS = Leicestershire MRC Incontinence Study; NHS = Nurses Health Study; NSHD = National Survey of Health and Development; SWAN = Study of Woman's Health Across the Nation.

Table 4. Conclusions about etiological factors involved in the development of SUI in women.

	<b>It has been demonstrated that:</b>	<b>level</b>	<b>authors</b>
SUI before pregnancy	...there is an increased risk of SUI after the pregnancy if SUI was present before the pregnancy.	A2	Eason et al., 2004 <sup>75</sup> ; Ekström et al., 2007 <sup>67</sup>
		B	Torrisi et al., 2007 <sup>86</sup>
SUI during pregnancy	...there is an increased risk of SUI after the pregnancy if SUI was present during the pregnancy.	A2	Arrue et al., 2010 <sup>65</sup> ; Eason et al., 2004 <sup>75</sup> , Viktrup & Lose 2001 <sup>72</sup>
		B	Meyer et al., 1998 <sup>69</sup> ; Torrisi et al., 2007 <sup>86</sup>
		C	Dolan et al., 2003 <sup>64</sup>
vaginal delivery	...there is an increased risk of developing SUI after vaginal delivery.	A2	Altman et al., 2006 <sup>80</sup> ; Viktrup & Lose, 2001 <sup>72</sup>
		B	Arya et al., 2001 <sup>81</sup> ; Meyer et al., 1998 <sup>69</sup> ; Kuh et al., 1999 <sup>96</sup>
		C	Eftekhari et al., 2006 <sup>66</sup> ; Mason et al., 1999 <sup>78</sup>
elective cesarean section	...the risk of developing SUI after an elective cesarean section is smaller than after a vaginal delivery.	A2	Eason et al., 2004 <sup>75</sup> ; Ekström et al., 2007 <sup>67</sup> ;
		B	B Meyer et al., 1998 <sup>69</sup> ; Viktrup et al., 1992 <sup>71</sup>
		C	Dimpfl et al., 1992 <sup>74</sup> ; Eftekhari et al., 2006 <sup>66</sup> ; Mason et al., 1999 <sup>78</sup>
age	...the risk of developing SUI rises with the age of the mother at the time of her first delivery.	A2	Altman et al., 2006 <sup>80</sup> ; Baydock et al., 2009 <sup>84</sup>
		B	Kuh et al., 1999 <sup>96</sup>
3 months after delivery	...if a woman has SUI 3 months after giving birth, there is an increased risk that she will also have SUI later on.	A2	Ekström et al., 2007 <sup>67</sup> ; Viktrup & Lose, 2001 <sup>72</sup>
		B	Torrisi et al., 2007 <sup>86</sup> ; Viktrup et al., 2006 <sup>73</sup>
BMI > 25	...the risk of developing SUI increases with increasing BMI (> 25).	A2	Eason et al., 2004 <sup>75</sup> ; Waetjen et al., 2007 <sup>98</sup> ; Townsend et al., 2007 <sup>102</sup> ; Waitjen et al., 2009 <sup>95</sup>
		B	Kuh et al., 1999 <sup>96</sup> ; Townsend et al., 2008 <sup>101</sup>
BMI > 30	...there is a high risk of developing SUI among obese women (BMI > 30).	A2	Dallosso et al., 2003 <sup>106</sup>
		B	Deitel et al., 1988 <sup>103</sup> ; McGrother et al., 2006 <sup>97</sup> ; Mishra et al., 2008 <sup>100</sup> ; Viktrup et al., 2006 <sup>73</sup>
		C	Eftekhari et al., 2006 <sup>66</sup>
waist circumference	...the risk of SUI increases with each additional centimeter of waist circumference.	A2	Brown et al., 1999 <sup>110</sup> ; Waetjen et al., 2007 <sup>98</sup> ; Waitjen et al., 2009 <sup>95</sup>
		B	Mishra et al., 2008 <sup>100</sup> ; Subak et al., 2005 <sup>104</sup>
body weight	...the risk of developing SUI in adult women increases with increasing body weight.	A2	Townsend et al., 2007 <sup>102</sup> ; Waitjen et al., 2009 <sup>95</sup>
		B	Mishra et al., 2008 <sup>100</sup>

physical activity	...the risk of developing SUI decreases with the frequency of moderate-intensity physical activity.	A2	Danforth et al., 2007 <sup>108</sup> ; Townsend et al., 2008 <sup>101</sup>
	<b>It is plausible that:</b>	<b>level</b>	<b>authors</b>
ethnicity	...Caucasian women have a higher risk of developing SUI than other ethnicities.	A2	Townsend et al., 2010 <sup>99</sup>
weight increase	...weight increase during pregnancy increases the risk of developing SUI after the delivery.	A2	Arrue et al., 2010 <sup>65</sup>
episiotomy	...there is an increased risk of developing SUI after episiotomy.	A2	Viktrup & Lose, 2001 <sup>72</sup>
		B	Viktrup et al., 1992 <sup>71</sup>
forceps delivery	...there is an increased risk of developing SUI after forceps delivery.	B	Arya et al., 2001 <sup>81</sup> ; Meyer et al., 1998 <sup>69</sup>
		C	Dimpfl et al., 1992 <sup>74</sup>
vacuum extraction	...there is an increased risk of developing SUI after vacuum extraction.	A2	Viktrup & Lose, 2001 <sup>72</sup>
		B	Arya et al., 2001 <sup>81</sup>
		C	Dimpfl et al., 1992 <sup>74</sup>
prolonged pushing stage	...women who were continent during pregnancy are at increased risk of SUI developing if they go through a prolonged pushing stage ( $\geq 1$ hour).	A2	Arrue et al., 2010 <sup>65</sup>
primipara	...women who have had a child are at increased risk of SUI.	A2	Waetjen et al., 2007 <sup>98</sup>
		C	Mason et al., 1999 <sup>78</sup>
multipara	...women who have had more than two children are at increasing risk of SUI with further births.	A2	Waetjen et al., 2007 <sup>98</sup>
		C	Groutz et al., 1999 <sup>76</sup> ; Herrmann et al., 2009 <sup>77</sup> , Mason et al., 1999 <sup>78</sup>
menopause	...the risk of developing SUI decreases after menopause.	A	Waetjen et al., 2009 <sup>95</sup>
		B	Kuh et al., 1999 <sup>96</sup>
carbonated drinks	...women who consume carbonated drinks are at increased risk of developing SUI.	A2	Dallosso et al., 2004 <sup>107</sup>
	<b>There are indications that:</b>	<b>level</b>	<b>authors</b>
age	...the risk of developing SUI increases with increasing age.	C	Mason et al., 1999 <sup>78</sup>
pregnancy	...SUI may develop as a result of pregnancy.	C	Mason et al., 1999 <sup>78</sup>

relaxin	...a high serum relaxin level in early pregnancy reduces the risk of developing SUI.	B	Kristiansson et al., 2001 <sup>88</sup>
pudendus block	...there is an increased risk of developing SUI after a pudendus block during vaginal delivery.	C	Dimpfl et al., 1992 <sup>74</sup>
smoking	...smokers are at increased risk of developing SUI.	B	Torrise et al., 2007 <sup>86</sup>
coughing	...women who frequently cough are at increased risk of developing SUI.	B	Torrise et al., 2007 <sup>86</sup>
painful joints	...women who have painful joints are at increased risk of developing SUI.	B	McGrother et al., 2006 <sup>97</sup>
multiple sclerosis	...women with multiple sclerosis are at increased risk of developing SUI.	B	McGrother et al., 2006 <sup>97</sup>
urinary tract infections	...women who frequently have urinary tract infections are at increased risk of developing SUI.	B	McGrother et al., 2006 <sup>97</sup>
educational level	...women with a low educational level are at greater risk of developing SUI.	B	Kuh et al., 1999 <sup>96</sup>
	<b>There is conflicting evidence that:</b>	<b>level</b>	<b>authors</b>
cesarean section	...the risk of developing SUI is greater after a cesarean section because of arrest of labor than after a vaginal delivery.	C	Eftekhar et al., 2006 <sup>66</sup> ; Mason et al., 1999 <sup>78</sup>
prolonged pushing stage	...there is an increased risk of developing SUI after a prolonged pushing stage of delivery.	B	Arya et al., 2001 <sup>81</sup> ; Viktrup et al., 1992 <sup>71</sup>
birth weight	...the risk of developing SUI is greater after delivery of a child with a birth weight of over 4000 g than after delivery of a smaller child.	B	Arya et al., 2001 <sup>81</sup> ; Viktrup et al., 1992 <sup>71</sup> ; Krue et al., 1997 <sup>87</sup>
		C	Eftekhar et al., 2006 <sup>66</sup> ; Groutz et al., 1999 <sup>76</sup>
hysterectomy	...there is an increased risk of developing SUI after hysterectomy.	A2	Heliövaara-Peippo et al., 2010 <sup>93</sup>
		B	Engh et al., 2006 <sup>91</sup> ; Altman et al., 2003 <sup>90</sup>
		C	Gustafsson et al., 2006 <sup>92</sup>
second parturition	...women who have had a second child are at increased risk of SUI.	C	Mason et al., 1999 <sup>78</sup> ; Yip et al., 2003 <sup>83</sup>
diabetes	...women with diabetes are at increased risk of developing SUI.	A2	Danforth et al., 2009 <sup>105</sup>
			Waetjen et al., 2007 <sup>98</sup>



The functional resilience of the extrinsic supportive mechanism depends on the condition of the pelvic floor muscles and ligaments, as well as on the integrity of the physiological control loops that enable a person to contract their pelvic floor muscles at the right moment. The functional resilience of the intrinsic urethral closure mechanism depends on the integrity of the urethra, the tunica mucosa, the tunica spongiosa and the tunica muscularis, as well as the integrity of the physiological control loops that are needed to contract the urethral sphincter and keep up its tonicity.

#### *Factors affecting the condition of the pelvic floor*

The systematic review of the literature also shows that the functional resilience of the pelvic floor is lower among Caucasian women than among African-American women. A major cause of dysfunction of the supporting extrinsic mechanism is weakness of the pelvic floor muscles and ligaments, which partly depends on the condition of the pelvic floor muscles and the connective tissue skeleton.

If the pelvic floor muscles contract insufficiently or too late, there may be inadequate active support for the urethral closure mechanism during exertion, leading to an abnormal downward movement of the pelvic floor and hypermobility of the urethra and bladder neck. This abnormal downward movement is associated with loss of the urethrovesical angle, which means that the intra-abdominal pressure cannot be transferred to the urethra, so the intra-urethral closure pressure cannot rise sufficiently.

Other factors affecting the functional resilience of the pelvic floor include poor physical condition and general nutritional and health status. This may be related to smoking and overweight as etiological factors.

Pregnancy also affects the condition of the pelvic floor. The resilience of the connective tissue skeleton changes under the influence of hormonal changes.

Such hormonal influences (especially that of estrogens) are also involved in menopause, with loss of supportive tissue around the urethra reducing the functional resilience of the intrinsic urethral closure mechanism.

Functional integrity, and hence functional resilience, can also be reduced by damage to the pelvic floor muscles, the connective tissue skeleton and the innervation of the pelvic floor. Vaginal delivery may also affect the functional integrity of the pelvic floor. Muscle and/or nerve fibers in the pelvic floor may be damaged during delivery, as may the endopelvic fascia. A prolonged pushing stage, vacuum extraction or forceps delivery may further contribute to this. If cesarean section is applied due to arrested labor, there is a high risk that the pelvic floor has already been damaged, whereas in elective cesarean section, the pelvic floor is usually undamaged. Giving birth to a heavy child (> 4000 g) and the number of vaginal deliveries a woman has had may also adversely affect the functional resilience of the pelvic floor. Other factors reducing the functional integrity of the pelvic floor, apart from delivery, include trauma to the pelvic floor or surgery in the pelvic floor area.

In patients with diabetes, the functional integrity may be affected by neuropathy, affecting the condition of the pelvic floor.

The use of catheters also increases the risk of damaging the urethral sphincter and hence the intrinsic urethral closure mechanism. Age is probably another risk factor, as cumulatively acquired changes in resilience have to be added to the dynamic variability of the condition and resilience of the pelvic floor. An interes-

ting finding is that the incidence and prevalence of SUI decrease after menopause, whereas those of urgency (urinary) incontinence actually increase.<sup>37</sup> The severity of reported SUI and mixed urinary incontinence rises with postmenopausal age, however.<sup>37</sup>

#### *Factors affecting the strain on the pelvic floor*

Increased strain on the pelvic floor appears to increase the risk of its functional resilience being exceeded. Pregnancy – i.e. bearing a child – may contribute to a higher strain on the pelvic floor.

The risk of SUI is also increased by chronically raised intra-abdominal pressure, as in obesity and chronic constipation.

It is essential to identify etiological factors, as the prognosis depends on the nature of the dysfunction of the continence mechanism. Etiological factors may give clues as to the modifiability of the underlying process by physical therapy.

*Based on the above considerations, the guideline development team has formulated the following recommendation:*

#### **Identifying etiological factors**

The therapist should systematically identify etiological factors, in order to assess the nature of the dysfunction of the continence mechanism.

#### *Etiological factors for SUI in men*

The search for possible causes of the development of SUI in men has shown that SUI nearly always results from sphincter dysfunction due to surgery, radiation treatment or neurological disorders.<sup>42-44</sup> Before the year 2000, there is hardly any mention in the scientific literature of SUI in men after prostatectomy. A man was then called incontinent if he lost any urine; incontinence was defined as a loss of control, and its severity was measured by asking about the number of incidents he experienced and the number of pads he used, and/or was assessed by means of a 24-hour pad test.<sup>111</sup> Van Kampen et al. evaluated urinary incontinence after prostate surgery among 489 patients: 216 patients had undergone TURP because of benign prostatic hyperplasia, 98 had undergone transvesical prostatectomy (TVP) and 175 had undergone radical prostatectomy for localized prostate carcinoma.<sup>112</sup> Among the patients treated with TURP, 19% were incontinent immediately after catheter removal and 0.5% were still incontinent after 15 months; the corresponding figures after TVP were 15% and 1%, respectively. The percentages after radical prostatectomy were considerably higher: 66% were incontinent immediately after removal of the bladder catheter, and 2% were still incontinent after 15 months. Van Kampen et al. also established the type of incontinence. Immediately after catheter removal, 38% of the patients who had undergone TURP had SUI, while 25% had urgency urinary incontinence and 21% had mixed urinary incontinence. The corresponding figures after TVP were 50%, 28% and 21%, respectively, and after radical prostatectomy 82%, 13% and 5%, respectively. Although incontinence after prostatectomy is often regarded as an unequivocal concept, this has proved to be incorrect. Much urodynamic research has been done to identify the specific causes of this type of incontinence. Ficazolla and Nitti evaluated incontinence after prostatectomy among 60 patients, and found sphincter deficiency in 90% of them.<sup>113</sup>

A study by Groutz et al. found sphincter deficiency as the most common urodynamic finding in 88% of the patients.<sup>114</sup> Detrusor instability was found in 33% of the patients, but was the main cause of incontinence in only 7%.

Kielb and Clemens reported similar findings.<sup>115</sup> They found SUI due to sphincter deficiency in 95% of 146 patients with incontinence after prostatectomy, as assessed by urodynamic examinations. Detrusor instability was also found in 17% of this group.

Hunskar et al. found a prevalence of urinary incontinence after radical prostatectomy for prostate cancer ranging from 5% to over 60%.<sup>38</sup> The differences between the incidence and prevalence data have been attributed by various authors to differences in the definition of incontinence, differences in the methods and timing of evaluation and inter-observer differences.<sup>44;46;47</sup> In addition, different surgical techniques have been found to result in different incidence rates.<sup>43;48;49;116-118</sup>

The prevalence of urinary incontinence after TURP for benign enlargement of the prostate is lower than that after radical prostatectomy.<sup>119</sup> Hunter et al. found that 10% of the men were still using incontinence products 3 months after the surgery.<sup>44</sup> The problem of urinary incontinence in men appears to improve over time, both after TURP and after radical prostatectomy: the number of men who are still incontinent decreases, and the severity of the incontinence stabilizes 1–2 years after surgery. Several authors have reported that a small proportion of men remain incontinent for urine.<sup>38;48</sup>

Hunter et al. found that the natural course of urinary incontinence after radical prostatectomy can be determined from the percentage of patients reporting to perceive leakage, a percentage that falls from 50% at 3 months after the operation to 20% at 12 months.<sup>44</sup> Review studies by Palmer,<sup>111</sup> Hunter,<sup>44</sup> Cambio,<sup>117</sup> Lourenco<sup>119</sup> and Bauer<sup>118</sup> show that men undergoing TURP or radical prostatectomy are at increased risk of developing SUI.

Stress (urinary) incontinence in men occurs almost exclusively in cases where the condition of the pelvic floor is traumatically affected as a result of prostatectomy, whether transurethral or radical.

#### Conclusion about etiological factors for the development of SUI in men (level 1)

- It has been demonstrated that prostatectomy increases the risk of developing SUI.  
Quality of the studies identified: A1 (Hunter et al., 2007<sup>44</sup>; Cambio et al., 2006<sup>117</sup>; Lourenco et al., 2008,<sup>119</sup> and Bauer et al., 2009<sup>118</sup>) and D (Palmer et al., 2000<sup>111</sup>).

#### A.12.3 Prognostic factors

Prognostic factors are (a) factors that determine the course of a health problem, whether favorable or unfavorable, and (b) factors that influence the chances of recovery in general as well as the chances of recovery after a particular intervention.

A systematic review of the literature was used to identify the prognostic factors for the course of and recovery from SUI. This review included only cohort studies reporting prognostic factors and differentiating between types of incontinence. We excluded cohort studies describing the prognostic factors for the course of and recovery from urinary incontinence without specifying the type of incontinence.

Nine studies were found to meet the inclusion criteria. These studies concerned only the prognosis of incontinence in women.

Their methodological quality was assessed using the EBRO criteria (Table 5); the results of this assessment are presented in Table 6.

#### Unfavorable prognostic factors for SUI in women

If prognostic factors are considered from the point of view of strain versus resilience, SUI can be regarded as a disturbance of the dynamic balance, in which the strain (intravesical pressure) exceeds the limits of resistance (the urethral closure pressure, the cooperation between continence-promoting mechanisms, and all intrinsic and extrinsic factors). Factors indicating a low resilience level or a higher level of strain can be regarded as unfavorable prognostic factors for recovery.

The systematic review of the literature shows that the following factors are indicative of low resilience, and can therefore be regarded as unfavorable prognostic factors:

- protracted delivery process;
- SUI during pregnancy and during the first three months after delivery;
- severity of the SUI;
- previous conservative treatment for SUI with unfavorable outcome;
- severe overweight (BMI > 30) imposing an additional strain on the continence mechanism;
- co-morbidity (e.g. chronic obstructive pulmonary disease, COPD);
- urethral hypermobility;
- presence of prolapse > stage 2;
- menopause;
- severe psychological stress (yellow flag);
- perception of low (physical) resilience.

Etiological factors can be regarded as unfavorable prognostic factors if they partly determine the moment when strain exceeds resistance. In this perspective, severe overweight, a factor which contributes to the development of SUI, can be regarded as an unfavorable prognostic factor. Hence, it is plausible to assume that a combination of overweight and SUI means that treatment of the SUI is only useful if the patient's weight status is addressed as well.

#### Conclusion about identifying prognostic factors

- In the opinion of the guideline development team, prognostic factors should be systematically identified and included in the treatment plan.  
In the team's opinion, the treatment should also address any modifiable factors, in collaboration with other professionals if appropriate (multidisciplinary approach).

#### Prognostic factors for SUI in men

No published studies were found that had investigated factors influencing the recovery from SUI in men and that met our quality criteria. The main causes of SUI in men are TURP and radical prostatectomy. The prognosis after these interventions is relatively favorable, as the problem of urinary incontinence appears to decrease over time, with a reduction and stabilization of complaints within 1–2 years after surgery, and only a small percentage of men remaining incontinent.<sup>38</sup> Different surgical techniques may lead to different prognoses; a possible difference in incidence has been attributed to this.<sup>43;48;49;117;118</sup> Exercise therapy for men with SUI after prostatectomy may influence the rate of recovery.<sup>128</sup>

Assessment of the quality of the studies investigating prognostic factors								
	n / cases <sup>a</sup>	cohort <sup>b</sup>	1	2	3	4	5	6
Burgio et al., 2003 <sup>120</sup>	60	RCT	x	x	x	n.a.	x	C
Cammu et al., 2004 <sup>121</sup>	447	PC	x	x	x	x	x	A2
Hendriks et al., 2010 <sup>122</sup>	267	PC	x	x	x	x	x	A2
Lagro-Janssen et al., 1994 <sup>123</sup>	66	PC	x	x	x	-	x	C
Siu et al., 2003 <sup>124</sup>	214	PC	x	x	-	-	x	C
Theofrastous et al., 2002 <sup>125</sup>	95	RCT	x	x	x	-	x	C
Truijen et al., 2001 <sup>126</sup>	104	RC	x	x	x	x	x	B
Viktrup et al., 2001 <sup>72</sup>	278	PC	x	x	x	x	x	A2
Wilson et al., 1987 <sup>127</sup>	60	RCT	x	x	x	-	x	C

*RCT = randomized controlled trial; PC = prospective cohort study; RC = retrospective cohort study; n.a. = inadequate; a = number of cases > 100; b = prospective cohort.*

*1 = reproducible inclusion and exclusion criteria;*

*2 = reproducible description of the prognostic factors;*

*3 = follow-up of ≥ 80% of participants;*

*4 = analysis adjusted for confounders;*

*5 = reproducible description of outcome measures;*

*6 = level of evidence (A, B, C, D). Quality level: A2 = meeting all 7 criteria; B = meeting 6 of 7 criteria; C = meeting ≤ 5 criteria.*

Conclusions on prognostic factors for SUI in women.		
It has been demonstrated that:	level	authors
...the chances of recovery decrease with increasing severity of the SUI.	A2	Cammu et al., 2004 <sup>121</sup> ; Hendriks et al., 2010 <sup>122</sup>
	C	Burgio et al., 2003 <sup>120</sup> ; Siu et al., 2003 <sup>124</sup> , Wilson et al., 1987 <sup>127</sup>
...the chances of recovery are smaller for women who have previously had conservative treatment for SUI with unfavorable outcome.	A2	Hendriks et al., 2010 <sup>122</sup>
	C	Burgio et al., 2003 <sup>120</sup>
...the chances of recovery are smaller for women who are severely overweight.	A2	Hendriks et al., 2010 <sup>122</sup>
		Truijen et al., 2001 <sup>126</sup>
It is plausible that:	level	authors
...the chances of recovery are smaller for women with a prolapse (> stage 2).	A2	Hendriks et al., 2010 <sup>122</sup>
...the chances of recovery are smaller for women who have gone through a protracted delivery.	A2	Hendriks et al., 2010 <sup>122</sup>

...the chances of recovery are smaller for persons affected by severe psychological stress.	A2	Hendriks et al., 2010 <sup>122</sup>
...the chances of recovery are smaller for persons feeling physically unwell.	A2	Hendriks et al., 2010 <sup>122</sup>
...the chances of recovery are increased by a higher level of motivation for and adherence to a pelvic floor training program.	B	Truijen et al., 2001 <sup>126</sup>
	C	Lagro-Janssen et al., 1994 <sup>123</sup> ; Siu et al., 2003 <sup>124</sup>
...the chances of recovery are smaller for women who have had SUI during pregnancy and during the first three months after delivery.	A2	Viktrup et al., 2001 <sup>72</sup>
...the chances of recovery are smaller for women with SUI who are suffering from co-morbidities (e.g. COPD).	A2	Hendriks et al., 2010 <sup>122</sup>
...the chances of recovery are smaller for women with SUI who have a low educational level.	A2	Hendriks et al., 2010 <sup>122</sup>
...the chances of recovery are smaller for women around the time of the menopause.	A2	Hendriks et al., 2010 <sup>122</sup>
...the chances of recovery are not smaller for women who have undergone hysterectomy.	A2	Hendriks et al., 2010 <sup>122</sup>
	C	Theofrastous et al., 2002 <sup>125</sup>
...the chances of recovery are smaller for women with a positive stress test upon the first forced coughing.	A2	Cammu et al., 2004 <sup>121</sup>
<b>There are indications that:</b>	<b>level</b>	<b>authors</b>
...the chances of recovery are smaller for women with urethral hypermobility.	B	Truijen et al., 2001 <sup>126</sup>
<b>There is conflicting evidence that:</b>	<b>level</b>	<b>authors</b>
...the chances of recovery are greater for young women than for older women.	A2	Hendriks et al., 2010 <sup>122</sup>
	C-	Burgio et al., 2003 <sup>120</sup> ; Theofrastous et al., 2002 <sup>125</sup>
	C+	Wilson et al., 1987 <sup>127</sup>
...the chances of recovery are smaller for women who have undergone previous surgery in the pelvic region.	A2	Hendriks et al., 2010 <sup>122</sup>
	B+	Truijen et al., 2001 <sup>126</sup>
	C+	Wilson et al., 1987 <sup>127</sup>
...the chances of recovery decrease with increasing number of completed pregnancies.	A2+	
	C-	Hendriks et al., 2010 <sup>122</sup> ; Theofrastous et al., 2002 <sup>125</sup>

### A.13 Referral versus direct access to physical therapy

In the Netherlands, direct access to physical therapy (i.e. without referral from a doctor) has been allowed by law since 1 January 2006. Since that date, patients have had the option of presenting directly to a physical therapist. Therapists collaborate with family physicians and medical specialists through reciprocal referrals, after consultation with and consent from the patient. If some of the necessary medical data are missing, the physical therapist should contact the patient's family physician or specialist. In the Netherlands, patients are usually referred to physical therapy by their family physician or a medical specialist (such as a urologist or gynecologist). If the patient was referred, the physical therapist should proceed as described in Section A.13.1 above. If the patient presents to a physical therapist at their own initiative, the therapist must proceed as described in Section A.13.2, and must screen for 'red flags'.

Family physicians have the choice of referring a patient to a pelvic physical therapist, a general physical therapist with proven competence regarding this problem or a continence nurse. The national agreement document on collaboration between family physicians and physical therapists on the management of incontinence (LESA) states that 7% of all patients with incontinence problems are referred by their family physician to a physical therapist.<sup>5</sup> It is unclear, however, whether this relates to pelvic physical therapists or general physical therapists.

A family physician only refers a patient to a physical therapist if they expect that physical therapy will help resolve the patient's presenting complaint, or aspects of it. Family physicians can only refer correctly if they are sufficiently aware of the treatments that can be provided by physical therapists.<sup>129</sup> Hendriks has shown that many family physicians feel they do not know enough about what physical therapy can do.<sup>130</sup> Teunissen et al. reported similar findings regarding urogynecological problems, such as urinary incontinence.<sup>131</sup> The LESA agreement might change this situation, as it describes what pelvic physical therapists and general physical therapists with proven knowledge and competence regarding pelvic floor problems can offer.<sup>5</sup> A committee of experts of the Dutch Health Care Insurance Board also concluded in its report on incontinence (*Attentie voor incontinentie*) that some family physicians lacked the necessary time and specific knowledge, and recommended that family physicians refer their patients directly to a pelvic physical therapist or a continence nurse, rather than giving instructions about pelvic floor muscle training and bladder training themselves.<sup>36</sup>

In the committee's opinion, treatment by a pelvic physical therapist offers good chances of improvement for patients with incontinence, and is easily accessible, not stressful and considerably cheaper than long-term use of absorptive materials. Direct access to physical therapy reduces the burden of work for family physicians. In addition, pelvic physical therapists can devote more time and attention to patients. They think in multidisciplinary terms and can easily refer their patients to other disciplines, using short referral lines.<sup>36</sup>

Little evidence is available about the policies of medical specialists regarding referral of patients with SUI to physical therapists, although pelvic floor muscle training for patients with SUI is mentioned as the treatment of first choice in the NVU (Dutch society of urologists) guideline on stress incontinence in women<sup>3</sup> and in the NVOG (Dutch society of obstetricists and gynecologists) guideline on

urinary incontinence,<sup>4</sup> unless the patient has a severe prolapse or serious intrinsic sphincter damage.

Urologists may refer men to a pelvic physical therapist (working in primary care) before surgery, since SUI in men occurs nearly exclusively after surgical intervention. The pelvic physical therapist then helps to make the patient aware of his pelvic floor, teaches him to contract and relax his pelvic floor muscles correctly and teaches him pelvic floor muscle exercises. This may improve the physical condition of the patient's pelvic floor, creating favorable conditions for postoperative recovery, and ensuring that the patient knows how to do the exercises as soon as he is allowed to start them. After the operation, the patient may at first be treated by a pelvic physical therapist working at the hospital, but a pelvic physical therapist working in primary care may also become involved. However, not all urologists are convinced of the value of pelvic floor muscle exercises for this group of patients.<sup>128</sup>

It is expected that recent developments in pelvic physical therapy will lead to a gradual increase in the number of referrals to pelvic physical therapists. These developments include further specialization, acquired competencies based on competency profiles, higher quality training courses, scientific evidence about effective treatments, and more effective provision of information to referring doctors and patients about what pelvic physical therapists can and cannot do.

#### A.13.1 Referral

A letter of referral from a Dutch family physician or medical specialist must include the following patient data:

- date of referral and personal details (date of birth, gender, address, insurance details);
- diagnosis or presumptive diagnosis of SUI, severity of urine loss and the patient's perception of this urine loss;
- diagnostic findings: whether the patient is able to voluntarily or involuntarily contract or relax their pelvic floor muscles, and, if possible, some indication of the functioning of the pelvic floor muscles;
- the presence and stage of prolapse and/or other urogynecologically relevant problems of the small pelvis;
- the information from the patient's micturition diary;
- any previous interventions;
- possible causative (risk) factors and prognostic factors, such as rupture during vaginal delivery, damaged pudendal nerve, diabetes mellitus, psychological condition, prior urogynecological surgery, etc.;
- use of medication (i.e. drugs that may relate to the incontinence and may affect the treatment outcome).

These are details that the physical therapist will require for an effective intervention. The purposes include the identification of possible local or general factors that can influence the prognosis by adversely affecting the recovery and adjustment processes, and assessing whether these factors can be modified by physical therapy. It goes without saying that this can have consequences for the choice of strategy and the outcome of the treatment. If the patient's family physician is unable to provide the necessary information about the patient's pelvic muscles, as he or she feels insufficiently competent to do so, he or she should refer the patient directly to a pelvic physical therapist and involve the therapist in the diagnostic process.

### A.13.2 Direct access to physical therapy

In view of the introduction of direct access to Dutch physical therapists, the guideline development team decided to add a screening process to the systematic approach described in this guideline. The screening process includes the following components: presentation, identifying the problem, screening for pathology that requires urgent medical attention and informing the patient of the results of the screening process and giving them advice. The screening process involves asking specific questions and doing tests or using other diagnostic procedures to decide whether the patient exhibits a pattern of signs and symptoms that is compatible with the physical therapist's area of competence.

In the context of this guideline, the purpose is to establish whether a patient who presents directly to a pelvic physical therapist is actually suffering from SUI. The pattern of SUI is characterized by loss of urine while straining or on effort, coughing or sneezing, without a sense of urgency and without pain, as well as by certain patient characteristics (age, sex, how the incontinence developed, etiological factors, course of the problem, and factors influencing this course). If the pelvic physical therapist interprets the information as constituting a pattern that is compatible with stress (urinary) incontinence, they can decide to accept the patient for treatment.

If the pattern of symptoms and signs does not seem familiar to the pelvic physical therapist, or if the pattern of SUI is familiar but the patient shows one or more symptoms that deviate from this familiar pattern, or the course of the problem is unusual, or if the therapist finds one or more 'red flags', he or she should inform the patient of these findings and advise them to contact their family physician or another doctor. Red flags are data, symptoms and signs that require special attention, as they may indicate serious disease. In the presence of red flags, further analysis of the health problem is beyond the physical therapist's competence. Examples of red flags include the absence of an explanation for the patient's incontinence, pain, loss of blood, signs of inflammation, infections and other alarming signs such as fever, perspiring (especially nocturnal), signs of general malaise and severe weight loss. The therapist should also inform the patient if the findings do not suggest any red flags (i.e. the pattern of signs and symptoms fits in with the normal pattern for SUI). In screening a patient with complaints of urinary incontinence, medical patient data are essential to exclude other causes, such as urinary tract infections. The Dutch national agreement between physical therapists and family physicians about the management of urinary incontinence (LESA) states that 'after screening, the further procedures of physical therapy diagnostics and treatment must not be started until after the therapist has consulted the patient's family physician'.<sup>5</sup> This position implies that true direct access is no longer possible, since treatment can only be started after contact with the patient's family physician.

In the opinion of the guideline development team, the requirement of contacting the family physician if a patient presents with incontinence problems in general is justified if essential medical data is missing, but that this procedure is unnecessary in cases of clear SUI without indications of red flags, and leads to unnecessary delays of treatment.

### Conclusion about direct access (level 4)

- In the opinion of the guideline development team, it is unnecessary to contact the family physician of a patient presenting directly to a physical therapist with a clear case of SUI, without indications of red flags, and the therapist can start the diagnostic process for physical therapy immediately.

## B Diagnostic process

The description of the diagnostic process for physical therapy in this Review of the Evidence is based on systematic review studies by the International Consultation on Incontinence ICI,<sup>132</sup> by Martin et al.,<sup>133</sup> and Neumann et al.,<sup>6</sup> as well as guideline M46 of the Dutch College of General Practitioners (NHG),<sup>2</sup> the guidelines by NVU<sup>3</sup> and NVOG<sup>4</sup> and the LESA agreement.<sup>134</sup>

In addition, we evaluated and analyzed guidelines on urinary incontinence from other countries to compare the diagnostic process (*Management of urinary incontinence in primary care*<sup>19</sup> by the Scottish Intercollegiate Guidelines Network, SIGN; *Conservative Management of Urinary Incontinence*,<sup>135</sup> the clinical practice guideline of the Society of Obstetricians and Gynaecologists of Canada, SCOG; and *Urinary incontinence: the management of urinary incontinence in women*,<sup>136</sup> the clinical practice guideline by the National Collaborating Centre for Women's and Children's Health).

In addition to examining the nature and severity of the health problem, the physical therapist's diagnostic process (supplemented by information from the prior screening procedure or the referral letter) is intended to provide as specific an answer as possible to the question whether and how the underlying disorders and/or any unfavorable prognostic factors are amenable to modification by physical therapy, since this information will be used to formulate a specific treatment plan.

The severity of the SUI as a health problem is assessed on the basis of the ICF categories (impairments, limitations, and restrictions of participation).<sup>24</sup>

### B.1 History-taking

The pelvic physical therapist takes the patient's history to establish the type of incontinence, to estimate the magnitude of urine loss and its impact (in terms of the duration of the incontinence, the use of absorptive products, and the consequences of the incontinence for everyday life), and to identify any underlying disorders and any relevant factors that may contribute to the involuntary loss of urine (use of medication and alcohol, abnormal fluid intake, limitations and co-morbidity).

It is important for the pelvic physical therapist to describe the urinary incontinence in any specific situation on the basis of a number of relevant factors, such as the type of urinary incontinence, its frequency and severity, precipitating factors, social impact, effects on hygiene and quality of life, measures taken to control the loss of urine and the patient's expressed care requirement or preference.<sup>132</sup>

Together with physical examination, history-taking constitutes the basis of the therapeutic process. The history-taking procedure also offers an opportunity to build a relationship of trust between therapist and patient. The treatment room must be suitable for this purpose, which means it must be enclosed and soundproof.

History-taking involves medical, paramedical, communicative, and attitudinal aspects. It should preferably have a goal-oriented and systematic character. The pelvic therapist's history-taking process relates to the domains of urology, gynecology, obstetrics, proctology, orthopedics (lower back, pelvis, and hips), sexology, fluid and nutrient intake, and psychological condition, and must be goal-oriented, systematic, and as complete as possible.

### B.1.1 Establishing the type of incontinence

The type of incontinence will become clear during history-taking, and can if necessary be confirmed using the Incontinence Questionnaire (3IQ) test. The diagnosis of SUI needs to be confirmed or established, depending on the way the patient presented to the therapist, i.e. after referral or through direct access. A presumptive diagnosis of SUI can be established using one of the recently developed short questionnaires for primary care, which allow rapid and valid distinction of the main types of urinary incontinence, viz. SUI and urgency (urinary) incontinence.<sup>132,137,138</sup> The 3IQ test is a useful measurement instrument, which can establish the presence of SUI with a sensitivity of 0.86 (95% CI = 0.79–0.90) and a specificity of 0.60 (95% CI = 0.51–0.68), and can establish urgency (urinary) incontinence with a sensitivity of 0.75 (95% CI = 0.68–0.81) and a specificity of 0.77 (95% CI = 0.69–0.84).<sup>138</sup>

*Based on the above considerations, the guideline development team has formulated the following recommendation:*

#### Establishing the type of incontinence

The guideline development team recommends using the 3IQ test to establish the type of incontinence.

The methodological value and usefulness of history-taking as an indicator of the diagnosis of urodynamic SUI has been proven by Lagro-Jansen (who found a sensitivity of 78%, a specificity of 84%, and a positive predictive value of 87%).<sup>139</sup> Reviews of studies into the validity and accuracy of history-taking as a predictor of urodynamic SUI found that an average of 70% (range 56–86) of the women for whom history-taking had led to a diagnosis of SUI did indeed prove to have urodynamic SUI upon evaluation.<sup>140,141</sup> A recent meta-analysis of the various methods of diagnostic examination for urinary incontinence found that history-taking by physical therapists working in primary care correctly identified women with urodynamic SUI (with a sensitivity of the methods of 0.92 (95% CI = 0.91–0.93) and a specificity of 0.56 (95% CI = 0.53–0.60)).<sup>133</sup>

#### Conclusion about history-taking or urodynamic examination in the diagnostic process (level 1)

- It had been demonstrated that the diagnosis of SUI in women can be established either by history-taking or by urodynamic examinations, with very similar results.  
Quality of the studies identified: A1 (Martin et al., 2006<sup>133</sup>).

#### The 3IQ test

- 1 During the last 3 months, have you leaked urine (even a small amount)?  
Yes (please continue with questions 2 and 3) or no (questionnaire completed).
- 2 During the last 3 months, did you experience any involuntary loss of urine: (check all questions that apply)
  - a. when you were performing some physical activity, such as coughing, sneezing, lifting, or exercise?
  - b. when you had the urge to empty your bladder, but you could not get to the toilet fast enough?
  - c. without physical activity and without a sense of urgency?
- 3 During the last 3 months, did you experience involuntary loss of urine most often: (check only one)
  - a. when you were performing some physical activity, such as coughing, sneezing, lifting, or exercise?
  - b. when you had the urge to empty your bladder, but you could not get to the toilet fast enough?
  - c. without physical activity and without a sense of urgency?
  - d. about equally as often with physical activity as with a sense of urgency?

Definitions of type of urinary incontinence are based on responses to question 3:

- a. Most often with physical activity → stress only or stress predominant urinary incontinence
- b. Most often with the urge to empty the bladder → urge only or urge predominant (urinary) incontinence.
- c. Without physical activity or sense of urgency → other cause.
- d. About equally with physical activity and sense of urgency → mixed (urinary) incontinence.

### B.1.2 Determining the severity of the health problem

The second goal of history-taking is to assess the severity of the patient's health problem by identifying any impairments, limitations of activities and restrictions of participation.<sup>24</sup>

The severity of the health problem is determined by the frequency and magnitude of the loss of urine, the use of absorptive products and the consequences of the incontinence for the patient's everyday life, including work, sports and housekeeping activities, family life, social life and sexuality. An instrument that assesses both the loss of urine and its impact on the patient is the PRAFAB questionnaire.<sup>142,143</sup>

### B.1.3 Identifying etiological and prognostic factors

The third goal of history-taking is to identify the factors that may adversely affect the recovery process, in order to determine whether and how the health problem is amenable to modification by physical therapy. This requires obtaining as much information as possible about:

1. the nature of the underlying disorder, by identifying the presence of etiological factors for SUI, and
2. the prognostic factors that influence the course of SUI and the recovery process, viz.:
  - local factors that may adversely affect the recovery and adjustment processes, whether relating to reduced resilience of or increased strain on the pelvic floor, or both;
  - general factors that may adversely affect the recovery process, that is, factors relating to the patient's poor physical condition.

#### B.1.4 Identifying the patient's illness beliefs

The fourth goal of history-taking is to identify the patient's own ideas and views about their incontinence, its possible causes and consequences, the chances of recovery and what they can do about it themselves, what can be done by the therapist and what contribution or role can be expected of others. Such ideas and views ('illness beliefs') can often have a favorable or adverse effect on the prognosis in terms of recovery, and may partly determine the type of intervention that can be used. For instance, what patients can do about the problem by themselves is usually determined by their own views about the problem, and unrealistic ideas may impede a natural recovery process.<sup>144,145</sup>

#### Conclusion about identifying illness beliefs (level 3)

- There are indications that identifying illness beliefs affects the degree of modifiability of the health problem.  
Quality of the studies identified: C (Ogden et al., 2000; Cameron et al., 2003<sup>145</sup>).

#### B.1.5 Considerations on the care provider's competence

An important aspect of history-taking is to enable the physical therapist to assess the extent to which the patient's health problem is compatible with the therapist's competencies, that is, whether the information obtained in the history-taking is such that the therapist feels he or she is sufficiently qualified to provide this patient with the best possible care. The key factor in this respect is the complexity of the health problem.

Physical therapists must reflect on the actions they intend to take, what they intend to examine, whether they are able to perform an internal examination, and if they are unable to do so, whether they will still be able to sufficiently assess the patient's pelvic floor muscle function. At the same time, other aspects may also need to be taken into consideration. For many patients, their pelvic floor is an emotionally sensitive area, and although sexual abuse is not more common among patients with urinary incontinence than among continent women, it may present a major complicating factor for treatment.

#### B.2 Physical examination

The physical examination consists of inspection at rest and during movement, palpation and functional examination, and has the following objectives:

- assessing the level of voluntary and involuntary control over the pelvic floor;
- assessing pelvic floor muscle function;
- assessing whether and to what extent other parts and functions of the musculoskeletal system, such as respiration, lower back, pelvis and hip, are hampering the function of the pelvic floor muscles;
- identifying any local and other (i.e. general) unfavorable prognostic factors.

#### B.2.1 Voluntary control over the pelvic floor muscles

The pelvic physical therapist should ascertain to what extent the patient has voluntary control over their pelvic floor, as exercising or training the pelvic floor muscles can only be usefully done if the patient is able to voluntarily contract and relax their pelvic floor muscles. The 'ability to contract' and 'relax' can be assessed by means of clinical observation,<sup>146-148</sup> vaginal or anal palpation,<sup>147-149</sup> ultrasound,<sup>150</sup> MRI,<sup>151</sup> and/or EMG,<sup>132</sup> although the correlation between EMG findings and muscle function in terms of strength, power, and endurance remains unclear.<sup>152</sup>

Voluntary contraction of the pelvic floor muscles means that the patient is able to contract their pelvic muscles on demand. A contraction can be perceived as an encircling, elevating and tightening sensation around the palpating finger. The contraction may be 'absent', 'weak', 'normal' or 'strong'.<sup>153</sup>

Voluntary relaxation of the pelvic floor muscles means that the patient is able to relax their pelvic muscles on demand after contracting them. The relaxation is perceived as the cessation of contraction. The pelvic floor muscles should at least return to their resting state. Voluntary 'relaxation' can be rated as 'absent', 'partial', or 'complete'.<sup>153</sup>

Physical therapists often use clinical observation of pelvic floor contraction to measure the patient's capacity to contract and relax their pelvic muscles. A review of published scientific studies found, however, that there is conflicting evidence on the reliability, validity, and responsiveness of this approach; moreover, the studies were of poor methodological quality.<sup>154</sup> Nevertheless, this clinical observation can be used in routine practice to obtain a preliminary impression in terms of whether an inward movement is visible upon contraction, whether any co-contractions are visible, whether the relaxation is visible and whether movements of the perineum are visible upon coughing and straining.<sup>147,148</sup> In view of the methodological shortcomings, however, the guideline development team recommends not to use such clinical observations to draw conclusions about the degree of inward and downward movement of the pelvic floor, nor about the resting muscle tone.<sup>154</sup>

#### B.2.2 Pelvic floor muscle function

The pelvic physical therapist should assess the pelvic floor muscle function by:

- assessing whether the patient is able to voluntarily contract and relax their pelvic floor muscles, and evaluating the performance;
- assessing the effectiveness of voluntary and involuntary contraction and relaxation of the pelvic floor muscles;
  - observing the effectiveness of involuntary contraction of the pelvic floor muscles associated with a sudden increase in the intra-abdominal pressure (forceful coughing) and subsequently during coughing after the patient has been instructed to contract their pelvic floor first;<sup>148</sup>



- observing the effectiveness of involuntary relaxation of the pelvic floor muscles during straining;<sup>148</sup>
- observing the involuntary contraction and relaxation of the pelvic floor muscles in relation to the abdominal muscles;
- establishing any differences between the right and left sides while the patient contracts and relaxes their pelvic floor muscles;
- quantifying the strength of the different pelvic floor muscles using manual muscle tests, such as vaginal or anal palpation<sup>148;155</sup> or using manometry<sup>156</sup> or dynamometry.<sup>157</sup>

Vaginal or rectal palpation enables the therapist to evaluate the correct performance of contraction and relaxation.<sup>147-149</sup>

A pelvic physical therapist should only opt for vaginal/anal palpation to evaluate pelvic floor function if there are no physical or psychological impediments, and only with the consent of the patient after the procedure has been fully explained to them and possible alternatives have been fully discussed.<sup>147;148;154</sup> Vaginal/anal palpation is a rapid examination, relatively simple to perform, and cost-efficient. The patient's initial position, the instructions given to the patient and the choice between using one or two fingers have been standardized and should be recorded.<sup>154</sup>

It is not yet clear whether vaginal/anal palpation is a suitable method to detect aspects like morphological differences between the left and right parts of the pelvic floor.<sup>154</sup> Even after thorough training, the inter-observer agreement as regards identifying damage to the levator ani muscle is no more than moderate.<sup>158</sup>

#### Conclusion about palpation (level 2)

- There are indications that vaginal palpation can be used to assess the effectiveness or voluntary and involuntary contraction and relaxation of the pelvic floor muscles.  
Quality of the studies identified: B (Bø & Sherburn, 2007; Devreese et al., 2004; Slieker-ten Hove et al., 2009<sup>147;148;154</sup>).

The Pelvic Floor Clinical Assessment Group of the ICS<sup>153</sup> has decided to use only the terms 'contraction' and 'relaxation' in evaluating the pelvic floor muscle function, and to indicate whether this concerns voluntary or involuntary contraction and relaxation.

An involuntary 'contraction' of the pelvic floor muscles is the contraction that takes place preceding an abdominal pressure rise, for instance due to a cough, to prevent loss of urine.

An involuntary 'relaxation' of the pelvic floor muscles is the relaxation that takes place when the patient is asked to strain as if defecating.

A 'non-contracting pelvic floor' means that during palpation there is no palpable voluntary or involuntary contraction.

A 'non-relaxing pelvic floor' means that during palpation there is no palpable voluntary or involuntary relaxation.

A 'non-contracting, non-relaxing pelvic floor' means that during palpation, there is neither a palpable contraction nor a palpable relaxation.

Assessment of the tonicity of the pelvic floor muscles is hampered by the fact that there are as yet no generally accepted definitions for the terms 'normal tonus', 'hypertonus' and 'hypotonus'.<sup>153</sup>

The Pelvic Floor Clinical Assessment Group of the ICS has opted for a summary description as a *condition* defined by *characteristic symptoms* associated with *specific signs*.<sup>153</sup>

#### Palpation

- Palpation enables the therapist to ascertain whether the patient is able to voluntarily contract their pelvic floor muscles.
- The therapist can also determine whether there is an inward movement of the urethra, whether the levator muscle tightens around the palpating finger and whether there is symmetrical contraction of the pelvic floor muscles in both the antero-posterior and lateral directions.
- Palpation enables the therapist to assess the degree of contraction. Since quantifying the contraction of pelvic floor muscles is difficult and there is no validated scale for this, the Pelvic Floor Clinical Assessment Group of the ICS recommends using only the terms 'absent', 'weak', 'normal' and 'strong' to describe the degree of contraction of the pelvic floor muscles.<sup>153</sup>
- Palpation can also give an impression of the endurance of the pelvic floor muscles.
- Palpation can be used to count the number of rapid repeats of a contraction (explosive strength).
- Palpation can also be used to assess the degree of relaxation of the pelvic floor muscles after contraction.

#### Palpation during coughing

- Palpation can be used to ascertain whether there is involuntary contraction of the pelvic floor muscles during coughing.
- Palpation can be used to assess whether there is a downward movement of the perineum during coughing.
- Palpation can also be used to assess whether there is any loss of urine during coughing.

#### Palpation during straining

- Palpation enables the therapist to ascertain whether the patient involuntarily relaxes their pelvic floor muscles during straining.
- It can also reveal if the patient paradoxically contracts their pelvic muscles during straining.

- normal pelvic floor muscles:
  - both voluntary and involuntary contraction and relaxation occur; the voluntary contraction is 'normal' or 'strong' and the voluntary relaxation is 'complete';
- overactive pelvic floor muscles:
  - no relaxation occurs; there is contraction even when relaxation is functionally needed, for instance during micturition or defecation;
  - symptoms: micturition dysfunction, loss of urine, obstructed defecation or dyspareunia;
  - signs: absence of voluntary pelvic floor muscle relaxation;
- underactive pelvic floor muscles:
  - no voluntary contraction occurs when it is appropriate;
  - symptoms: urinary incontinence, anal incontinence;
  - signs: pelvic organ prolapse and the absence of voluntary and involuntary contractions of the pelvic floor muscles;

- non-functioning pelvic floor muscles:
  - no pelvic floor muscle activity palpable;
  - symptoms: any symptom associated with a non-functioning pelvic floor;
  - signs: any sign of a non-contracting, non-relaxing pelvic floor.

Although there have been very few reports of a causal relationship between overactive pelvic floor muscles<sup>159</sup> and SUI, a patient with SUI may have overactive pelvic floor muscles. This may be caused by emotional stress<sup>160</sup> and has also been reported to occur in women with complaints of vaginal pain.<sup>161</sup> Increased stress during pelvic floor examinations occurs in women with vaginismus.<sup>161</sup> In addition, the fear of involuntary loss of urine during the examination can produce extra tension in the pelvic floor muscles.

*Based on the above considerations, the guideline development team has formulated the following recommendation:*

#### **Palpation**

The guideline development team recommends the use of the assessment procedure described in the practice guideline to evaluate the pelvic floor muscle function.

### **B.2.3 Impairments originating in other parts of the musculoskeletal system**

The pelvic physical therapist should assess whether and to what extent other parts of the musculoskeletal system are hampering the function of the pelvic floor muscles. To this end, the therapist should inspect and observe:

- the patient's sitting and standing posture (urethral angle, anorectal angle, abdominal pressure and toileting behavior);
- respiration (breath-holding and vocal behavior);
- movements (mobility and tonicity of the spinal column, abdominal and pelvic regions and movement patterns);
- abdominal, buttock and leg muscles (patients with fatigued pelvic floor muscles often show increased activity of other muscles).

In movements, muscles do not work in isolation, but work partly simultaneously and partly consecutively, as in a series (intermuscular coordination). The support and activate each other, or inhibit each other's action. The pelvic floor participates in an extension chain, which is mainly formed by the extensor hallucis longus muscle, the biceps femoris muscle, the obturatorius internus muscle, the rectus abdominus muscle, the obliquus internus and externus muscles, the latissimus dorsi muscle and the cervical flexors. Various authors have stated that it is plausible that the functioning of the pelvic floor muscles cannot be evaluated without looking at this entire muscle chain.<sup>162;163</sup> Proving this hypothesis, and studying and analyzing its impact, requires further and more detailed research. The hypothesis claims that poor functioning of this extension chain might imply poor pelvic floor function as well.

The pelvic floor is connected to the obturatorius internus muscle by fascia leaves on the left and right of the pelvis. Increased tonicity of this muscle as a result of exorotation of the leg also increases

the tonicity of the pelvic floor, which suggests that the pelvic floor needs the exorotation chain to achieve the right tonicity. On the anterior side, the pelvic floor is connected to tendon tissue of the symphysis and fascia leaves of the abdominal muscles, while on the posterior side, it is connected to the tendon tissue of the os coccygis and the leaves of the thoracolumbal fascia. It is also connected to the gluteus maximus muscle.

The pelvic floor muscles are part of the muscles that keep up the intra-abdominal pressure. There is a synergism between the deeper abdominal muscles and the pelvic floor muscles.<sup>164;165</sup> The pelvic floor muscles not only contribute to continence, but also make an integrated contribution to the stability of the trunk and pelvis.<sup>166</sup> In healthy persons, the intra-abdominal pressure is automatically regulated by feed-forward control of the transversus abdominis, in combination with the diaphragm and the pelvic floor muscles.<sup>164;167;168</sup>

Pool-Goudzwaard et al. reported a relationship between increased activity and prolonged contraction of the pelvic floor muscles in women with subacute and chronic lower back pain, to compensate for the loss of pelvic stability, and the development of pelvic floor dysfunctions that lead to SUI, due to excessive strain and a possible loss of motor control of the pelvic floor muscles.<sup>159</sup> Smith et al. found a strong relationship between lower back pain on the one hand and incontinence and respiratory dysfunction on the other. As a possible explanation, they suggest a limited ability to sufficiently integrate trunk muscle function in the regulation of posture and respiration as well as continence.<sup>169</sup>

#### **Assessing voiding posture and toileting behavior**

So far, little research has been done into the role of voiding posture and toileting behavior in relation to SUI. Inadequate voiding posture and inadequate toileting behavior, such as abdominal straining while micturating, might have an unfavorable effect on the pelvic floor through the increased strain imposed on it, which could disturb the balance between strain and resistance. Postponing micturition and drinking too much fluid (> 2.5 L per 24 hours) could be regarded as increasing the strain on the pelvic floor due to increased bladder content (> 500 mL).

Versprille-Fischer described the importance of a good voiding posture in relation to micturition and defecation, in which the pelvic floor plays an important role.<sup>163</sup> Devreese et al. concluded that a posture with the trunk bent forward is the most favorable posture to enable micturition with a relaxed pelvic floor.<sup>170</sup> Good voiding posture and relaxed pelvic floor and breathing create the optimal conditions for voiding the bladder and intestines.

The therapist discusses with the patient what sitting or standing posture they normally use for voiding, to assess its suitability. If the posture is inadequate, a correct voiding posture becomes one of the goals of the physical therapy intervention.

#### **Conclusion about functional examination (level 3)**

- There are indications that inadequate breathing patterns, postural control, voiding posture, and toileting behavior may have an adverse impact on pelvic floor muscle function. Quality of the studies identified: C (Smith et al., 2006<sup>169</sup>).

Based on the above considerations, the guideline development team has formulated the following recommendation:

#### Functional examination

The guideline development team recommends that breathing patterns, postural control, voiding posture and toileting behavior be examined in relation to the functioning of the pelvic floor muscles.

#### B.2.4 Unfavorable local and other (general) prognostic factors

The pelvic physical therapist should identify any unfavorable local and other (general) prognostic factors. Inspection can be used to identify signs of reduced resilience of the pelvic floor. Local resilience can be reduced as a result of rupture or incision scars, by anterior or posterior vagina wall defects or by a uterus prolapse. The patient's specific resilience can be estimated from their general physical condition. Overweight can be assessed using the body mass index (BMI), which is calculated by dividing the patient's weight in kilograms by the square of their height in meters. A BMI > 25 is regarded as overweight, a BMI  $\geq$  30 as pathological overweight (obesity).<sup>102</sup>

#### Conclusion about body mass index (level 3)

- It is plausible that calculating the body mass index in clinical practice is a useful instrument to evaluate the extent to which body weight should be regarded as an unfavorable prognostic factor for recovery.  
Quality of the studies identified: B (Townsend et al., 2007<sup>102</sup>).

#### B.3 Measurement instruments

All measurement instruments described below can, in principle, be used for both women and men, except those explicitly indicated to be suitable only for men or women.

The way in which a patient experiences their health problem is determined by the combination of the severity of the urinary incontinence and the consequences of the incontinence for everyday life, the way the patient adjusts to the problem and the significance of the urinary incontinence for the patient's sense of self-esteem. The therapist must record these aspects and monitor the changes in them to be able to evaluate the effect of the physical therapy treatment. In addition, the data obtained by means of validated measurement instruments are highly valuable in the communication between the relevant care providers and with insurance companies.

##### B.3.1 The PRAFAB questionnaire

The PRAFAB questionnaire (see Supplement XX in the Practice Guideline) measures the severity of the loss of urine in terms of the use of absorptive products (*PRO*tection), the magnitude of the loss of urine (*Am*ount) and the number of times urine is lost (*Fre*quency). In addition, it records the impact of the loss of urine in terms of more subjective aspects, such as the way the patient adjusts to the loss of urine in their everyday life (*Ad*justment) and the consequences of the incontinence for the patient's self-image (*Bo*dy image). The PRAFAB questionnaire thus combines key objective and subjective aspects of the incontinence problem. The questionnaire

measures two separate domains by means of a 'leakage severity scale' and a 'perceived impact scale'.<sup>171</sup>

The PRAFAB score allows persons with severe urinary incontinence to be identified. A comparison with the IncoTest (48 hour pad test) shows that a PRAFAB score of 14 points or less can be used to distinguish between more or less than 2 g of urine lost per hour.<sup>143</sup> Loss of more than 2 g of urine an hour is defined as severe urine loss.<sup>143</sup>

The psychometric qualities in terms of reliability, validity and responsiveness of the PRAFAB questionnaire have been studied among women aged 18–67 years, and were found to be satisfactory.<sup>172</sup> Research has also shown that the questionnaire can be used to record changes in the health status of individual patients, as the minimal change score on the instrument that corresponds to a clinically relevant change in the health problem has been determined.<sup>172</sup> The minimal clinically relevant change in the overall score (minimal important change or MIC) for patients with < 2 g urine loss per hour (PRAFAB score < 14) is 3 points, while the MIC for patients losing > 2 g of urine an hour is 5 points.<sup>173</sup> Although the overall PRAFAB score is a measure of the severity of the perceived health problem, the individual scores for the 'urine loss' and 'impact' items are also relevant. In diagnostic terms, these scores are part of the patient profile, comprising the severity of urine loss (impairments) on the one hand, and the limitations of activities and restrictions of participation and personal factors on the other. The Incontinence Severity Index (ISI)<sup>34;174</sup> and the International Consultation on Incontinence Questionnaire (ICIQ)<sup>175</sup> include questions relating to the same themes (symptoms of incontinence, amounts of urine lost, frequency and use of absorptive products) and can also be used to record the severity of the health problem. However, the Dutch versions of these two instruments have not yet been validated.

The severity of the loss of urine alone, however, has proved to be a poor predictor of possible limitations of activities, the psychosocial impact of SUI and the significance of the SUI for an individual's perceived quality of life.<sup>175;176</sup> Urinary incontinence nearly always has adverse effects on the patient's quality of life, including reduced social participation; patients feel lonely and unhappy, stigmatized, and hampered in nearly all activities of daily living, including their sexual relationships.<sup>18–20</sup> The practical discomforts associated with loss of urine, such as frequently having to change clothes or having to bathe more often, also have a negative impact on the quality of life.<sup>22;23;177–181</sup>

The way in which patients perceive and experience the consequences of urinary incontinence is important as this experience is part of the health problem. Even minor incontinence can have considerable effects on the patient's quality of life.<sup>18;23</sup> This is why recording the impact of the urinary incontinence on the patient's quality of life is crucially important for an assessment of the effectiveness of interventions and therapeutic options, especially since these interventions and therapeutic options frequently fail to achieve complete recovery from urinary incontinence.<sup>182</sup> Measuring the perceived impact of the loss of urine using extensive quality-of-life questionnaires is a rather time-consuming procedure in routine practice. In addition, the various questionnaires only measure specific aspects of quality of life (in addition to the severity of urine loss), making it difficult to choose the right instrument.<sup>34;174;175</sup>

The advantage of the PRAFAB questionnaire is that it is short, and records both the severity of loss of urine and the perceived impact of the problem on the patient's everyday activities and self-image. Moreover, research into the psychometric characteristics of the test has shown that improvements in PRAFAB scores correlate closely with the improvements in health status perceived by the patients themselves.<sup>172</sup>

#### Conclusion about the severity of the health problem (level 2)

- It is plausible that the PRAFAB questionnaire is a useful instrument to record the severity of the health problem at the start of therapy.  
Quality of the studies identified: B (Vierhout et al., 2004; Mulder et al., 1990<sup>142;143</sup>).

#### Conclusion about assessing changes in the patient's health status and the effect of physical therapy intervention (level 1)

- It has been demonstrated that the PRAFAB questionnaire is a suitable instrument to record changes in the patient's health status and hence to record the effect of the physical therapy intervention on their health status.  
Quality of the studies identified: A (Hendriks et al., 2007, 2008<sup>172;173</sup>).

*Based on the above considerations, the guideline development team has formulated the following recommendation:*

##### **PRAFAB questionnaire**

The guideline development team recommends using the PRAFAB questionnaire to assess the changes in the patient's health status and the effect of physical therapy intervention.

#### B.3.2 Pad tests

The aim of pad tests is to quantify the loss of urine by weighing the incontinence products (pads) used. This can be done by weighing the pads before and after a specified period of time (e.g. 24 or 48 hours). Such tests are usually done at the patient's home, or before and after implementation of a protocol to provoke involuntary loss of urine (e.g. the 1-hour ICS pad test); this provocation test can also be used to distinguish between continent and incontinent women. This short pad test is (usually) done with a full bladder, just before a series of exercises. An increase in pad weight of > 1 g in the 1-hour ICS pad test and an increase of > 4 g in a 24-hour test are regarded as a positive test result.<sup>132</sup> The intra- and inter-observer reliability values for the various short pad test vary widely.<sup>132</sup> The test often produces a negative result particularly in women with mild incontinence. The clinical value of the 1-hour ICS pad test is limited.<sup>183</sup>

Pad tests measuring loss of urine over a longer period are more reliable. The correlation coefficient between the loss of urine measured in two 24-hour pad tests (test-retest) is good, but the coefficient for 48-hour tests is even better.<sup>132</sup> On the other hand, patients often dislike 48-hour pad test, as they require considerable effort. There is no correlation between the loss of urine

measured by the 48-hour pad test and that measured by a standardized 1-hour pad test.<sup>132</sup>

#### Conclusion about pad tests (level 3)

- There are indications that the 24-hour pad test is the most useful of all pad tests, in view of its high reliability and the acceptable burden for the patient.  
Quality of the studies identified: C (Staskin et al., 2005<sup>132</sup>).

*Based on the above considerations, the guideline development team has formulated the following recommendation:*

##### **Quantifying the loss of urine**

The guideline development team recommends quantifying the loss of urine using the 24-hour pad test in case of uncertainty about the quantities of urine being lost.

#### B.3.3 Patient-Specific Complaints (PSC)

The Patient-Specific Complaints (PSC) instrument can be used to determine the specific limitations experienced by individual patients.<sup>184</sup> The PSC has been found to have good responsiveness for patients with low back pain.<sup>184</sup> The PSC can be used to measure relevant and important changes in the pattern of complaints of individual patients. It enables therapists to determine a patient's subjective functional status before and after treatment, making the instrument suitable for evaluation.<sup>185</sup> The PSC enables the patient to indicate the main activities in which they feel restricted. Changes over time in the PSC score reflect changes in perceived health status, and hence indirectly in their quality of life. The restrictions experienced by the patient are best assessed with the Numeric Rating Scale-11 (NRS-11; range 0-10) rather than with a Visual Analog Scale (VAS; range 0-100 mm), as the NRS is easier and simpler for the patient to interpret.

#### Conclusion about the Patient-Specific Complaints (PSC) questionnaire (level 2)

- The Patient-Specific Complaints instrument can be used for the initial identification of the health problem as perceived by an individual patient, as well as to evaluate the treatment after an intervention.  
Quality of the studies identified: B (Beurskens et al., 1999<sup>185</sup>).

*Based on the above considerations, the guideline development team has formulated the following recommendation:*

##### **Patient-Specific Complaints (PSC)**

The guideline development team recommends using the PSC both to identify the health problem and to evaluate the effect of treatment.

#### B.3.4 Global Perceived Effect (GPE)

The guideline development team recommends the use of the Global Perceived Effect (GPE) instrument, in view of its simplicity and practicability (*Practice Guideline*, Supplement 5). Patients can use the GPE to indicate their general perception of the change

or degree of improvement in their subjective health status.<sup>186</sup> Research into the psychometric characteristics of the PRAFAB questionnaire for patients with urinary incontinence has used the GPE instrument to measure the subjectively perceived generic effects of treatment.<sup>172</sup>

### Conclusion about the Global Perceived Effect (GPE) instrument (level 2)

- It is plausible that the Global Perceived Effect (GPE) measurement instrument is useful to assess the change in or degree of improvement of the health problem as perceived by individual patients after treatment.  
Quality of the studies identified: B (Hendriks et al., 2007; Jaeschke et al., 1989; Van der Roer et al., 2006; De Vet et al., 2006<sup>172,186-188</sup>).

*Based on the above considerations, the guideline development team has formulated the following recommendation:*

#### Global Perceived Effect (GPE)

The guideline development team recommends using the GPE to evaluate the health status improvement perceived by the patient.

### B.3.5 Micturition diary

A micturition diary (bladder diary) provides information about a number of variables relating to micturition, involuntary loss of urine and activities during which the loss of urine takes place.<sup>189-191</sup> The following variables are systematically recorded, preferably covering 3 consecutive days that are representative of the patient's daily activity patterns (e.g. 2 working days and 1 weekend day): the times when fluids are consumed and the amounts consumed, the type of fluid consumed, the level of urge to empty their bladder, the quantity of urine voided and the times of micturition, the times when urine is involuntarily lost and the amounts of urine lost, and the activity/activities the patient was engaged in just before or during the loss of urine.

The physical therapist evaluates the micturition diary by scoring the following data: the frequency of micturition, the total volume of urine produced per day, the volume of urine produced at each micturition, the presence of (uncontrollable) urge just before the micturition, the distribution of urine production over a 24-hour period and the activity/activities the patient was engaged in just before or during the loss of urine.

The data from the micturition diary give the therapist information about the functional capacity of the patient's bladder and their micturition behavior. The functional capacity of the bladder is normal (350–500 mL) in patients with SUI, but reduced in patients with urgency incontinence, as revealed by their tendency to produce small volumes (< 100 mL) per voiding. SUI patients also usually have a normal (or nearly normal) micturition frequency (about 8 times per 24 hours), whereas patients with urgency incontinence usually have a much higher micturition frequency. Patients with SUI usually experience involuntary loss of urine during moments of increased intra-abdominal pressure, whereas those with an overactive bladder experience an uncontrollable urge to empty their bladder just before the involuntary loss of urine. Finally,

patients with SUI usually lose fairly small volumes of urine (drops or trickles), whereas those with urgency incontinence may suffer much more substantial loss of urine.<sup>189</sup>

A micturition diary covering 7 full days has been found to be a valid instrument to determine changes in the symptoms of urgency incontinence, for both men and women with urgency-predominant incontinence.<sup>191</sup> A micturition diary covering a shorter period is just as reliable, and represents less of a burden to the patient, leading to better compliance.<sup>191</sup>

Not only can a micturition diary be used as a diagnostic instrument, but the physical therapist can also use the recorded data to give the patient specific advice on the timing of eating and micturition. Good toileting behavior will also promote continence.<sup>163,192</sup> See Supplement 3 in the *Practice Guideline* for an example of a micturition diary.

### Conclusion about the use of micturition diaries (level 1)

- It has been demonstrated that the physical therapist can derive information about the type of incontinence and about variables relating to micturition, involuntary loss of urine and activities during such urine loss by asking the patient to keep a micturition diary.  
Quality of the studies identified: A (Brown et al., 2003<sup>191</sup>).

*Based on the above considerations, the guideline development team has formulated the following recommendation:*

#### Micturition diary

The guideline development team recommends having patients keep a micturition diary in order to identify the severity of the loss of urine and to evaluate the results of treatment.

Therapists who want to evaluate the effects of treatment in greater detail can use validated measurement instruments such as the Incontinence Impact Questionnaire (IIQ) and the Urogenital Distress Inventory (UDI).<sup>193</sup> Both instruments have been translated into Dutch and the translated versions have been validated.<sup>194</sup>

### B.4 Analysis

The aim of the diagnostic process in physical therapy is to provide as specific an answer as possible to the question whether and how the underlying disorder and/or any unfavorable factors can be modified by physical therapy. This answer is formulated partly on the basis of the information provided by the patient's family doctor and/or specialist.

The analysis stage involves the explicit decision whether 'physical therapy' is the treatment indicated for a particular patient, based on the findings of the diagnostic process, supplemented by medical information.

If the diagnosis of SUI has been correctly established, the physical therapist should use the PRAFAB score and/or the 24-hour pad test to determine the severity of the SUI (grades 1 and 2 or grades 3 and 4) (see Table 7).<sup>143</sup>

#### B.4.1 SUI in women

Although surgery has been proposed as the most effective therapy

Table 7. Gradation of SUI by severity of loss of urine.

PRAFAB questionnaire	24-hour pad test*	use of absorptive products
1 (mild)	< 10 g	none
2 (moderate)	10–50 g	occasional
3 (severe)	50–100 g	continually, except when at rest
4 (severe)	> 100 g	day and night

\* *Incotest modified to 24-hour pad test.*<sup>143</sup>

for women with severe forms of SUI (grades 3 and 4)<sup>3;195</sup> and physical therapy in the form of pelvic floor muscle training (PFMT) as the therapy of first choice for women with moderate or mild forms of SUI (grades 1 and 2),<sup>2–4;196;197</sup> the general recommendation is nevertheless to start with non-surgical therapy for all forms of SUI, including severe forms.<sup>195;198;199</sup>

The reason is that some patients benefit sufficiently from PFMT, so that surgical intervention can be avoided, even in the longer term.<sup>139;200;201</sup> In addition, even if PFMT has insufficient effect and surgical intervention is called for, the exercises will have improved the patient's physical condition by then, which has a beneficial effect on postoperative recovery and reduces the risk of postoperative complications.<sup>202;203</sup> Norton et al.<sup>204</sup> and Jarvis et al.<sup>203</sup> recommend exercise therapy in preparation for surgery in the urogenital area, to prevent postoperative complications.

Another reason to be reticent about surgical intervention is that such surgery appears to be less successful in the longer term than was previously assumed.<sup>195;205;206</sup> The high prevalence of SUI and the knowledge that an operation, which carries the risk of causing permanent damage to the pelvic floor, is not the most suitable option for all patients<sup>195;207–209</sup> has resulted in renewed interest in conservative treatment of SUI.<sup>195;207;210;211</sup>

The analysis should be based not only on the severity of the loss of urine and the functionality of the pelvic floor muscles (expressed as the ability to correctly contract and relax these muscles, voluntarily as well as involuntarily), but also on the prognostic factors identified and whether they are modifiable by physical therapy. Prognostic factors that are hardly modifiable by physical therapy, such as severe prolapse (stage 3), partly determine the chances of a successful therapy. For those prognostic factors that are modifiable, the therapist must formulate explicit therapeutic goals, for instance to treat poor physical condition and overweight or poor physical resilience as perceived by the patient themselves.

It may be concluded that the severity of the SUI is important for the prognosis and the evaluation of the effect of the intervention, although the severity does not fully determine the physical therapist's treatment strategy.

It may also be concluded that the nature of the underlying disorder remains unclear for most patients who are given a presumptive diagnosis of SUI. Hence, the pelvic physical therapist cannot predict in advance whether and to what extent the SUI will prove amenable to modification by physical therapy. This means that the treatment by the pelvic physical therapist is a 'diagnostic' treatment, and only the presence of factors that are presumed to have prognostic value can be used to estimate the possible modifiability of the problem.

In view of these prognostic factors, the following problem categories can be distinguished for women:

- SUI with pelvic floor muscle dysfunction:
  - The patient is unable to identify their pelvic floor muscles, has no awareness, cannot manage contraction or relaxation; shows no effective involuntary contraction of the pelvic floor muscles associated with increased abdominal pressure.
  - The patient is unable to identify their pelvic floor muscles, has no awareness, cannot manage contraction or relaxation; shows some involuntary contraction of the pelvic floor muscles associated with increased abdominal pressure, but the contraction is ineffective.
  - The patient is unable to identify their pelvic floor muscles, has no awareness, cannot manage contraction or relaxation, but shows effective involuntary contraction of the pelvic floor muscles associated with increased abdominal pressure.
  - The pelvic floor muscle tone is measurably too high, and the patient is unable to reduce this on demand (with or without voluntary tightening and with or without effective involuntary contraction associated with increased abdominal pressure).
  - The patient is able to tighten and relax their pelvic floor, but has no effective involuntary control over the pelvic floor during increased abdominal pressure.
  - The patient has both voluntary and involuntary control over their pelvic floor muscles, but their pelvic floor muscles are too weak.
  - The functioning of other parts of the musculoskeletal system, for instance in relation to respiration, voiding posture and toileting behavior, adversely affects the pelvic floor muscle function.
- SUI without pelvic floor muscle dysfunction.
- SUI plus local and/or other (general) unfavorable prognostic factors that may have adverse local or general effects on recovery and/or adjustment processes, and which may or may not be modifiable by physical therapy interventions.

#### B.4.2 SUI in men

Dysfunctional pelvic floor muscles are usually not a primary causative factor for SUI in men, although pelvic floor dysfunction may be a limiting factor for compensation of internal sphincter insufficiency due to surgical interventions. Dysfunctional pelvic floor muscles are more common among older men, possibly as a result of damage to muscle and/or nerve fibers in the pelvic floor area, for instance due to previous trauma or radiation treatment.

Patients may also not know how to contract their pelvic floor muscles or may actually generate too much muscle tension to prevent loss of urine. The ability to voluntarily contract and relax the pelvic floor muscles is a precondition for pelvic floor exercises.

The problem categories that can be distinguished are the same as those for women.

## C Therapeutic process

The general objective of the pelvic physical therapy intervention is to enable patients to adjust the physical resistance offered by their pelvic floor to the actual strains that occur (i.e. peaks in intra-abdominal pressure). This objective can be regarded as achieved if the patient reports fewer impairments and limitations, and fewer problems of participation, or improved functions, resumption of activities and recovery of participation.

The pelvic physical therapist tries to enable the patient to increase the condition of their pelvic floor by training the pelvic floor muscles (training to produce structure); in addition, the therapist tries to eliminate as much as possible the influence of factors impeding this adjustment process. Since the resistance offered by the pelvic floor muscles should ideally be equal to the strain, this means that the patient should not only work to improve the physical condition of their pelvic floor, but also continue their efforts to maintain this condition ('use it or lose it'). This implies achieving a change in lifestyle, and an important part of the physical therapy interventions must be to support this change of patients' lifestyle or behavior.

In addition, it may be useful to improve the patient's general physical condition, in order to reduce the influence of other diseases and disorders on the continence.

The therapy starts with the therapist explaining the nature of the patient's problem to them and giving them information. The patient will be more motivated to start the therapy if they understand the normal anatomy and physiology, the influence of (mental) stress and relaxation on the functioning of the pelvic floor muscles and the way stress (urinary) incontinence develops.<sup>212</sup>

The therapist formulates the objectives of the physical therapy treatment in terms of reducing the impairment(s), limitation(s), and participation restrictions, in other words improving body functions, abilities, and social participation. Together with the patient, the pelvic floor physical therapist designs a treatment plan, based on the information obtained during the diagnostic process. It is important to formulate the treatment goals explicitly and to indicate how long it should take to achieve them. Determining the strategy and objectives of treatment is a joint effort by patient and therapist, each with their own interests, preferences and expectations. It is essential that the patient and the pelvic physical therapist both know what to expect from each other. The objectives focus on reducing the influence of unfavorable prognostic factors, many of which are linked to behavior that adversely influences health, that is, to lifestyle. The adverse influence of these factors on health in general and on the physical condition of the pelvic floor in particular can be reduced if the patient manages to adjust their own lifestyle. This makes the patient 'trainable' and makes functional improvement of the pelvic floor condition a potentially feasible goal for the physical therapy intervention.

As indicated in the above description of the analysis process, the presence of one or more of the factors presumed to have prognostic value does not enable the therapist to predict whether and to what extent the health problem of SUI can be modified by means

of physical therapy. Hence, the therapy should be regarded as a 'diagnostic therapy' (6 sessions). The attainment or non-attainment of the objectives thus acquires a diagnostic significance. It may allow an underlying disorder that is not modifiable by physical therapy to be identified, and reveal the need for further evaluation of the problem.

## Conclusion about the physical therapy intervention (level 4)

- In the opinion of the guideline development team, the physical therapist's diagnostic process does not allow definitive conclusions as to whether and to what extent the health problem of SUI will be amenable to modification by physical therapy intervention, which implies that the physical therapy treatment must be regarded as a 'diagnostic therapy', which needs to be evaluated after 6 sessions.

The various therapeutic interventions used by pelvic physical therapists to treat adult patients with SUI include:

- information and advice;
- interventions to increase general physical condition;
- intervention to increase the functional condition of the pelvic floor:
  - practicing and controlling the pelvic floor functions (i.e. training the pelvic floor muscles to enable the patient to voluntarily contract and relax them, to increase their strength and endurance and to promote their involuntary contraction to support abdominal pressure increase);
  - training with the help of feedback;
  - training with the help of electrostimulation;
  - training with the help of vaginal cones.

### C.1 Information and advice

In the process of taking a patient's history, the pelvic physical therapist has identified their 'illness beliefs' about their health problem, and gained some impression of the patient's ideas about the nature of the problem and its possible causes, how long the patient thinks it might last, their ideas about the ultimate consequences of the problem, whether the patient thinks they can be completely cured, and their ideas about what they will be able to do about it themselves, and what others could do for them. The emotions associated with the problem have also been assessed. Based on this information, the therapist should formulate a patient-specific education plan, as part of the physical therapy treatment plan. This plan includes specific subsidiary goals, for instance relating to the patient's views and ideas. Achieving long-term success will require changing the patient's behavior. Important instruments to achieve this are education and counseling, especially as regards changes relating to the pelvic floor and micturition behavior.

Depending on the patient's ideas, preferences and expectations, the pelvic physical therapist should explain to them the following relevant concepts: SUI; the function of the bladder; where and how urine is produced; the relationships between kidneys, bladder, and pelvic floor; the relationship between pelvic floor, respiration, and posture; the possible causes of urinary incontinence; the potential consequences of incontinence; the influence of (mental) stress and relaxation on the physical condition of the pelvic floor; the relationships with other functional impairments in the pelvic floor region; etc.

The therapist should also explain about potential risk factors and prognostic factors in general, and the particular factors that are relevant in the patient's specific case. Topics to be discussed include the possible relationships between incontinence, pregnancy, and delivery; prolapses and the hereditary factors that may be involved in them; lifting heavy objects; and the influence of overweight and general physical condition on the incontinence. For male patients, this should be supplemented with information about the relation between incontinence and surgical interventions. In addition, the therapist should discuss the relationships between SUI and smoking and the use of alcohol, coffee, and tea. The pelvic floor can only be effectively trained if the patient knows where the pelvic floor muscles are located, what their function is and how they can be contracted and relaxed, and what the effect is of the presence or absence of effective involuntary contraction associated with increased abdominal pressure. The pelvic physical therapist can make use of educational materials in the form of anatomical plates and phantoms.

The therapist should also discuss with the patient what sitting or standing posture they normally use for voiding. Tilting the pelvis forward results in a more vertical position of the urethra, while the bladder is lifted in a ventrocranial direction as the trunk is extended.<sup>163</sup> Tilting the pelvis as a toileting exercise promotes the development of a suitable voiding posture. This can be demonstrated using anatomical plates and a model of the pelvis.<sup>163</sup>

*Based on the above considerations, the guideline development team has formulated the following recommendation:*

#### **Information and advice**

The guideline development team recommends the use of anatomical plates and pelvic phantoms, as well as other educational materials such as lifestyle advice.

The pelvic physical therapist can use the information recorded in the patient's micturition diary to discuss their micturition behavior and to offer specific advice on eating habits and micturition behavior (e.g. timing). Good toileting behavior will also promote continence.

In evaluating the information and recommendations given, the pelvic physical therapist can consider whether the patient has realistic views and expectations with regard to their complaints, and whether they are doing what they ought to do.

Essential factors regarding behavioral change include: (1) the expected outcome of behavior (do the advantages for the patient outweigh the disadvantages) and (2) the patient's self-efficacy, that is, their perceived control over their behavior. Whether patients actually change their behavior will depend on 6 aspects of behavioral change. First of all, the patient must be receptive to information about behavioral change, must be able to understand the information and must be willing and able to change their behavior. Subsequently, they must actually start to implement the new behavior, continue to engage in it, and internalize it. The way patients cope with their problem can be improved by systematically discussing their views and attributions about their complaints, for instance using Leventhal's classification (identity,

cause, timeline, consequences, possible recovery [spontaneous or through treatment] and controllability of the complaints).<sup>213;214</sup>

### **C.2 Interventions to increase general physical condition**

The better someone's physical condition and resilience, the less they will be affected by the consequences of illnesses or disorders. Improving a patient's general physical condition is useful and is recommended for a wide range of disorders.<sup>215</sup> KNGF stimulates the development of exercise programs for a range of patient groups. Since SUI can be regarded as a dysbalance between strain and resilience, it is plausible that improving the patient's general physical condition will result in their being less affected by the SUI. A patient's physical condition can be improved by exercising and/or training. Training can be defined in two different ways: 'systematically practicing a particular sport' and 'practicing a particular skill'. In physical therapy, systematic practicing with 'overload' can be referred to as training. Practicing particular skills can be referred to as practicing. This means that practicing with overload and practicing particular skills can both be used in this context to improve the patient's physical condition and resilience. Where this guideline refers to pelvic floor muscle training, the context should clarify whether this means 'practicing with overload' or 'practicing the particular skill'. The latter may include practicing the correct way to contract and relax the pelvic floor muscles. If a patient is overweight (BMI > 25) or obese (BMI > 30), increasing their physical condition by means of training can reduce the level of overweight, and hence reduce the influence of overweight as an unfavorable prognostic factor.

#### **Conclusion about increasing general physical condition (level 4)**

- In the opinion of the guideline development team, improving the general physical condition of persons with SUI will reduce the severity of their SUI.

*Based on the above considerations, the guideline development team has formulated the following recommendation:*

#### **Improving general physical condition**

The guideline development team recommends the inclusion in the treatment plan of interventions to improve the patient's general physical condition.

### **C.3 Interventions to improve the physical condition of the pelvic floor muscles**

#### **C.3.1 Practicing and controlling the pelvic floor functions**

The goal of pelvic floor muscle training for patients with SUI is to improve their extrinsic support mechanism to such an extent that the pelvic floor provides enough support to prevent loss of urine associated with increased intra-abdominal pressure.

The evidence used to support the recommendations in this guideline is derived from systematic reviews by Berghmans et al.,<sup>7</sup> Hay-Smith et al.,<sup>216</sup> Neuman et al.,<sup>6</sup> Hay-Smith and Dumoulin,<sup>217</sup> Dumoulin and Hay-Smit,<sup>218</sup> Shamliyan et al.<sup>219</sup> and reviews by Bø et al.<sup>8</sup> and Wilson et al.<sup>197</sup> All reviews include results of a number of high-quality RCTs. The evidence supporting pelvic floor muscle



training (PFMT) for incontinence in men due to prostatectomy is based on the Cochrane reviews by Moore et al.<sup>220</sup> and Hunter et al.<sup>44</sup>, and reviews by Van Kampen.<sup>128</sup>

These reviews show that PFMT results in complete recovery, or at least considerable improvement of the health status, in women with SUI (evidence level 1) and to a reduction in subjective symptoms (level 1), and that this improvement can be objectively confirmed by urodynamic examination and a pad test (level 1). PFMT has also been found to result in objective improvement of the pelvic floor muscle function (level 1) and improvement of the patient's quality of life (level 1). The reviews do not report any adverse effects or side effects of this form of training (level 1). The reviews show that PFMT to treat post-prostatectomy incontinence in men shortens the duration of the incontinence relative to no therapy or placebo (level 1).

### Conclusions about pelvic floor muscle training (level 1)

- It has been demonstrated that pelvic floor muscle training is an effective treatment for women with SUI.  
Quality of the studies identified: A1 (Neumann et al., 2006; Berghmans et al., 1998; Bø et al., 2007; Wilson et al., 2005; Hay-Smith et al., 2001; Hay-Smith et al., 2005; Dumoulin et al., 2008; Shamliyan et al., 2008).<sup>6-8;197;216-219</sup>
- It has been demonstrated that pelvic floor muscle training reduces the duration of the incontinence in men with SUI after prostatectomy.  
Quality of the studies identified: A1 and A2 (Hunter et al., 2007; Van Kampen et al., 2007; Moore et al., 2001).<sup>44;128;220</sup>

### Other considerations

There are currently two relevant theories about the mode of action of PFMT. Both theories are supported by basic scientific research and case-control studies. These theories form the basis for the main conservative treatment strategies, such as PFMT.<sup>221</sup> The first theory assumes that PFMT produces a kind of behavior modification, in that patients learn to voluntarily contract their pelvic floor just before and during an increase in intra-abdominal pressure, and to maintain this contraction to prevent downward movement of the pelvic floor (timing and coordination). The other theory assumes that PFMT enables patients to increase the strength of their pelvic muscles (strength training) over a longer period of time, thereby enhancing the 'stiffness' and structural support function of the pelvic floor (obviously only if it has been established that the patient does not have overactive pelvic floor muscles).

There is evidence to support both of these theories. The evidence for the first theory can be summarized as follows. During voluntary contraction of the pelvic floor muscles, just before and during an increase in intra-abdominal pressure, the pelvic floor moves inward and upward, and the urethra, vagina and rectum are buckled and compressed.<sup>146;222-224</sup> Ultrasound and MRI studies have shown that the pelvic floor moves inward and upward, while the os coccygis moves in a forward, inward, and cranial direction.<sup>225;226</sup> Miller et al. referred to this voluntary, stabilizing contraction as 'the knack', and showed that women with SUI who used the knack during moderately forceful or heavy coughing were able to reduce their involuntary loss of urine by 98.2% and 73.3%, respectively.<sup>227</sup> Basic research and functional anatomy studies have also confirmed the 'knack' principle as an effective means of stabilizing the pelvic

floor.<sup>53;228</sup> So far, however, it remains unknown how much muscle strength is actually required to prevent the downward movement of the pelvic floor during coughing and other physical exertions. Slieker found no straightforward relation between muscle strength and effective involuntary contraction.<sup>229</sup> It also remains unclear whether regularly practicing such stabilizing pelvic floor contractions during daily activities is enough to increase the muscle strength and whether this results in the required morphological changes in the pelvic floor. Nor has it been examined whether and to what extent the 'knack' can be used to reduce an SUI-associated prolapse or prevent it from worsening during an increase in intra-abdominal pressure. The effect may be due to coordination and timing rather than to absolute strength.

The evidence for the second theory can be summarized as follows. Kegel<sup>146</sup> originally described PFMT as a physiological method to train patients in contracting their pelvic floor muscles. The rationale behind intensive PFMT for SUI is that effective and purposeful muscle strength training can improve the structural support function of the pelvic floor. Firstly, the muscle layer of the levatores ani muscles is permanently raised to a higher position within the pelvis; secondly, the resulting hypertrophy, and the associated greater stiffness of the pelvic floor, supports the supportive connective tissue. This prevents a downward movement of the pelvic floor during increased intra-abdominal pressure. This might mean that the apertures in the pelvis are narrowed and the pelvic organs show less movement during increased intra-abdominal pressure. If the pelvic floor is situated at a higher level, it is better able to respond in a coordinated manner to increased intra-abdominal pressure, and is thus better able to close the urethra.<sup>230;231</sup> This is particularly important for women suffering from both prolapse and urinary incontinence.

Ultrasound studies have shown that the level at which the pelvic floor is situated is lower during pregnancy and after delivery than before.<sup>232</sup> There is also a difference between continent and incontinent women in the anatomical position of the pelvic floor.<sup>53</sup> Bernstein's ultrasound study found a significant increase in muscle volume after training, although this was only an uncontrolled clinical study.<sup>233</sup> In view of the lack of a control group in this study, there is a need for further research to definitively establish the presence of hypertrophy of the pelvic floor muscles after relevant training, as well as to establish whether this hypertrophy is the cause of the reduction of complaints or whether the hypertrophy is more the result of effective involuntary contraction.

So far, there have been no RCTs, either for urinary incontinence or for prolapse, to assess the effect of PFMT on the tonicity of the pelvic floor muscles or the stiffness of the associated connective tissue, the position of the pelvic floor muscles within the pelvic cavity, the cross-sectional area of the pelvic floor or its neuro-physiological function.

In an uncontrolled ultrasound study, Balmforth et al. found a significantly higher position of the bladder neck, at rest as well as during a Valsalva maneuver and during contraction, after a 14-week supervised pelvic floor muscle training program.<sup>234</sup> Although these findings support the above theories about the mode of action of PFMT, they have not yet been confirmed in high-quality RCTs. A number of studies have found that patients no longer had involuntary loss of urine during physical activities after completing the training program.<sup>235-237</sup> This effect is most likely caused by improved involuntary muscle function (i.e. the second theory) rather than merely the ability to voluntarily contract the pelvic

floor muscles just before an increase in intra-abdominal pressure, as is the case when using the 'knack' (i.e. the first theory).

The combination of exercise therapy with education and counseling is part of the so-called behavioral techniques.<sup>238</sup> These techniques can be regarded as low-risk interventions, aimed at reducing involuntary loss of urine, which can be applied by pelvic physical therapists with proven knowledge and understanding of the underlying problem. Suitable exercise therapy (i.e. the therapist having established that the patient does not have overactive pelvic floor muscles and that they carry out the exercises correctly) has the great advantage that there are no side-effects and that exercise therapy does not impede any future forms of therapy. The pelvic floor is a complex, continuously adjusting, coherent organ system, consisting of various 'tissues', each with their own characteristics. For instance, the bladder and the rectum are also part of the pelvic floor, as they are closely integrated with it. Internal examinations of healthy people, with no complaints, have shown that there is a great deal of variation in the strength and duration of contractions of the levator ani muscle.<sup>235</sup>

The relevant literature also shows that it is not yet possible to define standards for therapeutic training to optimize strength, speed and endurance and to enhance the physical properties of the pelvic floor. Many different standards are currently being used in this respect.<sup>197;216</sup>

The literature provides descriptions of numerous types of programs and protocols to improve pelvic floor muscle function, especially with regard to urinary incontinence. Some centers give patients verbal instructions, supplemented by printed brochures,<sup>239</sup> while others use intensive programs based on physiological exercise principles.<sup>240</sup> Research has shown, however, that verbal instructions alone are insufficient<sup>241</sup> and that an intensive PFMT program is much more effective than a low-intensity program.<sup>235</sup> The main concern is to ensure that the patient's pelvic floor muscle contractions are effective and purposeful, in order to achieve the intended result: effectiveness can be achieved by practicing selective maximum voluntary contraction of the pelvic floor muscles, so by training the right muscles at maximum intensity, while purposeful muscle control can be achieved by implementing an effective PFMT program with the correct parameters and basic physiological principles for strength training. It has been found, however, that 30% of the women who engage in PFMT do not use the correct inward and upward contraction with simultaneous inward movement of the perineum, but actually press down their perineum, resulting in a downward movement of the pelvic floor.<sup>241</sup> In women with a prolapse, this could in fact increase the complaints, rather than reducing them.<sup>197</sup>

#### Conclusions about pelvic floor muscle training (level 1)

- It has been demonstrated that teaching women with SUI to contract their pelvic floor muscles just before and during an increase in intra-abdominal pressure is an effective treatment method.

Quality of the studies identified: A1 (Neumann et al., 2006).<sup>6</sup>

- It has been demonstrated that the success rate of the treatment can be improved by checking whether patients carry out the pelvic floor exercises correctly.

Quality of the studies identified: A1 (Haddow et al., 2005<sup>242</sup>).

The diagnostic process, more specifically the testing of the pelvic floor muscles, has to show whether and to what extent the patient is able to contract and relax their pelvic floor muscles effectively and purposefully, and whether the involuntary contraction associated with increased intra-abdominal pressure is effective.<sup>7</sup> If the patient persistently shows incorrect or ineffective contraction and relaxation of the pelvic floor muscles (in the sense of incorrect coordination, strength or timing), it may be useful to make use of feedback,<sup>243</sup> digital vaginal/anal palpation by the physical therapist or by the patient themselves,<sup>7</sup> or ultrasound imaging. If the patient is unable to contract their pelvic floor muscles or if these muscles are overactive, it might be useful to have the patient feel the contraction by means of electrostimulation, although there is as yet little evidence to support this.<sup>197</sup>

The main objective of pelvic floor muscle training is to achieve optimal pelvic floor function, or to attain a situation that approximates optimal function as closely as possible. This implies that the process of stopping involuntary loss of urine will be simple and quick for some patients, while others may not achieve complete remission of the problem.

If exercise therapy is indicated, and the patient has no specific preference for individual therapy, group therapy might be an option.<sup>235;244;245</sup> A study by Janssen et al.<sup>245</sup> found both methods to be equally effective, even at 9 months after the completion of the therapy. Research into factors that might predict the effect of group therapy is important, as it might help to correctly select those patients who will actually benefit from group therapy. If patients are highly motivated for therapy, their prognosis for partial or complete recovery is favorable. For these patients, training the pelvic floor muscles is an effective method to reduce involuntary loss of urine in SUI.<sup>7;197;216;246</sup>

A precondition for effective improvement through training is that the pelvic floor muscles are always contracted correctly, with reinforcement provided by a high-frequency, intensive, and prolonged training program.<sup>8;246;247</sup> Although there is as yet no definitive agreement about the most effective training program, in terms of the number, frequency, and intensity of the exercises, or about the minimum duration of such training programs,<sup>7;197;216</sup> there is increasing evidence from RCTs for the effectiveness of the pelvic floor muscle training program introduced by Bø et al., both for individual therapy (in the initial stages) and for group training sessions (in later stages).<sup>8;221;235-237;248</sup>

The evidence suggests that PFMT based on modern and accepted principles of training physiology is effective.<sup>197;221</sup> The results of five different RCTs show that a program with the following specifications and parameters is effective for the prevention and treatment of SUI in women: 8-12 voluntary maximal pelvic floor muscle contractions during 6-8 seconds, combined with 3-4 rapid pelvic floor contractions during 1-2 seconds. The quality of these contractions depends on their direction (inward and upward, as described above). They should be carried out at home 2-3 times a day, on 3-5 days a week. The individual training program is first carried out once a week at the physical therapist's treatment room, and then continued as group sessions for 6 months, of course only if the patient meets the requirements for group training.<sup>221;235-237;248</sup> One of the quality criteria for training programs is the dose-response relation. Different research studies have reported wide variations in the dosages of different training programs (in terms of type of exercise, frequency, duration, and intensity).<sup>197;216</sup> The

studies of SUI that were included in the Cochrane systematic review used interventions with durations ranging from 6 weeks to 6 months, with intensity (in the sense of the duration of one contraction) ranging from 3–40 seconds, and with the number of contractions per day ranging from 36 to over 200. The frequency of training sessions was nearly the same in all studies, viz. once a day.<sup>216</sup>

Bø et al.<sup>235</sup> showed that training sessions supervised by a physical therapist led to significantly better results than individual exercises at home. Their study combined individual instructions and teaching patients the correct way to contract by means of palpation of the pelvic floor, with 6 months of muscle strength training in groups. The participants were randomized into two groups. The first group engaged in an intensive training program consisting of a combination of 7 individual sessions supervised by a physical therapist, a 45-minute weekly group training program and 3 series of 8–12 maximal contractions a day. The other group followed the same program, except for the weekly intensive group sessions. The intensive training group had significantly better results, both as regards the increase in muscle strength and as regards the reduction of involuntary loss of urine. Sixty percent of the participants in the intensive group reported little or no involuntary urine loss after the program, compared to just 17% in the less intensive group. A significant reduction of the loss of urine, as measured by means of pad tests with standardized bladder content, was only found in the intensive group.

This study shows that a huge difference in results may be expected depending on the intensity and follow-up of the training program offered, and that little effect is to be expected if patients train without careful supervision or with insufficient intensity. Three other RCTs<sup>249–251</sup> and 1 non-randomized study<sup>127</sup> reported similar results of intensive versus less intensive training.

Dose-response relations have been found for all kinds of training regimes.<sup>252</sup> This means that one of the reasons for disappointing outcomes of physical therapy treatment in some clinical studies may be insufficient training stimulus and low dosage. If a low-dosage program is used in one of the arms of an RCT comparing its effect with that of other intervention methods, the effect of the PFMT can be expected to be smaller.

A PFMT exercise program consists of short and longer exercises, as type I as well as type II muscle fibers need to be trained using overload strategies. Type-II muscle fibers can be trained by having the patient perform powerful contractions (75–90% 1 RM) lasting 1–2 seconds, in 3–5 series with 8–12 repeats; type-I muscle fibers are trained by means of longer contractions (50% 1 RM) lasting 5–15 seconds, in 3–5 series of 10–50 repeats. In building up strength, it is important to first increase the amount of exercise, and increase the intensity later.

The therapist must be careful to prevent excessive overload. Improving the absolute strength and endurance of the pelvic floor muscles does not in itself guarantee the correct functioning of the continence mechanism.<sup>229</sup> The latter requires a development from isolated voluntary contractions to a fully automatic use of the pelvic floor, even during multiple complex activities in various initial postures.<sup>163</sup>

Although the literature pays little attention to functional pelvic floor training, most experiential experts regard functional training as an essential component of the training program.<sup>163;229</sup>

The effect of exercise therapy obviously depends on the patient's compliance. Any effect will depend on regular practice, at sufficient intensity and frequency. The more frequent the training<sup>253</sup> and the longer it is kept up,<sup>254</sup> the greater the chances of recovery from incontinence.

Exercises that the patient should do at home after being instructed by the pelvic physical therapist constitute an essential component of the training program. It is also essential that both the patient and the therapist are sufficiently motivated, if the PFMT is to be successful.<sup>216,243,246,255</sup>

#### **Conclusion about practicing and controlling functions (level 2)**

- It is plausible that the effect of training the pelvic floor muscles is partly determined by the training frequency and the duration of the training period.  
Quality of the evidence found : B (Glazener et al., 2001; Reilly et al., 2002).<sup>253;254</sup>

#### **Conclusion about practicing and controlling functions (level 4)**

- In the opinion of the guideline development team, the training program should be designed to be realistically feasible, in order to promote compliance. This means that it must be possible to integrate the exercises into everyday activities. The team recommends two or more supervised training sessions a week.\*

The effect of the training program is also partly determined by the presence of prognostic factors that unfavorably affect the course of the problem. The patient's physical fitness, degree of overweight, and comorbidities like diabetes mellitus or COPD have an adverse effect on the development and persistence of the SUI.

#### **Conclusion about reducing overweight (level 3)**

- It is plausible that reducing overweight by adopting a healthy lifestyle and engaging in exercise will contribute to the success of specific programs to train the pelvic floor muscles.  
Quality of the studies identified: B (Hunnskaar, 2008).<sup>256</sup>

#### **Conclusion about prognostic factors (level 4)**

- In the opinion of the guideline development team, improving the patient's general physical condition by means of exercise training will contribute to the success of specific programs to train the pelvic floor muscles.

The effect of a training program is partly determined by the extent to which patients actually comply with the program. Alewijnse et al. claimed that compliance is facilitated by intensive supervision during the therapy, by improving the patient's self-efficacy, by the use of 'reminders', by working according to guidelines and by giving the patient explicit feedback about the extent to which the therapeutic goals have been met.<sup>212</sup>

\* Haddow et al. (2005) already recommended this on the basis of expert opinion, and the guideline development team agrees with their view.<sup>242</sup>

Based on the above considerations, the guideline development team has formulated the following recommendation:

#### Frequency and performance of pelvic floor muscle training (PFMT)

The guideline development team recommends treating SUI by means of daily PFMT with sufficient intensity and duration, while paying attention to the correct performance of the exercises and integrating the exercises into activities of daily life.

### C.3.2 Training with the help of biofeedback

Biofeedback is defined as a group of experimental procedures using an external sensor to assess a bodily process, usually with the intention of altering the variable being measured.<sup>257</sup> Biofeedback is not a therapy in itself, but can be used in the treatment of patients with SUI to give them an indication of the activity of their pelvic floor muscles, at rest, in contraction and in relaxation, the strength of individual contractions of the pelvic floor muscles (EMG), the strength of the contracting pelvic floor muscles (pressure measurement) or the way in which certain muscles contract and the direction of contraction (ultrasound). Biofeedback for patients with SUI is only used in combination with pelvic floor muscle training. Training with the help of biofeedback has been studied in systematic reviews by Neuman et al.,<sup>6</sup> Hay-Smith,<sup>216</sup> and Berghmans<sup>7</sup> and the reviews by Bø et al.<sup>8</sup> and Wilson et al.<sup>197</sup> All reviews include results of a number of high-quality RCTs. The guideline development team evaluated the effect of biofeedback for incontinence in men due to prostatectomy on the basis of the Cochrane reviews by Moore et al.<sup>220</sup> and Hunter et al.<sup>44</sup>, as well as reviews by Van Kampen.<sup>128</sup>

These reviews show that a combination of PFMT with biofeedback is an effective therapy for patients with SUI, although the combination is no more effective than pelvic floor training alone (level 1).

#### Conclusions about biofeedback (level 1)

- It has been demonstrated that a combination of pelvic floor muscle training and biofeedback for the treatment of SUI is no more effective than pelvic floor muscle training alone. Quality of the studies identified: A1 (Neuman et al., 2006; Berghmans et al., 1998; Bø et al., 2007; Wilson et al., 2005; Hay-Smith et al., 2001; Hay-Smith et al., 2006; Dumoulin et al., 2008; Shamliyan et al., 2008).<sup>6-8;197;216-219</sup>
- It has been demonstrated that a combination of pelvic floor muscle training and biofeedback for the treatment of SUI in men after prostatectomy is no more effective than pelvic floor muscle training alone. Quality of the studies identified: A1 (Hunter et al., 2007; Van Kampen et al., 2007; Moore et al., 2001).<sup>44;128;220</sup>

#### Other considerations

Biofeedback is based on the principle of operant conditioning, in which a particular behavior is expected to be maintained after positive reinforcement and to disappear after negative reinforcement. Biofeedback refers to a range of audiovisual techniques that present information about the activity of striated muscles in the context of learning and controlling muscle functions. For instance,

biofeedback can be used to teach a patient with SUI to selectively contract their pelvic floor muscles. A sensor or electrode is introduced into the vagina or rectum, to record the vaginal or rectal pressure or the anti-electromyogram (EMG) signal of the sphincter muscle. The patient receives visual or acoustic information about the pressures measured and/or the EMG signals, enabling them to see what force is being generated by the pelvic floor muscles and whether this force has reached its maximum. The technique can also be used to visualize progress, which obviously motivates patients to keep exercising. Biofeedback is not a therapy in itself, but supports existing forms of therapy.

Recent research has investigated the use of extracorporeal ultrasonography to show patients with SUI whether they are producing the right type of lift (in an inward and upward direction) of the pelvic floor during contraction.<sup>258</sup> Dietz et al. used suprapubic external ultrasonography for this purpose.<sup>259</sup> They concluded that this form of biofeedback takes little time (an average of 5 minutes) and is effective as well as efficient, and as such is a useful strategy to teach patients to produce the right contractions. Ultrasonography can also be used to estimate the volume (thickness) of the pelvic floor. But this type of biofeedback cannot be used to measure muscle strength.<sup>149;259</sup> Further research will be needed to assess methodological aspects of this type of biofeedback, such as its validity and reliability.<sup>149</sup>

A combination of biofeedback and pelvic floor muscle training can be useful to reduce the involuntary loss of urine in patients with SUI.<sup>243</sup> Successful use of biofeedback very much depends on the physical therapist's knowledge and skills. The value of biofeedback as an add-on to PFMT is controversial.<sup>197;260</sup> Studies into the effects of various types of biofeedback in combination with PFMT have reported improvements to the incontinence ranging from 54–95%. Berghmans et al. concluded that PFMT with and without biofeedback are both effective modalities for the treatment of SUI, but that the value of adding biofeedback to PFMT lies only in the more rapid progress made in the early stages of the therapy.<sup>243</sup>

Mørkved et al. compared the results of a combination of PFMT and biofeedback for women with SUI (based on intravaginal pressure measurements for use at home and in the physical therapist's treatment room) with a similar program without biofeedback. Although a large percentage of the patients showed major improvement, and a significant reduction was found in involuntary loss of urine, the authors found no significant difference between the two groups at any of their assessments.<sup>237</sup> On the other hand, Aksac et al.<sup>261</sup> concluded that a combination of PFMT and biofeedback (based on digital palpation) yielded better results than PFMT alone, although both groups showed significant improvement of the SUI compared to an untreated control group. Patients who are insufficiently aware of their pelvic floor may well benefit from the addition of biofeedback to PFMT,<sup>7</sup> but this hypothesis needs to be further examined in a high-quality controlled clinical trial.<sup>8;197</sup> The long-term results of biofeedback also remain to be further investigated.

A review by the ICI made a distinction between biofeedback used only in the therapist's treatment room and biofeedback that is also used at home. The results and methodological quality of the studies included in this review indicate that nearly all studies had methodological shortcomings, but also that the currently available evidence does not suggest a difference between the effects of PFMT with and without biofeedback (at least in the patient sample investigated), whether it is performed at home or in the treatment room.<sup>197</sup>

### Conclusion about biofeedback (level 4)

- In the opinion of the guideline development team, combining pelvic floor muscle training with biofeedback in the early stages of treatment of SUI may be useful for persons with insufficient voluntary control over their pelvic floor, as it enables patients to find out sooner the correct way to contract their pelvic floor muscles.

### C.3.3 Training with the help of electrostimulation

The purpose of electrostimulation in the treatment of patients with SUI is to make the pelvic floor muscles contract, with the aim of achieving a training effect to ensure that the pelvic floor will provide sufficient support to prevent loss of urine during an increase in the intra-abdominal pressure.

The evaluation is based on systematic reviews by Berghmans et al.,<sup>7</sup> Neuman et al.,<sup>6</sup> and Berghmans et al.,<sup>262</sup> and the review by Wilson et al.<sup>197</sup> All reviews include results of a number of RCTs of sufficient methodological quality. The guideline development team evaluated the effect of electrostimulation for incontinence due to prostatectomy on the basis of the Cochrane reviews by Moore et al.<sup>220</sup> and Hunter et al.<sup>44</sup>, as well as reviews by Van Kampen.<sup>128</sup> These reviews show that there is insufficient evidence that electrostimulation alone is an effective treatment for patients with SUI (level 1) and also show that the addition of electrostimulation to pelvic floor muscle training offers no additional benefits for the treatment of patients with SUI (level 1).

### Conclusions about electrostimulation (level 1)

- It has been demonstrated that the addition of electrostimulation to pelvic floor muscle training for the treatment of patients with SUI offers no additional benefits compared to pelvic floor muscle training alone.  
Quality of the studies identified: A1 (Neumann et al., 2006; Berghmans et al., 1998; Wilson et al., 2005; Hay-Smith et al., 2001; Berghmans, 2007).<sup>6;7;197;216;262</sup>
- It has been demonstrated that the addition of electrostimulation to pelvic floor muscle training for the treatment of patients with SUI after prostatectomy offers no additional benefits compared to pelvic floor muscle training alone.  
Quality of the studies identified: A1 (Hunter et al., 2007; Van Kampen, 2007; Moore et al., 2001).<sup>44;128;220</sup>

### Other considerations

There are major inconsistencies between the various electrostimulation protocols, partly due to a lack of understanding of the physiological principles of electrostimulation and the way it could contribute to recovery from SUI in women.<sup>197</sup>

Patients whose pudendus nerve is intact and who find it hard to voluntarily contract their pelvic muscles may benefit from the use of electrostimulation to induce contractions in these muscles.<sup>263</sup> These contractions can be used for the re-education of inadequate pelvic floor muscles. Contraction of the levator ani muscle and the external urethral sphincter can also be brought about by direct stimulation of the efferent fibers of the n. pudendus. When combined with stimulation of the hypogastric nerve fibers, which activate periurethral smooth muscle, this may influence the urethral closure mechanism. In addition, stimulation of the efferent fibers of the n. pelvici appears to increase the intraluminal urethral pressure.

It is thought that electrostimulation may contribute to the conversion of fatigable into fatigue-resistant muscle fibers.<sup>238</sup> This view has not yet been substantiated, however.

Different forms of electrostimulation are distinguished in physical therapy, viz. brief maximal stimulation, which is usually performed at the physical therapist's treatment room, and prolonged, low-intensity electrostimulation, which can also be performed at home. Possible side-effects of electrostimulation include pain and tissue damage; electrostimulation is contra-indicated if patients use a pacemaker or are pregnant.<sup>264</sup>

One of the arguments for the use of electrostimulation in the treatment of SUI is that over 30% of women with SUI are unable to selectively contract their pelvic muscles.<sup>265</sup> Electrostimulation is thought to contribute to better awareness of what constitutes correct contraction. As such it provides an important initial cognitive step toward a functional training program to restore the physical condition of the pelvic floor.<sup>7;265</sup> Electrostimulation is the treatment of first choice for patients with SUI and dysfunctional pelvic floor muscles who do not have voluntary control.<sup>238;262;265</sup> An important point here is making the right choice from among the many relevant parameters, a choice which should lead to a satisfactory response of the pelvic floor muscles.

### Conclusions about electrostimulation (level 3)

- There are indications that the use of electrostimulation to treat patients with stress (urinary) incontinence can be beneficial if patients are unable to selectively contract their pelvic floor muscles.  
Quality of the studies identified: A2 (Berghmans et al., 1998; Berghmans et al., 2007)<sup>7;262</sup> and C (Bourcier et al., 1995; Bø & Maanum, 1996).<sup>238;265</sup>

Reported success rates of electrostimulation for SUI in the literature range from 37 to 92%.<sup>197</sup> However, these figures are mostly derived from studies without a control group, with low methodological quality.

There is as yet insufficient evidence for the effectiveness of electrostimulation compared to no treatment, placebo treatment, the use of vaginal cones or the use of estrogen supplementation for women with SUI. Nor does adding electrostimulation to PFMT yield better results than PFMT alone. Although definitive proof is still lacking, this group appears to benefit more from PFMT.<sup>262</sup>

Further research is required into the specific effectiveness of electrostimulation for SUI and into the best way to perform electrostimulation.<sup>7;8;265</sup> Neuman et al. concluded in their systematic review that adding electrostimulation to a home treatment program did not improve compliance.<sup>6</sup>

*Based on the above considerations, the guideline development team has formulated the following recommendation:*

#### Selective contraction of pelvic floor muscles

The guideline development team recommends combining pelvic floor muscle exercises with electrostimulation for the treatment of patients who are unable to voluntarily and/or selectively contract their pelvic floor muscles.

### C.3.4 Training with the help of vaginal cones

The goal of using vaginal cones is to train the pelvic floor muscles by contracting them to hold in place a weight inserted into the vagina. If the patient manages to hold a particular weight in place, it is then replaced by a slightly heavier weight.

The evaluation was based on systematic reviews by Neuman et al.,<sup>6</sup> Herbison et al.,<sup>266</sup> and Berghmans<sup>7</sup> and reviews by Bø et al.<sup>8</sup> and Wilson et al.<sup>197</sup> All reviews include results of a number of RCTs of sufficient methodological quality.

The reviews show that it remains unclear whether the use of vaginal cones to treat patients with SUI is more effective than no treatment (level 1), and that this treatment modality offers no demonstrable additional benefits compared to a combination of pelvic floor muscle training and electrostimulation (level 1). By contrast, the use of a combination of PFMT and vaginal cones in accordance with the general principles of strength training is effective (level 3). On the other hand, many women find training with vaginal cones difficult and uncomfortable (level 1).

#### Conclusion about training with vaginal cones (level 1)

- It remains unproven that training the pelvic floor muscles with vaginal cones alone is an effective treatment for SUI. Quality of the studies identified: A1 (Neumann et al., 2006; Berghmans et al., 1998; Wilson et al., 2005; Herbison et al., 2002)<sup>6,7,197,266</sup> and C (Bø et al., 2007).<sup>8</sup>

#### Conclusion about combining PFMT with vaginal cone training (level 3)

- There are indications that it may be useful to train the pelvic floor muscles using a combination of PFMT and vaginal cones in accordance with general principles of strength training. Quality of the studies identified: C (Bø et al., 2007).<sup>8</sup>

#### Other considerations

The use of vaginal cones can serve as an application in PFMT for women. The patient is given a set of vaginal cones, which are all the same size but have different weights. In the context of her exercise program, the patient inserts the selected cone intravaginally, above the level of the levatores muscle plate, using a standardized procedure, and then tries to hold the cone in place for up to 15 minutes by contracting her pelvic floor muscles.<sup>266</sup> If a positive result is obtained twice in a row, the training can be continued with the next heavier cone. Training based on this principle is thought to strengthen the pelvic floor muscles under simultaneous proprioceptive feedback.

A Cochrane review including studies of stress as well as mixed urinary incontinence concluded that training with vaginal cones is more effective than no treatment.<sup>266</sup>

There are currently 5 RCTs available comparing the results of PFMT with and without vaginal cones for the treatment of SUI.<sup>236,267-270</sup> Bø et al.<sup>236</sup> concluded that PFMT is better than training with cones, while 3 other studies found no difference, and Cammu and Van Nylén<sup>268</sup> reported that training with cones kept causing problems. The women found the training uncomfortable, and there were motivational problems. Bø et al. also doubted the theoretical basis of the treatment with vaginal cones.<sup>271</sup>

Further research is required to establish the value of vaginal cones for the treatment of SUI.<sup>197</sup> Training with vaginal cones might be more effective if the woman tries to keep the cone in place in

her vagina while at the same time trying to pull it out with her hand. If this is repeated 8–12 times, 3 times a day, it would be in accordance with the general training principles for PFMT described above.<sup>8</sup>

## D Preventing SUI

The evaluation below is based on the systematic reviews by Hay-Smith<sup>216</sup> and Haddow et al.,<sup>242</sup> the review by Wilson et al.<sup>197</sup> and the studies by Brown et al.<sup>272</sup> and Subak et al.<sup>104</sup> on the effect of treating overweight. The guideline development team evaluated the effect of pelvic floor muscle training (PFMT) for incontinence in men due to prostatectomy on the basis of the Cochrane reviews by Moore et al.,<sup>220</sup> and Hunter et al.,<sup>44</sup> as well as reviews by Van Kampen.<sup>128</sup>

These reviews show that weight loss reduces SUI in women who are obese (level 2). They also show that weight loss reduces the problems of SUI in women who are moderately overweight (level 1). Women who train their pelvic floor are at lower risk of developing perinatal and postnatal SUI (level 1). There have been inconsistent findings with regard to the effect of pre- and postoperative pelvic floor muscle training for men undergoing prostatectomy. Two studies reported a favorable effect, while a third study found the opposite.

#### Conclusions about the prevention of SUI (level 1)

- It has been demonstrated that weight loss reduces the risk of SUI in women who are overweight. Quality of the studies identified: A1 (Wilson et al., 2005; Hay-Smith et al., 2001; Haddow et al., 2005)<sup>197,216,242</sup> and A2 (Subak et al., 2005; Brown et al., 2006).<sup>104,272</sup>
- It has been demonstrated that supervised pelvic floor muscle training of sufficient intensity reduces the postnatal risk of SUI in pregnant women (primipara). Quality of the studies identified: A1 (Bø et al., 2007; Wilson et al., 2005; Hay-Smith et al., 2001; Haddow et al., 2005).<sup>8,197,216,242</sup>
- There is conflicting evidence that pre- and postoperative pelvic floor muscle training is an effective method to prevent SUI in men who have to undergo prostatectomy. Quality of the studies identified: A1 (Moore et al., 2001; Hunter et al., 2007)<sup>220,44</sup> and A2 (Van Kampen et al., 2007).<sup>128</sup>

#### Other considerations

Preventing pelvic floor muscle insufficiency is an important goal of pelvic floor education (and re-education).<sup>204,248</sup> Identifying the target population (i.e. those who would benefit from preventive measures) requires identification of etiological factors for the development of pelvic floor muscle dysfunction.

A number of intrinsic and extrinsic etiological factors are associated with pelvic floor problems. Intrinsic etiological factors include hereditary factors such as weak supportive tissues, excessive overweight and prolapse.<sup>197</sup> Extrinsic etiological factors include pregnancy, vaginal delivery, certain work- and sports-related activities associated with increased intra-abdominal pressure, and chronic overtraining during defecation.<sup>197</sup> Certain exercise programs which involve increased abdominal strain can also contribute to pelvic floor dysfunctions. It remains unclear how strong the unfavorable influence of each of these factors on the pelvic floor is.<sup>197,204</sup>

In practice, it turns out to be difficult to identify the target popula-

tion for prevention. One of the reasons is that people with a pelvic floor insufficiency often do not perceive this to be a problem, and may perceive little subjective discomfort from mild forms of SUI. This means that a large part of this population probably does not turn to a professional care provider like their family doctor. If the complaints worsen later, the patients often have other symptoms as well, such as frequent micturition, increased urgency and nocturia. Frequent use of absorptive products by women may give rise to chronic vulvitis.

Contraction of the pelvic floor muscles may stabilize the bladder neck or close the urethra at moments of increased intra-abdominal pressure.<sup>53;228</sup> These concomitant symptoms can be influenced by increasing the strength and improving the voluntary control of the pelvic floor muscles before SUI arises. Although pelvic floor education improves a patient's control over their pelvic floor muscles and the strength of these muscles, little high-quality research has been done into the effectiveness of SUI prevention.<sup>197;216</sup> Studies by Wall and Davidson<sup>202</sup> and Morkved et al.<sup>248</sup> concluded that PFMT is an effective method to prevent urinary incontinence. PFMT during pregnancy may reduce the birth trauma, speed up postpartum recovery and improve the long-term functioning of the pelvic floor muscles.<sup>202,248</sup>

Recent years have seen the publication of a PhD thesis<sup>273</sup> and a number of articles on the prevention of incontinence that underlined the effectiveness of PFMT during pregnancy<sup>248</sup> as well as after pregnancy,<sup>248;254;274-276</sup> especially for women at increased risk of postpartum urinary incontinence. It should be mentioned, however, that only Reilly et al.<sup>254</sup> actually investigated real primary/secondary prevention of incontinence, as the other two studies included women with and without incontinence.

Woldringh et al.<sup>277</sup> undertook an RCT among 264 women who were at increased risk of SUI, as they were already incontinent during pregnancy, to study the short- and long-term effects of PFMT during pregnancy, with 112 women engaging in PFMT and 152 being given usual care. The treatment included only 3 sessions, combining PFMT with written instructions, between the 23rd and 30th weeks of pregnancy, and 1 session 6 weeks after delivery. Six months after the delivery, no difference in effect was found between the two groups, although the severity of incontinence had decreased considerably. This finding may have been affected by the dose-response relationship, in view of the low frequency and intensity of the intervention.

There is a need for more research into the prevention of SUI, in order to explore options for reducing the medical, paramedical and other costs of therapeutic interventions for SUI, and to try and improve the quality of life of patients with SUI.<sup>7;197;216;216;248</sup>

An RCT by Burgio et al. found that a preoperative biofeedback-assisted practice session, followed by a home-based exercise program, speeded up recovery from incontinence and reduced its severity after radical prostatectomy.<sup>278</sup>

Parekh et al. found that PFMT for men prior to radical prostatectomy helped to speed up the patient's return to continence. The exercise therapy had less effect in patients with more severe incontinence.<sup>279</sup> Exercise therapy does not appear to affect the eventual prognosis, as the percentage of men who were continent after 1 year was the same in the experimental and control groups. The exercise therapy does not determine whether a man becomes continent again, but only shortens the time until continence is regained.<sup>279</sup>

### Conclusion about promoting postoperative recovery after prostatectomy (level 2)

- It has been demonstrated that preoperative pelvic floor muscle training speeds up the return to continence of men undergoing prostatectomy. Quality of the studies identified: A2 (Burgio et al., 2006; Parekh et al., 2003).<sup>278;279</sup>

*Based on the above considerations, the guideline development team has formulated the following recommendation:*

#### **Pelvic floor muscle training to promote postoperative recovery after prostatectomy**

The guideline development team recommends preoperative pelvic floor muscle training for men who have to undergo prostatectomy.

## E Reporting

In the context of SUI, reporting involves the systematic and methodical recording, documenting, and storing of relevant data on the screening process (if applicable), the presentation and referral by a doctor, the physical therapist's diagnostic process, the conclusion drawn from the diagnostic process, the decision whether to treat the patient, the treatment plan, the therapy, the evaluation of the therapy and the report to the doctor holding the patient's file or the referring doctor. The goal of reporting is to record all the facts from the moment of presentation to that of reporting back to the referring doctor, to show the choices and decisions made during the various stages of the methodical approach. The first KNGF guideline for reporting on physical therapy (Fysiotherapeutische Verslaglegging) was developed in 1993.<sup>280</sup> A fully revised version was published in 2011.<sup>281</sup>

## F Legal status of the guidelines

Guidelines are not statutory regulations. They offer knowledge and recommendations based on the results of scientific research, which care providers must use to provide high-quality care. Since the recommendations are mainly based on the 'average' patient, care providers must use their professional judgment to decide when to deviate from the guidelines if that is required in a particular patient's situation. Any deviations from the recommendations in the guidelines must be justified and documented.<sup>25;282</sup> This implies that the responsibility for the interventions remains that of the individual physical therapist.

## G Guideline revisions

This KNGF guideline offers preliminary answers to clinical questions on diagnostics, treatment, and prevention for adult patients with SUI. New developments that could improve physical therapy care in this group of patients may change the current views described in these guidelines. The methodological recommendations for developing and implementing guidelines state that any guideline should be revised within 3 to 5 years after the original publication.<sup>25;282</sup> This implies that KNGF, together with the guideline development team, will decide in 2016 at the latest whether this guideline is still up to date. If necessary, a new guideline development team will be assembled to revise the guideline. The current

guideline will cease to be valid if there are new developments that necessitate a program of revisions. Before any revision is carried out, the document offering methodological recommendations for guideline development and implementation will also be updated on the basis of any new insights and any cooperative agreements between the different groups of guideline developers in the Netherlands. The consensus products developed by the Dutch *Evidence-Based Richtlijnen Overleg* (evidence-based guidelines platform; EBRO platform), under the auspices of the Dutch Institute for Healthcare Improvement (CBO), will also be included in any updated version of the method. Important improvements include uniform and transparent methods to determine the level of evidence and the practice recommendations derived from them.

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## I References

- Berghmans LCM, Bernards ATM, Bluysen AMWL, Gruppings-Morel MHM, Hendriks HJM, Jong-van Ierland MJE de, et al. KNGF-richtlijn. Stress urine-incontinentie. Amersfoort: KNGF; 1998.
- Lagro-Jansen ALM, Breedveldt Boer HP, Dongen JJAM van, Lemain TJJ, Teunissen D, Pinxteren B van. NHG-Standaard Incontinentie voor urine. Huisarts Wet. 2006;49(10):501-10.
- Venema PL, Geelen JM van, Kil PJM, Capelle JW van, Tjon Pian Gi NP, Ridder D de, et al. Stressincontinentie bij de vrouw. Utrecht: Nederlandse Vereniging voor Urologie; 2003.
- Groenendijk AG, Vervest HAM, Vaart CH van der, Geelen JM van. NVOG-Richtlijn nr.:55. Urine-incontinentie. Utrecht: Nederlandse Vereniging voor Obstetrie en Gynaecologie; 2004.
- Faber E, Custers JWH, Berghmans LCM, Dongen JJAM van, Groenings COM van, Gruppings-Morel MHM, et al. Landelijke Eerstelijns Samenwerkings Afspraak Incontinentie voor urine. Huisarts Wet. 2007;50(5):S9-S12.
- Neumann PB, Grimmer KA, Deenadayalan Y. Pelvic floor muscle training and adjunctive therapies for the treatment of stress urinary incontinence in women: a systematic review. BMC Womens Health. 2006 Jun 28;6:11.
- Berghmans LCM, Hendriks HJ, Bo K, Hay-Smith EJ, Bie RA de, Waalwijk van Doorn ES van. Conservative treatment of stress urinary incontinence in women: a systematic review of randomized clinical trials. Br J Urol. 1998 Aug;82(2):181-91.
- Bo K, Berghmans B, Møkvad S, Kampen M van. Evidence based physical therapy for the pelvic floor. Bridging science and clinical practice. Edinburgh: Butterworth Heinemann Elsevier; 2007.
- Incontinence 3rd International Consultation on Incontinence. Plymouth, UK: Health Publication Ltd; 2005.
- Wet op de Geneeskundige Behandelingsovereenkomst (WGBO). Staatsblad. 1994;838.
- BIG. Wet op de beroepen in de Individuele Gezondheidszorg. (Wet van 11 november 1993). Staatsblad. 1993;655.
- Koninklijk Nederlands Genootschap voor Fysiotherapie (KNGF). Brochure voorbehouden handelingen en bijzondere handelingen. Amersfoort: KNGF; 2007.
- Beroeps Competentie Profiel (BCP) Bekkenfysiotherapeut. 2006. Report No.: 0301.
- KNGF. Mededelingen van het Algemeen Bestuur KNGF. FysioPraxis. 2006.
- Koninklijk Nederlands Genootschap voor Fysiotherapie (KNGF). Raamwerk voor het schrijven van een werkplan 'Fysiotherapeutische behandeling in groepsverband'. Amersfoort: KNGF; 1996.
- Haylen BT, Ridder D de, Freeman RM, Swift SE, Berghmans B, Lee J, et al. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. Neurourol Urodyn. 2010;29(1):4-20.
- Abrams P, Artibani W, Cardozo L, Dmochowski RR, Kerrebroeck P van, Sand PK. Reviewing the ICS 2002 Terminology Report: The Ongoing Debate. Neurourol Urodyn. 2006;25:293.
- Brittain K, Perry S, Williams K. Triggers that prompt people with urinary symptoms to seek help. Br J Nurs. 2001 Jan 25;10(2):74-6, 78, 80.
- Scottisch Intercollegial Guideline Network. Management of urinary incontinence in primary care. Edinburgh: Royal College of Physicians; 2004. Report No.: 79.
- Engstrom G, Henningsohn L, Steineck G, Leppert J. Self-assessed health, sadness and happiness in relation to the total burden of symptoms from the lower urinary tract. BJU Int. 2005 Apr;95(6):810-5.
- Milsom I, Ekelund P, Molander U, Arvidsson L, Areskoug B. The influence of age, parity, oral contraception, hysterectomy and menopause on the prevalence of urinary incontinence in women. J Urol. 1993 Jun;149(6):1459-62.
- Melville JL, Walker E, Katon W, Lentz G, Miller J, Fenner D. Prevalence of comorbid psychiatric illness and its impact on symptom perception, quality of life, and functional status in women with urinary incontinence. Am J Obstet Gynecol. 2002 Jul;187(1):80-7.
- Fultz NH, Burgio K, Diokno AC, Kinchen KS, Obenchain R, Bump RC. Burden of stress urinary incontinence for community-dwelling women. Am J Obstet Gynecol. 2003 Nov;189(5):1275-82.
- WHO FIC Collaborating Centre in the Netherlands RB. Nederlandse vertaling van de WHO-publicatie: International Classification of Functioning, Disability and Health: ICF, Geneva 2001. Houten: Bohn Stafleu van Loghum; 2002.
- Hendriks HJM, Ettekoven H van, Reitsma E, Verhoeven ALJ, Wees PJ van der. Methode voor centrale richtlijnontwikkeling en implementatie in de fysiotherapie. Amersfoort: KNGF/NPI/CBO; 1998.
- Hendriks HJM, Ettekoven H van, Bekkering GE, Verhoeven ALJ. Implementatie van KNGF-richtlijnen. FysioPraxis. 2000;9:9-13.
- van der Wees PJ, Hendriks EJ, Jansen MJ, Beers H van, Bie RA de, Dekker J. Adherence to physiotherapy clinical guideline acute ankle injury and determinants of adherence: a cohort study. BMC Musculoskelet Disord. 2007 May 22;8:45.
- van der Wees PJ, Hendriks HJM, Helldoorn M, Custers JW, Bie RA de. Methode voor ontwikkeling, implementatie en bijstelling van KNGF-richtlijnen. Methode versie 2.5. Amersfoort/Maastricht: KNGF; 2007.



29. Verkerk K, Veenendaal H van, Severens JL, Hendriks EJ, Burgers JS. Considered judgement in evidence-based guideline development. *Int J Qual Health Care*. 2006 Oct;18(5):365-9.
30. CBO. Evidence-based Richtlijnontwikkeling. Handleiding voor werkgroep-leden. Utrecht: Kwaliteitsinstituut voor de Gezondheidszorg CBO; 2007.
31. Teunissen TA, Bosch WJ van den, Hoogen HJ van den, Lagro-Janssen AL. Prevalence of urinary, fecal and double incontinence in the elderly living at home. *Int Urogynecol J Pelvic Floor Dysfunct*. 2004 Jan;15(1):10-3.
32. van der Linden MW, Westert GP, Bakker DH de, Schellevis FG. Tweede Nationale Studie naar ziekten en verrichtingen in de huisartspraktijk. Klachten en aandoeningen in de bevolking en in de huisartspraktijk. Utrecht/Bilthoven: NIVEL/RIVM; 2004.
33. van den Muijsenbergh ME, Lagro-Janssen TA. Urinary incontinence in Moroccan and Turkish women: a qualitative study on impact and preferences for treatment. *Br J Gen Pract*. 2006 Dec;56(533):945-9.
34. Sandvik H, Seim A, Vanvik A, Hunnskaar S. A severity index for epidemiological surveys of female urinary incontinence: comparison with 48-hour pad-weighting tests. *NeuroUrol Urodyn*. 2000;19(2):137-45.
35. Morrill M, Lukacz ES, Lawrence JM, Nager CW, Contreras R, Lubner KM. Seeking healthcare for pelvic floor disorders: a population-based study. *Am J Obstet Gynecol*. 2007 Jul;197(1):86.
36. CVZ. Attentie voor incontinentie. College voor zorgverzekeringen; 2006.
37. Hannestad YS, Rortveit G, Sandvik H, Hunnskaar S. A community-based epidemiological survey of female urinary incontinence: the Norwegian EPINCONT study. *Epidemiology of Incontinence in the County of Nord-Trøndelag*. *J Clin Epidemiol*. 2000 Nov;53(11):1150-7.
38. Hunnskaar S, Burgio K, Clark A, Lapitan MC, Nelson R, Sillén U, et al. Epidemiology of urinary and faecal incontinence and pelvic organ prolaps. In: Abrams P, Cardozo L, Khoury R, Wein A, editors. *Incontinence 3rd International Consultation on Incontinence*. Plymouth, UK: Health Publication Ltd; 2005. p. 255-312.
39. Slieker-ten Hove MC, Pool-Goudzwaard AL, Eijkemans MJ, Steegers-Theunissen RP, Burger CW, Vierhout ME. Prevalence of double incontinence, risks and influence on quality of life in a general female population. *NeuroUrol Urodyn*. 2010 Apr;29(4):545-50.
40. van der Vaart CH, Leeuw JR de, Roovers JP, Heintz AP. [The influence of urinary incontinence on quality of life of community-dwelling, 45-70 year old Dutch women]. *Ned Tijdschr Geneesk*. 2000 May 6;144(19):894-7.
41. Samuelsson EC, Victor FT, Svardsudd KF. Five-year incidence and remission rates of female urinary incontinence in a Swedish population less than 65 years old. *Am J Obstet Gynecol*. 2000 Sep;183(3):568-74.
42. Dorey G. Male patients with lower urinary tract symptoms. 1: Assessment. *Br J Nurs*. 2000 Apr 27;9(8):497-501.
43. Peyromaure M, Ravery V, Boccon-Gibod L. The management of stress urinary incontinence after radical prostatectomy. *BJU Int*. 2002 Jul;90(2):155-61.
44. Hunter KF, Glazener CM, Moore KN. Conservative management for post-prostatectomy urinary incontinence. *Cochrane Database Syst Rev*. 2007 Apr 18;(2):CD001843.
45. Maral I, Ozkardes H, Peskircioglu L, Bumin MA. Prevalence of stress urinary incontinence in both sexes at or after age 15 years: a cross-sectional study. *J Urol*. 2001 Feb;165(2):408-12.
46. Donnellan SM, Duncan HJ, MacGregor RJ, Russell JM. Prospective assessment of incontinence after radical retropubic prostatectomy: objective and subjective analysis. *Urology*. 1997 Feb;49(2):225-30.
47. McCammon KA, Kolm P, Main B, Schellhammer PF. Comparative quality-of-life analysis after radical prostatectomy or external beam radiation for localized prostate cancer. *Urology*. 1999 Sep;54(3):509-16.
48. Van Kampen M, Weerdt W de, Poppel H van, Feys H, Castell CA, Stragier J, et al. Prediction of urinary continence following radical prostatectomy. *Urol Int*. 1998;60(2):80-4.
49. Grise P, Thurman S. Urinary incontinence following treatment of localized prostate cancer. *Cancer Control*. 2001 Nov;8(6):532-9.
50. College voor zorgverzekeringen (CVZ). GIPeilingen 2007 Genees- en hulpmiddelen informatie project. *Rol Int* 2008 nr. 29 (augustus 2008). Available from: [http://www.cvz.nl/resources/GIP%2029\\_tcm28-26435.pdf](http://www.cvz.nl/resources/GIP%2029_tcm28-26435.pdf)
51. Ashton-Miller JA, Howard D, DeLancey JO. The functional anatomy of the female pelvic floor and stress continence control system. *Scand J Urol Nephrol Suppl*. 2001;(207):1-7.
52. de Boer PW, Vereecken RL, Voogt HJ. *Urologie*. Utrecht: Bunge; 1987.
53. Miller JM, Perucchini D, Carchidi LT, DeLancey JO, Ashton-Miller J. Pelvic floor muscle contraction during a cough and decreased vesical neck mobility. *Obstet Gynecol*. 2001 Feb;97(2):255-60.
54. van Loenen NT, Vierhout ME. Augmentation of urethral pressure profile by voluntary pelvic floor contraction. *Int Urogynecol J Pelvic Floor Dysfunct*. 1997;8(5):284-7.
55. DeLancey JO. Why do women have stress urinary incontinence? *NeuroUrol Urodyn*. 2010;29 Suppl 1:S13-7.
56. Mostwin J, Bourcier AP, Haab F, Koelbl H, Rao S, Resnick NM, et al. Pathophysiology of urinary and faecal incontinence and pelvic organ prolaps. In: Abrams P, Cardozo L, Khoury R, Wein A, editors. *Incontinence 3rd International Consultation on Incontinence*. Plymouth, UK: Health Publication Ltd; 2005. p. 423-84.
57. Schafer W. Some biomechanical aspects of continence function. *Scand J Urol Nephrol Suppl*. 2001;(207):44-60.
58. Yucel S, Baskin LS. An anatomical description of the male and female urethral sphincter complex. *J Urol*. 2004 May;171(5):1890-7.
59. Strasser H, Klima G, Poisel S, Horninger W, Bartsch G. Anatomy and innervation of the rhabdosphincter of the male urethra. *Prostate*. 1996 Jan;28(1):24-31.
60. Gosling JA, Dixon JS. Structural changes associated with obstruction of the urinary tract: A comparison between upper and lower systems. *Prog Clin Biol Res*. 1981;78:283-4.
61. Elbadawi A, Mathews R, Light JK, Wheeler TM. Immunohistochemical and ultrastructural study of rhabdosphincter component of the prostatic capsule. *J Urol*. 1997 Nov;158(5):1819-28.
62. Myers RP, Cahill DR, Kay PA, Camp JJ, Devine RM, King BF, et al. Pubopereineales: muscular boundaries of the male urogenital hiatus in 3D from magnetic resonance imaging. *J Urol*. 2000 Oct;164(4):1412-5.
63. Barbic M, Kralj B, Cör A. Compliance of the bladder neck supporting structures: importance of activity pattern of levator ani muscle and content of elastic fibers of endopelvic fascia. *NeuroUrol Urodyn*. 2003;22(4):269-76.
64. Dolan LM, Hosker GL, Mallett VT, Allen RE, Smith AR. Stress incontinence and pelvic floor neurophysiology 15 years after the first delivery. *BJOG*. 2003 Dec;110(12):1107-14.
65. Arrue M, Ibanez L, Paredes J, Murgiondo A, Belar M, Sarasqueta C, et al. Stress urinary incontinence six months after first vaginal delivery. *Eur J Obstet Gynecol Reprod Biol*. 2010 Jun;150(2):210-4.
66. Eftekhar T, Hajibaratali B, Ramezanzadeh F, Shariat M. Postpartum evaluation of stress urinary incontinence among primiparas. *Int J Gynaecol Obstet*. 2006 Aug;94(2):114-8.
67. Ekstrom A, Altman D, Wiklund I, Larsson C, Andolf E. Planned cesarean section versus planned vaginal delivery: comparison of lower urinary tract symptoms. *Int Urogynecol J Pelvic Floor Dysfunct*. 2008 Apr;19(4):459-65.

68. King JK, Freeman RM. Is antenatal bladder neck mobility a risk factor for postpartum stress incontinence? *Br J Obstet Gynaecol.* 1998 Dec;105(12):1300-7.
69. Meyer S, Schreyer A, Grandi P de, Hohlfield P. The effects of birth on urinary continence mechanisms and other pelvic-floor characteristics. *Obstet Gynecol.* 1998 Oct;92(4 Pt 1):613-8.
70. Meyer S, Hohlfield P, Ahtari C, Russolo A, Grandi P de. Birth trauma: short and long term effects of forceps delivery compared with spontaneous delivery on various pelvic floor parameters. *BJOG.* 2000 Nov;107(11):1360-5.
71. Viktrup L, Lose G, Rolff M, Barfoed K. The symptom of stress incontinence caused by pregnancy or delivery in primiparas. *Obstet Gynecol.* 1992 Jun;79(6):945-9.
72. Viktrup L, Lose G. The risk of stress incontinence 5 years after first delivery. *Am J Obstet Gynecol.* 2001 Jul;185(1):82-7.
73. Viktrup L, Rortveit G, Lose G. Risk of stress urinary incontinence twelve years after the first pregnancy and delivery. *Obstet Gynecol.* 2006 Aug;108(2):248-54.
74. Dimpfl T, Hesse U, Schussler B. Incidence and cause of postpartum urinary stress incontinence. *Eur J Obstet Gynecol Reprod Biol.* 1992 Jan 9;43(1):29-33.
75. Eason E, Labrecque M, Marcoux S, Mondor M. Effects of carrying a pregnancy and of method of delivery on urinary incontinence: a prospective cohort study. *BMC Pregnancy Childbirth.* 2004 Feb;19;4(1):4.
76. Groutz A, Fait G, Lessing JB, David MP, Wolman I, Jaffa A, et al. Incidence and obstetric risk factors of postpartum anal incontinence. *Scand J Gastroenterol.* 1999 Mar;34(3):315-8.
77. Herrmann V, Scarpa K, Palma PC, Riccetto CZ. Stress urinary incontinence 3 years after pregnancy: correlation to mode of delivery and parity. *Int Urogynecol J Pelvic Floor Dysfunct.* 2009 Mar;20(3):281-8.
78. Mason L, Glenn S, Walton I, Appleton C. The prevalence of stress incontinence during pregnancy and following delivery. *Midwifery.* 1999 Jun;15(2):120-8.
79. Lewicky-Gaupp C, Cao DC, Culbertson S. Urinary and anal incontinence in African American teenaged gravidas during pregnancy and the puerperium. *J Pediatr Adolesc Gynecol.* 2008 Feb;21(1):21-6.
80. Altman D, Ekstrom A, Gustafsson C, Lopez A, Falconer C, Zetterstrom J. Risk of urinary incontinence after childbirth: a 10-year prospective cohort study. *Obstet Gynecol.* 2006 Oct;108(4):873-8.
81. Arya LA, Jackson ND, Myers DL, Verma A. Risk of new-onset urinary incontinence after forceps and vacuum delivery in primiparous women. *Am J Obstet Gynecol.* 2001 Dec;185(6):1318-23.
82. van Brummen HJ, Bruinse HW, Pol G van de, Heintz AP, Vaart CH van der. The effect of vaginal and cesarean delivery on lower urinary tract symptoms: what makes the difference? *Int Urogynecol J Pelvic Floor Dysfunct.* 2007 Feb;18(2):133-9.
83. Yip SK, Sahota D, Chang A, Chung T. Effect of one interval vaginal delivery on the prevalence of stress urinary incontinence: a prospective cohort study. *Neurourol Urodyn.* 2003;22(6):558-62.
84. Baydock SA, Flood C, Schulz JA, MacDonald D, Esau D, Jones S, et al. Prevalence and risk factors for urinary and fecal incontinence four months after vaginal delivery. *J Obstet Gynaecol Can.* 2009 Jan;31(1):36-41.
85. Benassi L, Bocchialini E, Bertelli M, Kaihura CT, Ricci L, Siliprandi V. Risk of genital prolapse and urinary incontinence due to pregnancy and delivery. A prospective study. *Minerva Ginecol.* 2002 Aug;54(4):317-24.
86. Torrisi G, Sampugnaro EG, Pappalardo EM, D'Urso E, Vecchio M, Mazza A. Postpartum urinary stress incontinence: analysis of the associated risk factors and neurophysiological tests. *Minerva Ginecol.* 2007 Oct;59(5):491-8.
87. Krue S, Jensen H, Agger AO, Rasmussen KL. The influence of infant birth weight on post partum stress incontinence in obese women. *Arch Gynecol Obstet.* 1997;259(3):143-5.
88. Kristiansson P, Samuelsson E, Schoultz B von, Svardsudd K. Reproductive hormones and stress urinary incontinence in pregnancy. *Acta Obstet Gynecol Scand.* 2001 Dec;80(12):1125-30.
89. Townsend MK, Curhan GC, Resnick NM, Grodstein F. Oral contraceptive use and incident urinary incontinence in premenopausal women. *J Urol.* 2009 May;181(5):2170-5.
90. Altman D, Lopez A, Falconer C, Zetterstrom J. The impact of hysterectomy on lower urinary tract symptoms. *Int Urogynecol J Pelvic Floor Dysfunct.* 2003 Dec;14(6):418-23.
91. Engh MA, Otterlind L, Stjernedahl JH, Lofgren M. Hysterectomy and incontinence: a study from the Swedish national register for gynecological surgery. *Acta Obstet Gynecol Scand.* 2006;85(5):614-8.
92. Gustafsson C, Ekstrom A, Brismar S, Altman D. Urinary incontinence after hysterectomy – three-year observational study. *Urology.* 2006 Oct;68(4):769-74.
93. Heliövaara-Peippo S, Halmesmaki K, Hurskainen R, Teperi J, Grenman S, Kivela A, et al. The effect of hysterectomy or levonorgestrel-releasing intrauterine system on lower urinary tract symptoms: a 10-year follow-up study of a randomised trial. *BJOG.* 2010 Apr;117(5):602-9.
94. Hendrix SL, Cochrane BB, Nygaard IE, Handa VL, Barnabei VM, Iglesia C, et al. Effects of estrogen with and without progestin on urinary incontinence. *JAMA.* 2005 Feb 23;293(8):935-48.
95. Waetjen LE, Ye J, Feng WY, Johnson WO, Greendale GA, Sampsel CM, et al. Association between menopausal transition stages and developing urinary incontinence. *Obstet Gynecol.* 2009 Nov;114(5):989-98.
96. Kuh D, Cardozo L, Hardy R. Urinary incontinence in middle aged women: childhood enuresis and other lifetime risk factors in a British prospective cohort. *J Epidemiol Community Health.* 1999 Aug;53(8):453-8.
97. McGrother CW, Donaldson MM, Hayward T, Matthews R, Dallosso HM, Hyde C. Urinary storage symptoms and comorbidities: a prospective population cohort study in middle-aged and older women. *Age Ageing.* 2006 Jan;35(1):16-24.
98. Waetjen LE, Liao S, Johnson WO, Sampsel CM, Sternfield B, Harlow SD, et al. Factors associated with prevalent and incident urinary incontinence in a cohort of midlife women: a longitudinal analysis of data: study of women's health across the nation. *Am J Epidemiol.* 2007 Feb 1;165(3):309-18.
99. Townsend MK, Curhan GC, Resnick NM, Grodstein F. The incidence of urinary incontinence across Asian, black, and white women in the United States. *Am J Obstet Gynecol.* 2010 Apr;202(4):378-7.
100. Mishra GD, Hardy R, Cardozo L, Kuh D. Body weight through adult life and risk of urinary incontinence in middle-aged women: results from a British prospective cohort. *Int J Obes (Lond).* 2008 Sep;32(9):1415-22.
101. Townsend MK, Curhan GC, Resnick NM, Grodstein F. BMI, waist circumference, and incident urinary incontinence in older women. *Obesity (Silver Spring).* 2008 Apr;16(4):881-6.
102. Townsend MK, Danforth KN, Rosner B, Curhan GC, Resnick NM, Grodstein F. Body mass index, weight gain, and incident urinary incontinence in middle-aged women. *Obstet Gynecol.* 2007 Aug;110(2 Pt 1):346-53.
103. Deitel M, Stone E, Kassam HA, Wilk EJ, Sutherland DJ. Gynecologic-obstetric changes after loss of massive excess weight following bariatric surgery. *J Am Coll Nutr.* 1988 Apr;7(2):147-53.
104. Subak LL, Whitcomb E, Shen H, Saxton J, Vittinghoff E, Brown JS. Weight loss: a novel and effective treatment for urinary incontinence. *J Urol.* 2005 Jul;174(1):190-5.

105. Danforth KN, Townsend MK, Curhan GC, Resnick NM, Grodstein F. Type 2 diabetes mellitus and risk of stress, urge and mixed urinary incontinence. *J Urol*. 2009 Jan;181(1):193-7.
106. Dallosso HM, McGrother CW, Matthews RJ, Donaldson MM. The association of diet and other lifestyle factors with overactive bladder and stress incontinence: a longitudinal study in women. *BJU Int*. 2003 Jul;92(1):69-77.
107. Dallosso H, Matthews R, McGrother C, Donaldson M. Diet as a risk factor for the development of stress urinary incontinence: a longitudinal study in women. *Eur J Clin Nutr*. 2004 Jun;58(6):920-6.
108. Danforth KN, Shah AD, Townsend MK, Lifford KL, Curhan GC, Resnick NM, et al. Physical activity and urinary incontinence among healthy, older women. *Obstet Gynecol*. 2007 Mar;109(3):721-7.
109. Townsend MK, Danforth KN, Rosner B, Curhan GC, Resnick NM, Grodstein F. Physical activity and incident urinary incontinence in middle-aged women. *J Urol*. 2008 Mar;179(3):1012-6.
110. Brown JS, Grady D, Ouslander JG, Herzog AR, Varner RE, Posner SF. Prevalence of urinary incontinence and associated risk factors in postmenopausal women. Heart & Estrogen/Progestin Replacement Study (HERS) Research Group. *Obstet Gynecol*. 1999 Jul;94(1):66-70.
111. Palmer MH. Postprostatectomy incontinence: the magnitude of the problem. *J Wound Ostomy Continence Nurs*. 2000 May;27(3):129-37.
112. Van Kampen M, Weerd W de, Poppel H van, Baert L. Urinary incontinence following transurethral, transvesical and radical prostatectomy. Retrospective study of 489 patients. *Acta Urol Belg*. 1997 Dec;65(4):1-7.
113. Ficazzola MA, Nitti VW. The etiology of post-radical prostatectomy incontinence and correlation of symptoms with urodynamic findings. *J Urol*. 1998 Oct;160(4):1317-20.
114. Groutz A, Blaivas JG, Chaikin DC, Weiss JP, Verhaaren M. The pathophysiology of post-radical prostatectomy incontinence: a clinical and video urodynamic study. *J Urol*. 2000 Jun;163(6):1767-70.
115. Kielb SJ, Clemens JQ. Comprehensive urodynamics evaluation of 146 men with incontinence after radical prostatectomy. *Urology*. 2005 Aug;66(2):392-6.
116. Burkhard FC, Kessler TM, Fleischmann A, Thalmann GN, Schumacher M, Studer UE. Nerve sparing open radical retropubic prostatectomy – does it have an impact on urinary continence? *J Urol*. 2006 Jul;176(1):189-95.
117. Cambio AJ, Evans CP. Minimising postoperative incontinence following radical prostatectomy: considerations and evidence. *Eur Urol*. 2006 Nov;50(5):903-13.
118. Bauer RM, Bastian PJ, Gozzi C, Stief CG. Postprostatectomy incontinence: all about diagnosis and management. *Eur Urol*. 2009 Feb;55(2):322-33.
119. Lourenco T, Pickard R, Vale L, Grant A, Fraser C, MacLennan G, et al. Minimally invasive treatments for benign prostatic enlargement: systematic review of randomised controlled trials. *BMJ*. 2008 Oct 9;337:a1662. doi: 10.1136/bmj.a1662..a1662.
120. Burgio KL, Goode PS, Locher JL, Richter HE, Roth DL, Wright KC, et al. Predictors of outcome in the behavioral treatment of urinary incontinence in women. *Obstet Gynecol*. 2003 Nov;102(5 Pt 1):940-7.
121. Cammu H, Nylen M van, Blockeel C, Kaufman L, Amy JJ. Who will benefit from pelvic floor muscle training for stress urinary incontinence? *Am J Obstet Gynecol*. 2004 Oct;191(4):1152-7.
122. Hendriks EJ, Kessels AG, Vet HC de, Bernards AT, Bie RA de. Prognostic indicators of poor short-term outcome of physiotherapy intervention in women with stress urinary incontinence. *Neurourol Urodyn*. 2010;29(3):336-43.
123. Lagro-Janssen AL, Smits AJ, Weel C van. [Beneficial effect of exercise therapy in urinary incontinence in family practice depends largely on therapy compliance and motivation]. *Ned Tijdschr Geneesk*. 1994 Jun 18;138(25):1273-6.
124. Siu LS, Chang AM, Yip SK, Chang AM. Compliance with a pelvic muscle exercise program as a causal predictor of urinary stress incontinence amongst Chinese women. *Neurourol Urodyn*. 2003;22(7):659-63.
125. Theofrastous JP, Wyman JF, Bump RC, McClish DK, Elser DM, Bland DR, et al. Effects of pelvic floor muscle training on strength and predictors of response in the treatment of urinary incontinence. *Neurourol Urodyn*. 2002;21(5):486-90.
126. Truijen G, Wyndaele JJ, Weyler J. Conservative treatment of stress urinary incontinence in women: who will benefit? *Int Urogynecol J Pelvic Floor Dysfunct*. 2001;12(6):386-90.
127. Wilson PD, Al Samarrai T, Deakin M, Kolbe E, Brown AD. An objective assessment of physiotherapy for female genuine stress incontinence. *Br J Obstet Gynaecol*. 1987 Jun;94(6):575-82.
128. Van Kampen M. Evidence for pelvic floor physical therapy in men. In: Bo K, Berghmans B, Mølkved S, Kampen M van, editors. Evidence based physical therapy for the pelvic floor. Bridging science and clinical practice. Edinburgh: Butterworth Heinemann Elsevier; 2007. p. 379-93.
129. Hendriks HJM, Kerssens JJ, Dekker J, Zee J van der, Oostendorp RAB, Nelson RM. One-time physical therapist consultation in primary health care. *Phys Ther*. 2003;83:918-31.
130. Hendriks EJM. Physiotherapist's consultation in general practice [PhD thesis]. Maastricht: Maastricht University; 2000.
131. Teunissen D, Den BW van, Weel C van, Lagro-Janssen T. Urinary incontinence in the elderly: attitudes and experiences of general practitioners. A focus group study. *Scand J Prim Health Care*. 2006 Mar;24(1):56-61.
132. Staskin D, Hilton P, Emmanuel A, Goode P, Mills I, Shull B, et al. Initial assessment of incontinence. In: Abrams P, Cardozo L, Khoury R, Wein A, editors. Incontinence 3rd International Consultation on Incontinence. Plymouth, UK: Health Publication Ltd; 2005. p. 485-517.
133. Martin JL, Williams KS, Sutton AJ, Abrams KR, Assassa RP. Systematic review and meta-analysis of methods of diagnostic assessment for urinary incontinence. *Neurourol Urodyn*. 2006;25(7):674-83.
134. Faber CG, Klaver MM, Wokke JHJ. Een afstaand schouderblad. *Ned Tijdschr Geneesk*. 2002;146(37):1717-20.
135. Robert M, Ross S, Farrel SA, Easton WA, Epp A, Girouard L, et al. Conservative management of urinary incontinence. *J Obstet Gynaecol Can*. 2006 Dec;28(12):1113-25.
136. National Collaborating Centre for Women's and Children's Health. Urinary incontinence: the management of urinary incontinence in women. London: RCOG Press; 2006.
137. Bent AE, Gousse AE, Hendrix SL, Klutke CG, Monga AK, Yuen CK, et al. Validation of a two-item quantitative questionnaire for the triage of women with urinary incontinence. *Obstet Gynecol*. 2005 Oct;106(4):767-73.
138. Brown JS, Bradley CS, Subak LL, Richter HE, Kraus SR, Brubaker L, et al. The sensitivity and specificity of a simple test to distinguish between urge and stress urinary incontinence. *Ann Intern Med*. 2006 May 16;144(10):715-23.
139. Lagro-Jansen ALM. Urine-incontinentie bij vrouwen in de huisartsenpraktijk [Thesis]. Nijmegen, the Netherlands: Katholieke Universiteit Nijmegen; 1991.
140. Jarvis GJ. Urogynaecology Audit. In: Stanton SL, Monga AK, editors. Clinical Urogynaecology. Churchill Livingstone; 2000. p. 615-31.
141. Harvey MA, Versi E. Predictive value of clinical evaluation of stress urinary incontinence: a summary of the published literature. *Int Urogynecol J Pelvic Floor Dysfunct*. 2001;12(1):31-7.

142. Vierhout ME. Meting van ongewenst urineverlies bij de vrouw. *Ned Tijdschr Geneesk.* 1990;134(38):1837-9.
143. Mulder AFP, Vierhout ME. De Inco-test. *Medicus.* 1990;264.
144. Ogden J. *Health Psychology: a textbook.* Buckingham-Philadelphia: Open University Press; 2000.
145. Cameron LD, Leventhal H. *The self-regulation of health and illness behaviour.* London: Routledge; 2003.
146. Kegel A. Progressive resistance exercise in the functional restoration of the perineal muscles. *Am J Gynecol.* 1948;56:238-4.
147. Devreese A, Staes F, Weerdt W de, Feys H, Assche A van, Penninckx F, et al. Clinical evaluation of pelvic floor muscle function in continent and incontinent women. *NeuroUrol Urodyn.* 2004;23(3):190-7.
148. Slieker-ten Hove MC, Pool-Goudzwaard AL, Eijkemans MJ, Steegers-Theunissen RP, Burger CW, Vierhout ME. Face validity and reliability of the first digital assessment scheme of pelvic floor muscle function conform the new standardized terminology of the International Continence Society. *NeuroUrol Urodyn.* 2009;28(4):295-300.
149. Bo K, Sherburn M. Evaluation of female pelvic-floor muscle function and strength. *Phys Ther.* 2005 Mar;85(3):269-82.
150. Dietz HP, Jarvis SK, Vancaillie TG. The assessment of levator muscle strength: a validation of three ultrasound techniques. *Int Urogynecol J Pelvic Floor Dysfunct.* 2002;13(3):156-9.
151. Stoker J, Halligan S, Bartram CI. Pelvic floor imaging. *Radiology.* 2001 Mar;218(3):621-41.
152. Vodusek DB. Electromyography. In: Bo K, Berghmans B, Møkvæd S, Kampen M van, editors. *Evidence based physical therapy for the pelvic floor. Bridging science and clinical practice.* Edinburgh: Butterworth Heinemann Elsevier; 2007. p. 56-63.
153. Messelink B, Benson T, Berghmans B, Bo K, Corcos J, Fowler C, et al. Standardization of terminology of pelvic floor muscle function and dysfunction: report from the pelvic floor clinical assessment group of the International Continence Society. *NeuroUrol Urodyn.* 2005;24(4):374-80.
154. Bo K, Sherburn M. Visual observation and palpation. In: Bo K, Berghmans B, Møkvæd S, Kampen M van, editors. *Evidence based physical therapy for the pelvic floor. Bridging science and clinical practice.* Edinburgh: Butterworth Heinemann Elsevier; 2007. p. 50-5.
155. Van Kampen M, Weerdt W de, Feys H, Honing S. Reliability and validity of a digital test for pelvic muscle strength in women. *NeuroUrol Urodyn.* 1996;15:338-9.
156. Bo K, Sherburn M. Vaginal squeeze pressure measurement. In: Bo K, Berghmans B, Møkvæd S, Kampen M van, editors. *Evidence based physical therapy for the pelvic floor. Bridging science and clinical practice.* Edinburgh: Butterworth Heinemann Elsevier; 2007. p. 63-8.
157. Dumoulin C, Gravel D, Bourbonnais D, Lemieux MC, Morin M. Reliability of dynamometric measurements of the pelvic floor musculature. *NeuroUrol Urodyn.* 2004;23(2):134-42.
158. Dietz HP, Shek C. Validity and reproducibility of the digital detection of levator trauma. *Int Urogynecol J Pelvic Floor Dysfunct.* 2008 Feb 13;19:1097-101.
159. Pool-Goudzwaard AL, Slieker ten Hove MC, Vierhout ME, Mulder PH, Pool JJ, Snijders CJ, et al. Relations between pregnancy-related low back pain, pelvic floor activity and pelvic floor dysfunction. *Int Urogynecol J Pelvic Floor Dysfunct.* 2005 Nov;16(6):468-74.
160. Velde J van der, Laan E, Everaerd W. Vaginismus, a component of a general defensive reaction. an investigation of pelvic floor muscle activity during exposure to emotion-inducing film excerpts in women with and without vaginismus. *Int Urogynecol J Pelvic Floor Dysfunct.* 2001;12(5):328-31.
161. Reissing ED, Binik YM, Khalife S, Cohen D, Amsel R. Vaginal spasm, pain, and behavior: an empirical investigation of the diagnosis of vaginismus. *Arch Sex Behav.* 2004 Feb;33(1):5-17.
162. Koldewijn E. *Progress in neuro-urology: Evaluation of investigatory techniques and new treatment options (Thesis).* Nijmegen, the Netherlands: Katholieke Universiteit Nijmegen; 1994.
163. Versprille-Fischer ES. *Begeleiding van patiënten met bekkenbodemdysfunctie. 2de gewijzigde druk.* Maarssen: Elsevier Gezondheidszorg; 2001.
164. Sapsford RR, Hodges PW, Richardson CA, Cooper DH, Markwell SJ, Jull GA. Co-activation of the abdominal and pelvic floor muscles during voluntary exercises. *NeuroUrol Urodyn.* 2001;20(1):31-42.
165. Neumann P, Gill V. Pelvic floor and abdominal muscle interaction: EMG activity and intra-abdominal pressure. *Int Urogynecol J Pelvic Floor Dysfunct.* 2002;13(2):125-32.
166. Richardson CA, Hodges PW, Hides J. *Therapeutic exercise for lumbopelvic stabilization - A motor control approach for the treatment and prevention of low back pain.* 2nd ed. Edinburgh: Churchill Livingstone; 2004.
167. Hodges PW, Gandevia SC. Changes in intra-abdominal pressure during postural and respiratory activation of the human diaphragm. *J Appl Physiol.* 2000 Sep;89(3):967-76.
168. Hodges PW, Sapsford R, Pengel LH. Postural and respiratory functions of the pelvic floor muscles. *NeuroUrol Urodyn.* 2007;26(3):362-71.
169. Smith MD, Russell A, Hodges PW. Disorders of breathing and continence have a stronger association with back pain than obesity and physical activity. *Aust J Physiother.* 2006;52(1):11-6.
170. Devreese AM, Nuyens G, Staes F, Vereecken RL, Weerdt W de, Stappaerts K. Do posture and straining influence urinary-flow parameters in normal women? *NeuroUrol Urodyn.* 2000;19(1):3-8.
171. Hendriks EJ, Bernards AT, Staal JB, Vet HC de, Bie RA de. Factorial validity and internal consistency of the PRAFAB questionnaire in women with stress urinary incontinence. *BMC Urol.* 2008 Jan 24;8:1.
172. Hendriks EJ, Bernards AT, Berghmans BC, Bie RA de. The psychometric properties of the PRAFAB-questionnaire: A brief assessment questionnaire to evaluate severity of urinary incontinence in women. *NeuroUrol Urodyn.* 2007 Jun 11;26:998-1007.
173. Hendriks EJM, Bernards ATM, Bie RA de, Vet HCW de. The Minimally Important Change of the PRAFAB Questionnaire in Women With Stress Urinary Incontinence: Results From a Prospective Cohort Study. *NeuroUrology and Urodynamics.* 2008;27(5):379-87.
174. Sandvik H, Espuna M, Hunskaar S. Validity of the incontinence severity index: comparison with pad-weighing tests. *Int Urogynecol J Pelvic Floor Dysfunct.* 2006 Sep;17(5):520-4.
175. Avery K, Donovan J, Peters TJ, Shaw C, Gotoh M, Abrams P. ICIQ: a brief and robust measure for evaluating the symptoms and impact of urinary incontinence. *NeuroUrol Urodyn.* 2004;23(4):322-30.
176. Amarenco G, Arnould B, Carita P, Haab F, Labat JJ, Richard F. European psychometric validation of the CONTILIFE: a Quality of Life questionnaire for urinary incontinence. *Eur Urol.* 2003 Apr;43(4):391-404.
177. Shumaker SA, Wyman JF, Uebersax JS, McClish D, Fantl JA. Health-related quality of life measures for women with urinary incontinence: the Incontinence Impact Questionnaire and the Urogenital Distress Inventory. Continence Program in Women (CPW) Research Group. *Qual Life Res.* 1994 Oct;3(5):291-306.
178. Fonda D, Woodward M, D'Astoli M, Chin WF. Sustained improvement of subjective quality of life in older community-dwelling people after treatment of urinary incontinence. *Age Ageing.* 1995 Jul;24(4):283-6.
179. Engberg SJ, McDowell BJ, Burgio KL, Watson JE, Belle S. Self-care behaviors of older women with urinary incontinence. *J Gerontol Nurs.* 1995 Aug;21(8):7-14.

180. Seim A, Hermstad R, Hunskaar S. Management in general practice significantly reduced psychosocial consequences of female urinary incontinence. *Qual Life Res.* 1997 Apr;6(3):257-64.
181. Teunissen D, Den BW van, Weel C van, Lagro-Janssen T. "It can always happen": the impact of urinary incontinence on elderly men and women. *Scand J Prim Health Care.* 2006 Sep;24(3):166-73.
182. Herbison P, Plevnik S, Mantle J. Weighted vaginal cones for urinary incontinence. *Cochrane Database Syst Rev.* 2002;(1):CD002114.
183. Abdel-Fattah M, Barrington JW, Youssef M. The standard 1-hour pad test: does it have any value in clinical practice? *Eur Urol.* 2004 Sep;46(3):377-80.
184. Beurskens AJ, Vet HC de, Koke AJ. Responsiveness of functional status in low back pain: a comparison of different instruments. *Pain.* 1996 Apr;65(1):71-6.
185. Beurskens AJ, Vet HC de, Koke AJ, Lindeman E, Heijden GJ van der, Regtop W, et al. A patient-specific approach for measuring functional status in low back pain. *J Manipulative Physiol Ther.* 1999 Mar;22(3):144-8.
186. Jaeschke R, Singer J, Guyatt GH. Measurement of health status. Ascertain the minimal clinically important difference. *Control Clin Trials.* 1989 Dec;10(4):407-15.
187. van der Roer N, Ostelo RW, Bekkering GE, Tulder MW van, Vet HC de. Minimal clinically important change for pain intensity, functional status, and general health status in patients with nonspecific low back pain. *Spine.* 2006 Mar 1;31(5):578-82.
188. de Vet HC, Terwee CB, Ostelo RW, Beckerman H, Knol DL, Bouter LM. Minimal changes in health status questionnaires: distinction between minimally detectable change and minimally important change. *Health Qual Life Outcomes.* 2006 Aug 22;4:54.
189. Berghmans LCM, Ijland M, Koeveringe G van, Winkens R, Kerrebroeck PEV van. Bekkenfysiotherapie bij onvrijwillig urineverlies. *Huisarts Wet.* 2003;46(3):148-52.
190. Addla S, Adeyouju A, Neilson D. Assessment of reliability of 1-day, 3-day and 7-day frequency volume charts. *European Urology supplements* 2004;3(2):130.
191. Brown JS, McNaughton KS, Wyman JF, Burgio KL, Harkaway R, Bergner D, et al. Measurement characteristics of a voiding diary for use by men and women with overactive bladder. *Urology* 2003 Apr;61(4):802-9.
192. Averink M, Melein L, Duker PC. Establishing diurnal bladder control with the response restriction method: extended study on its effectiveness. *Res Dev Disabil.* 2005 Mar;26(2):143-51.
193. Tannenbaum C, Corcos J. Outcomes in urinary incontinence: Reconciling clinical relevance with scientific rigour. *European Urology.* 2008 Jun;53(6):1151-61.
194. van der Vaart CH, Leeuw JR de, Roovers JP, Heintz AP. Measuring health-related quality of life in women with urogenital dysfunction: the urogenital distress inventory and incontinence impact questionnaire revisited. *Neurourol Urodyn.* 2003;22(2):97-104.
195. Smith ARB, Daneshgari F, Dmochowski R, Milani R, Miller K, Paraiso M, et al. Surgery for urinary incontinence in women. In: Abrams P, Cardozo L, Khoury R, Wein A, editors. *Incontinence 3rd International Consultation on Incontinence.* Plymouth, UK: Health Publication Ltd; 2005. p. 1297-370.
196. Hilton P. The role of urodynamics in pelvic floor re-education. In: Schuessler B, Laycock J, Norton P, Stanton S, editors. *Pelvic Floor Re-Education.* London: Springer Verlag; 1994.
197. Wilson PD, Berghmans B, Hagen S, Hay-Smith J, Moore K, Nygaard I, et al. Adult conservative management. In: Abrams P, Cardozo L, Khoury R, Wein A, editors. *Incontinence 3rd International Consultation on Incontinence.* Plymouth, UK: Health Publication Ltd; 2005. p. 855-964.
198. Fantl JA, Newman DK, Colling J, DeLancey JO, Keely C, Loughery R, et al. Urinary incontinence in adults: Acute and chronic management. *Clinical Practice Guideline No. 2, 1996 Update.* Rockville, MD: U.S. Department of Health and Human Services. Public Health Service, Agency for Health Care Policy and Research; 1996.
199. Gezondheidsraad. Urine-incontinentie. Den Haag: Gezondheidsraad; 2001. Publicatie nr: 2001/12.
200. Bo K, Borgen JS. Prevalence of stress and urge urinary incontinence in elite athletes and controls. *Med Sci Sports Exerc.* 2001 Nov;33(11):1797-802.
201. Cammu H, Nylen M van, Amy JJ. A 10-year follow-up after Kegel pelvic floor muscle exercises for genuine stress incontinence. *BJU Int.* 2000 Apr;85(6):655-8.
202. Wall LL, Davidson TG. The role of muscular re-education by physical therapy in the treatment of genuine stress urinary incontinence. *Obstet Gynecol Surv.* 1992 May;47(5):322-31.
203. Jarvis SK, Hallam TK, Lujic S, Abbott JA, Vancaillie TG. Peri-operative physiotherapy improves outcomes for women undergoing incontinence and or prolapse surgery: results of a randomised controlled trial. *Aust N Z J Obstet Gynaecol.* 2005 Aug;45(4):300-3.
204. Norton P. Aims of pelvic floor re-education. In: Schüssler B, Laycock J, Norton P, Stanton S, editors. *Pelvic floor re-education.* London, UK: Springer-Verlag; 1994.
205. Schuessler B. Introduction. In: Schüssler B, Laycock J, Norton P, Stanton S, editors. *Pelvic floor re-education.* London, UK: Springer-Verlag; 1994.
206. Black NA, Downs SH. The effectiveness of surgery for stress incontinence in women: a systematic review. *Br J Urol.* 1996 Oct;78(4):497-510.
207. McGuire EJ. Stress incontinence: new alternatives. *Int J Fertil Menopausal Stud.* 1996 Mar;4(2):142-7.
208. Leach GE. Post-prostatectomy incontinence: the importance of bladder dysfunction. *J Urol.* 1995 Mar;153(3 Pt 2):1038.
209. Knispel HH, Klän R, Siegmann K, Miller K. Results with the Stamey procedure in 251 consecutive patients with genuine stress urinary incontinence. *J Urol.* 1995;153(suppl):812.
210. Rush CB, Entman SS. Pelvic organ prolapse and stress urinary incontinence. *Med Clin North Am.* 1995 Nov;79(6):1473-9.
211. Berghmans LCM. Conservative treatment for woman with stress incontinence and bladder overactivity. Maastricht: Maastricht University; 2000.
212. Alewijnse D, Mesters I, Metsemakers J, Borne B van den. Strategies to enhance adherence and reduce drop out in conservative treatment. In: Bo K, Berghmans B, Møkvad S, Kampen M van, editors. *Evidence based physical therapy for the pelvic floor. Bridging science and clinical practice.* Edinburgh: Butterworth Heinemann Elsevier; 2007. p. 133-46.
213. Leventhal H, Zimmerman R, Gutmann M. Compliance: A Self-Regulation Perspective. In: Gentry D, editor. *Handbook of behavioral medicine.* New York: Pergamon; 1984. p. 369-436.
214. Weinman J. The cognitive strategy: focussing on patients' beliefs about illness and treatment as a basis for enhancing self-regulation and self-management. 2003.
215. Taylor NF, Dodd KJ, Shields N, Bruder A. Therapeutic exercise in physiotherapy practice is beneficial: a summary of systematic reviews 2002-2005. *Aust J Physiother.* 2007;53(1):7-16.
216. Hay-Smith EJ, Bo K, Berghmans LC, Hendriks HJ, Bie RA de, Waalwijk van Doorn ES van. Pelvic floor muscle training for urinary incontinence in women. *Cochrane Database Syst Rev.* 2001;(1):CD001407.
217. Hay-Smith EJ, Dumoulin C. Pelvic floor muscle training versus no treatment, or inactive control treatments, for urinary incontinence in women. *Cochrane Database Syst Rev.* 2006 Jan 25;(1):CD005654.

218. Dumoulin C, Hay-Smith J. Pelvic floor muscle training versus no treatment for urinary incontinence in women. A Cochrane systematic review. *Eur J Phys Rehabil Med.* 2008 Mar;44(1):47-63.
219. Shamliyan TA, Kane RL, Wyman J, Wilt TJ. Systematic review: randomized, controlled trials of nonsurgical treatments for urinary incontinence in women. *Ann Intern Med.* 2008 Mar 18;148(6):459-73.
220. Moore KN, Cody DJ, Glazener CM. Conservative management for post prostatectomy urinary incontinence. *Cochrane Database Syst Rev.* 2001;(2):CD001843.
221. Bo K. Pelvic floor muscle training is effective in treatment of female stress urinary incontinence, but how does it work? *Int Urogynecol J Pelvic Floor Dysfunct.* 2004 Mar;15(2):76-84.
222. DeLancey JO, Starr RA. Histology of the connection between the vagina and levator ani muscles. Implications for urinary tract function. *J Reprod Med.* 1990 Aug;35(8):765-71.
223. DeLancey JO. Structural support of the urethra as it relates to stress urinary incontinence: the hammock hypothesis. *Am J Obstet Gynecol.* 1994 Jun;170(6):1713-20.
224. DeLancey JO. The pathophysiology of stress urinary incontinence in women and its implications for surgical treatment. *World J Urol.* 1997;15(5):268-74.
225. Thompson JA, O'Sullivan PB. Levator plate movement during voluntary pelvic floor muscle contraction in subjects with incontinence and prolapse: a cross-sectional study and review. *Int Urogynecol J Pelvic Floor Dysfunct.* 2003 Jun;14(2):84-8.
226. Bo K, Finckenhagen HB. Vaginal palpation of pelvic floor muscle strength: inter-test reproducibility and comparison between palpation and vaginal squeeze pressure. *Acta Obstet Gynecol Scand.* 2001 Oct;80(10):883-7.
227. Miller JM, Ashton-Miller JA, DeLancey JO. A pelvic muscle precontraction can reduce cough-related urine loss in selected women with mild SUI. *J Am Geriatr Soc.* 1998 Jul;46(7):870-4.
228. Peschers UM, Vodusek DB, Fanger G, Schaer GN, DeLancey JO, Schuessler B. Pelvic muscle activity in nulliparous volunteers. *Neurourol Urodyn.* 2001;20(3):269-75.
229. Sliker-ten Hove MC, Pool-Goudzwaard AL, Eijkemans MJ, Steegers-Theunissen RP, Burger CW, Vierhout ME. Pelvic floor muscle function in a general female population in relation with age and parity and the relation between voluntary and involuntary contractions of the pelvic floor musculature. *Int Urogynecol J Pelvic Floor Dysfunct.* 2009 Dec;20(12):1497-504.
230. Constantinou CE, Govan DE. Contribution and timing of transmitted and generated pressure components in the female urethra. *Prog Clin Biol Res.* 1981;78:113-20:113-20.
231. Howard D, Miller JM, DeLancey JO, Ashton-Miller JA. Differential effects of cough, valsalva, and continence status on vesical neck movement. *Obstet Gynecol.* 2000 Apr;95(4):535-40.
232. Peschers UM, Schaer GN, DeLancey JO, Schuessler B. Levator ani function before and after childbirth. *Br J Obstet Gynaecol.* 1997 Sep;104(9):1004-8.
233. Bernstein IT. The pelvic floor muscles: muscle thickness in healthy and urinary-incontinent women measured by perineal ultrasonography with reference to the effect of pelvic floor training. Estrogen receptor studies. *Neurourol Urodyn.* 1997;16(4):237-75.
234. Balmforth JR, Mantle J, Bidmead J, Cardozo L. A prospective observational trial of pelvic floor muscle training for female stress urinary incontinence. *BJU Int.* 2006 Oct;98(4):811-7.
235. Bo K, Hagen R, Kvarstein B, Jorgensen J, Larsen S, Burgio KL. Pelvic floor muscle exercise for the treatment of female stress urinary incontinence: III. Effects of two different degrees of pelvic floor muscle exercises. *Neurourol Urodyn.* 1990;9(5):489-502.
236. 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 Feb 20;318(7182):487-93.
237. Morkved S, Bo K, Fjortoft T. Effect of adding biofeedback to pelvic floor muscle training to treat urodynamic stress incontinence. *Obstet Gynecol.* 2002 Oct;100(4):730-9.
238. Bourcier AP, Juras JC. Nonsurgical therapy for stress incontinence. *Urol Clin North Am.* 1995 Aug;22(3):613-27.
239. Hagen S, Stark D, Cattermole D. A United Kingdom-wide survey of physiotherapy practice in the treatment of pelvic organ prolapse. *Physioth.* 2004;90:19-26.
240. Bo K, Kvarstein B, Nygaard I. Lower urinary tract symptoms and pelvic floor muscle exercise adherence after 15 years. *Obstet Gynecol.* 2005 May;105(5 Pt 1):999-1005.
241. Bump RC, Hurt WG, Fantl JA, Wyman JF. Assessment of Kegel pelvic muscle exercise performance after brief verbal instruction. *Am J Obstet Gynecol.* 1991 Aug;165(2):322-7.
242. Haddow G, Watts R, Robertson J. Effectiveness of a pelvic floor muscle exercise program on urinary incontinence following childbirth. *Systematic Review. Int J Evid Based Healthc.* 2005;3:103-46.
243. Berghmans LC, Frederiks CM, Bie RA de, Weil EH, Smeets LW, Waalwijk van Doorn ES van, et al. Efficacy of biofeedback, when included with pelvic floor muscle exercise treatment, for genuine stress incontinence. *Neurourol Urodyn.* 1996;15(1):37-52.
244. Borghuis ME, Lemain TJ, Schreuder JLM. Groepsgewijze behandeling van vrouwen met incontinentieklachten. *FysioPraxis.* 1993;8:4-6.
245. Janssen CC, Lagro-Janssen AL, Felling AJ. The effects of physiotherapy for female urinary incontinence: individual compared with group treatment. *BJU Int.* 2001 Feb;87(3):201-6.
246. Bo K, Talseth T. Long-term effect of pelvic floor muscle exercise 5 years after cessation of organized training. *Obstet Gynecol.* 1996 Feb;87(2):261-5.
247. DiNubile NA. Strength training. *Clin Sports Med.* 1991;10(1):33-62.
248. Morkved S, Bo K, Schei B, Salvesen KA. Pelvic floor muscle training during pregnancy to prevent urinary incontinence: a single-blind randomized controlled trial. *Obstet Gynecol.* 2003 Feb;101(2):313-9.
249. Glavind K, Nohr SB, Walter S. Biofeedback and physiotherapy versus physiotherapy alone in the treatment of genuine stress urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct.* 1996;7(6):339-43.
250. Goode PS, Burgio KL, Locher JL, Roth DL, Umlauf MG, Richter HE, et al. Effect of behavioral training with or without pelvic floor electrical stimulation on stress incontinence in women: a randomized controlled trial. *JAMA.* 2003 Jul 16;290(3):345-52.
251. Borello-France DF, Downey PA, Zyczynski HM, Rause CR. Continence and quality-of-life outcomes 6 months following an intensive pelvic-floor muscle exercise program for female stress urinary incontinence: a randomized trial comparing low- and high-frequency maintenance exercise. *Phys Ther.* 2008 Dec;88(12):1545-53.
252. Haskel W. Dose response issues from a biological perspective. In: Bouchard C, Shephard RJ, Stephens T, editors. *Physical Activity, Fitness, and Health.* Champaign, Ill: Human Kinetics Publishers; 1994.
253. Glazener CM, Herbison GP, Wilson PD, MacArthur C, Lang GD, Gee H, et al. Conservative management of persistent postnatal urinary and faecal incontinence: randomised controlled trial. *BMJ.* 2001 Sep 15;323(7313):593-6.

254. Reilly ET, Freeman RM, Waterfield MR, Waterfield AE, Steggles P, Pedlar F. Prevention of postpartum stress incontinence in primigravidae with increased bladder neck mobility: a randomised controlled trial of ante-natal pelvic floor exercises. *BJOG*. 2002 Jan;109(1):68–76.
255. Alewijnse D. Urinary incontinence in women: long-term adherence to and outcome of pelvic floor muscle exercise therapy. Maastricht: Universiteit Maastricht; 2002.
256. Hunksaar S. A systematic review of overweight and obesity as risk factors and targets for clinical intervention for urinary incontinence in women. *NeuroUrol Urodyn*. 2008;27(8):749–57.
257. Schwartz G, Beatty J. Biofeedback: Theory and research. New York: Academic Press; 1977.
258. Thompson JA, O'Sullivan PB, Briffa NK, Neumann P. Assessment of voluntary pelvic floor muscle contraction in continent and incontinent women using transperineal ultrasound, manual muscle testing and vaginal squeeze pressure measurements. *Int Urogynecol J Pelvic Floor Dysfunct*. 2006 Nov;17(6):624–30.
259. Dietz HP, Wilson PD, Clarke B. The use of perineal ultrasound to quantify levator activity and teach pelvic floor muscle exercises. *Int Urogynecol J Pelvic Floor Dysfunct*. 2001;12(3):166–8.
260. Bo K. Stress urinary incontinence, physical activity and pelvic floor muscle strength training. *Scand J Med Sci Sports*. 1992;2:197–206.
261. Aksac B, Aki S, Karan A, Yalcin O, Isikoglu M, Eskiyurt N. Biofeedback and pelvic floor exercises for the rehabilitation of urinary stress incontinence. *Gynecol Obstet Invest*. 2003;56(1):23–7.
262. Berghmans B. Electrical stimulation for stress urinary incontinence. In: Bo K, Berghmans B, Mørkved S, Kampen M van, editors. Evidence based physical therapy for the pelvic floor. Bridging science and clinical practice. Edinburgh: Butterworth Heinemann Elsevier; 2007. p. 187–201.
263. Eriksen BC. Electrostimulation of the pelvic floor in female urinary incontinence. Thesis University of Trondheim, Norway; 1989.
264. WHO. Guidelines on basic training and safety in acupuncture. Geneva: WHO/EDM/TRM/99.1; 1999.
265. Bo K, Maanum M. Does vaginal electrical stimulation cause pelvic floor muscle contraction? A pilot study. *Scan J Urol Nephrol*. 1996;(Suppl 179):39–45.
266. Herbison P, Plevnik S, Mantle J. Weighted vaginal cones for urinary incontinence. *Cochrane Database Syst Rev*. 2002;(1):CD002114.
267. Pieber D, Zivkovic F, Tamussino K. [Pelvic floor exercises without or with vaginal cones in premenopausal women with mild to moderate stress incontinence]. *Gynakol Geburtshilfliche Rundsch*. 1994;34(1):32–3.
268. Cammu H, Nylen M van. Pelvic floor exercises versus vaginal weight cones in genuine stress incontinence. *Eur J Obstet Gynecol Reprod Biol*. 1998 Mar;77(1):89–93.
269. Laycock J, Brown J, Cusack C, Green S, Jerwood D, Mann K, et al. Pelvic floor reeducation for stress incontinence: comparing three methods. *Br J Community Nurs*. 2001 May;6(5):230–7.
270. Arvonen T, Fianu-Jonasson A, Tyni-Lenne R. Effectiveness of two conservative modes of physical therapy in women with urinary stress incontinence. *NeuroUrol Urodyn*. 2001;20(5):591–9.
271. Bo K. Vaginal weight cones. Theoretical framework, effect on pelvic floor muscle strength and female stress urinary incontinence. *Acta Obstet Gynecol Scand*. 1995 Feb;74(2):87–92.
272. Brown JS, Wing R, Barrett-Connor E, Nyberg LM, Kusek JW, Orchard TJ, et al. Lifestyle intervention is associated with lower prevalence of urinary incontinence: the Diabetes Prevention Program. *Diabetes Care*. 2006 Feb;29(2):385–90.
273. Mørkved S. Urinary incontinence during pregnancy and after delivery. Effect of pelvic floor muscle training in prevention and treatment. NTNU Trondheim, Norway; 2003.
274. Chiarelli P, Cockburn J. Promoting urinary continence in women after delivery: randomised controlled trial. *BMJ*. 2002 May 25;324(7348):1241.
275. Dumoulin C, Lemieux MC, Bourbonnais D, Gravel D, Bravo G, Morin M. Physiotherapy for persistent postnatal stress urinary incontinence: a randomized controlled trial. *Obstet Gynecol*. 2004 Sep;104(3):504–10.
276. Gorbea Chavez V, Velazquez Sanchez MP, Kunhardt Rasch Jr. [Effect of pelvic floor exercise during pregnancy and puerperium on prevention of urinary stress incontinence]. *Ginecol Obstet Mex*. 2004 Dec;72:628–36.
277. Woldringh C, Wijngaard M van den, Albers-Heitner P, Nijeholt AA, Lagro-Janssen T. Pelvic floor muscle training is not effective in women with UI in pregnancy: a randomised controlled trial. *Int Urogynecol J Pelvic Floor Dysfunct*. 2007 Apr;18(4):383–90.
278. Burgio KL, Goode PS, Urban DA, Umlauf MG, Locher JL, Bueschen A, et al. Preoperative biofeedback assisted behavioral training to decrease post-prostatectomy incontinence: a randomized, controlled trial. *J Urol*. 2006 Jan;175(1):196–201.
279. Parekh AR, Feng MI, Kirages D, Bremner H, Kaswick J, Aboseif S. The role of pelvic floor exercises on post-prostatectomy incontinence. *J Urol*. 2003 Jul;170(1):130–3.
280. Koninklijk Nederlands Genootschap voor Fysiotherapie. KNGF-richtlijn Fysiotherapeutische Verslaglegging. Amersfoort: KNGF; 1993.
281. Heerkens YF, Hendriks HJM, Graaf-Peters VB de. KNGF-richtlijn Fysiotherapeutische verslaglegging [Praktijkrichtlijn]. Amersfoort: KNGF; 2011.
282. Hendriks HJM, Bekkering GE, Ettekoen H van, Brandsma JW, Wees PJ van der, Bie RA de. Development and implementation of national practice guidelines: A prospect for continuous quality improvement in physiotherapy. Introduction to the method of guideline development. *Physioth*. 2000;86:535–47.



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