Clinical practice guidelines for the physical therapy in patients with stress urinary incontinence

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Introduction

These guidelines embody the diagnostic and therapeutic processes involved in the physical therapy (physiotherapy) of adult patients with stress urinary incontinence (SUI). In the second part of these guidelines, entitled "Review of evidence", the choices made in arriving at guideline recommendations are described in detail.

The International Continence Society defines urinary incontinence as "the involuntary loss of urine, which is objectively demonstrable, with such a degree of severity that it is a social or hygienic problem". Furthermore, the International Continence Society defines SUI as the "involuntary loss of urine that occurs when, in the absence of a simultaneous detrusor contraction, intravesical pressure exceeds the maximum urethral pressure". SUI results from dysfunction of the urethral closing mechanism. The associated involuntary loss of urine affects the individual's participation in society (i.e., causes participation problems) to a certain extent.

Epidemiology

Involuntary loss of urine is a frequently occurring problem, though the exact number of people affected is unknown. It is estimated that the prevalence of (a certain degree of) urinary incontinence is about 5% in the Dutch population, which means that possibly 800,000 Dutch people aged five years or older are affected by involuntary urine loss. The reported prevalence of SUI in women varies from 8% to 26%. This variation in reported prevalence may be explained by the fact that different studies involved different population groups, in which different definitions of SUI were used. The reported prevalence of SUI in men under 65 years of age is lower than that in women and varies from 1.5% to 5%.

Guidelines target group

These guidelines are intended for use by physical therapists (physiotherapists) who work with patients with pelvic floor problems. The physical therapist is expected to have demonstrable specific knowledge and skills concerning this group of patients, a positive attitude towards them, and an insight into their problems. Dutch physical therapists who carry out the internal examination or treatment of patients with SUI should be aware that the Royal Dutch Association for Physical Therapists (KNGF) regards interventions such as palpation via the vagina or anus as 'specified interventions', as defined by current (Dutch) legislation, and interventions such as the insertion of an electrode into the vagina or anus as 'restricted interventions', also as defined by current legislation. The physical therapist may only examine and treat a patient internally if this is explicitly requested and condoned by the referring physician and, furthermore, if the patient agrees after being fully informed about the intended treatment and possible alternatives.

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Referral

In the Netherlands, the physical therapist must receive a written referral from a primary care physician or medical specialist, such as a urologist or gynecologist. Referrals can also be made indirectly on the advice of a midwife or obstetrician. In addition to routine patient data, the referral documentation must include, at least, the nature of the intervention requested, an estimate of SUI severity, and details of the following:

- possible causal factors leading to the development of SUI, for example, labor;
- local factors that may inhibit recovery and adjustment, for example, prolapse of the uterus;
- general factors that may inhibit recovery and adjustment, for example, hormonal disturbances;
- the primary care physician's and medical specialist's diagnostic findings, including, for example, the patient's ability to contract and relax the pelvic floor muscles, with or without awareness.

Diagnosis

The objectives of the physical therapy diagnostic process are to assess the nature and severity of the health problem and to evaluate the extent to which it can be influenced by physical therapy. The concepts of impairments in functions, disabilities in skills or activities, and participation problems are used to describe the severity of the health problems resulting from SUI. Describing problems in this way make it possible to identify changes over time and facilitates the use of evaluating instruments for measuring the effects of physical therapy. When the nature of the health problem and the extent to which it can be influenced are known, the individual patient's prognosis and the goals of physical therapy in that patient can be defined in terms of reducing impairments, disabilities and participation problems, or in terms of improving functions, abilities and social participation.

The physical therapy diagnostic process, which supplements the referral data, must determine whether, to what extent, and in which way physical therapy can influenced the health problems resulting from SUI. Use of the terms impairment, disability and participation problems provides no information about the nature of the disorder that is responsible for the SUI or the extent to which that disorder can be influenced. Therefore, the physical therapy diagnostic process must reveal the information necessary to define the nature of the disorder responsible for SUI and the extent to which it can be influenced. This information is obtained from history-taking, the patient's subjective reports, questionnaires and voiding diaries. It is advisable to make use of standardized questionnaires such as the PRAFAB questionnaire, as detailed in the review of the evidence.

History-taking

In history-taking, the functions of the questions[1] asked are:

- to register the patient's needs;
- to identify the severity of the health problem by recording impairments (e.g., loss of urine while coughing), disabilities (e.g., problems with personal hygiene), and participation problems (e.g., social isolation);
- to identify the possible nature of the underlying pathology by noting causal factors (e.g., experiences during childbirth);
- to identify local inhibitory factors that may impede recovery and adaptation (e.g., prolapse of the uterus);
- to identify general inhibitory factors that may impede recovery and adaptation (e.g., diabetes mellitus); and
- to record personal data (e.g., what effort does the patient make to alleviate SUI).

On the basis of the information obtained by history-taking, supplemented by the referral data, the physical therapist determines the approach that should be adopted during physical examination and, if possible, the physical therapy interventions that should be used. The physical therapist must discuss his[2] selected course of action, and the possible alternatives, with the patient. Whenever it is decided that a 'specified intervention' or 'restricted intervention', as understood in Dutch law, has to be carried out, the patient must be informed in writing

1 *These questions are elaborated in the section entitled "Review of evidence".*

2 *The combinations 'his/her' and 'he/she' have been avoided in these guidelines to facilitate readability. The terms 'his' and 'he' should be understood to apply to both sexes.*

about the nature of the intended examination or treatment method. This enables the patient to make a considered decision about whether to undergo the examination or treatment proposed for the second visit. Physical therapists are advised to follow the guidelines developed by Dutch Association for Physical Therapy in Pelvic Disease and Perinatal Care (NVFB), entitled "Guidelines on hygiene during medical procedures in the pelvic region".

Physical examination

The severity of the health problems associated with SUI depends not only on the condition of the pelvic floor, but also on the patient's posture, respiration, way of moving, and general physical and psychological state. Therefore, it is important to examine the patient both locally, in the abdominal and pelvic region, and generally.

Local examination of the genital and anal region

Local examination in this region, by means of visual examination and palpation, is only permissible if all obligatory requirement relating to specified interventions have been fulfilled. Physical examination consists of a visual examination of the patient at rest and during movement, palpation, and functional examination. The objectives are:

- to assess the extent to which the pelvic floor can be consciously controlled;
- to assess pelvic floor function; and
- to assess the extent to which pelvic floor function is disturbed by the actions of other parts of the locomotor system.

Visual examination with the patient at rest

General:

- general impression;
- standing and sitting posture;
- respiration.

Local and regional:

- abdominal and pelvic region;
- genital and anal region.

Visual examination during movement

General:

- mobility;
- coordination.

Local and regional:

- abdominal, buttock and pelvic region during contraction of the abdominal, buttock and leg muscles;
- genital and anal region and perineum during contraction of the pelvic floor muscles and while coughing.

Palpation

- pelvic floor;
- vagina;
- anus;
- perineum;
- abdomen.

Functional examination

Functional examination consists of testing:

- the function and coordination of pelvic floor, torso and leg muscles;
- proprioception;
- the sensitivity of dermatomes S2–S4; and assessing:
- behavior and posture during toilet use.

Analysis and treatment plan

The objective of the physical therapy diagnostic process is, in addition to assessing the severity of the health problem, to obtain an insight into the nature of the disorder responsible for SUI and the extent to which it can be modified. It is necessary to identify any local and general factors that may affect recovery and adaptation because of the implications they may have for the results of physical therapy.

During analysis, indications for treatment by physical therapy are clearly defined on the basis of information obtained during diagnosis and from medical referral data. The following questions must be answered sequentially:

- Is the referral diagnosis of SUI likely to be correct? Are there any health problems related to SUI?
- How likely is it that the patient has SUI? (See Tables 2 and 3 in the review of the evidence.)
- Is there pelvic floor dysfunction?
- What caused this dysfunction?
- Are there any local inhibitory factors that could prevent recovery and adaptation? Can they be influenced by physical therapy?
- Are there any general inhibitory factors that could prevent recovery and adaptation? Can they be influenced by physical therapy?

Conclusion
In dealing with a diagnosis of SUI, the following has to be remembered:

- a diagnosis of SUI that is made on the basis of history-taking is not always correct; and
- a correct diagnosis usually gives no information about the nature of the disorder causing the SUI.

However, the following specific complaints can be distinguished:

- SUI with pelvic floor muscle dysfunction, with no awareness of pelvic floor muscles; or with awareness of pelvic floor muscles; or in which pelvic floor muscle function is disturbed by breathing or other actions of the locomotor system, or by toilet posture, behavior, or regime;
- SUI without pelvic floor muscle dysfunction;
- The existence of general factors, other than SUI, that inhibit recovery and adaptation.

In addition to recognizing these specific complaints, prognostic variables and patient characteristics that can influence the result of the treatment (e.g., age, parity, and postmenopausal factors) also have to be taken into account.

It is not always clear whether or to what extent physical therapy is indicated in these patients because the nature of underlying disorder and the extent to which it can be influenced cannot always be clearly defined. This observation may also apply to local factors that could impede recovery. In these situations, physical therapy can be considered as pilot treatment.

If the severity or nature of the disorder or associated health problems is uncertain, the referring physician could be consulted, the patient could be sent back to the referring physician, or the patient could be referred for further diagnosis or treatment.

Therapy

The specific objectives of physical therapy in individual patients are formulated in terms of reducing impairments, disabilities and participation problems, or in terms of improving functions, abilities and social participation. A treatment plan is devised and treatment goals are set using information obtained during diagnosis. In general, the treatment of patients with SUI comprises pelvis floor muscles exercises combined with the provision of information and training. There is strong evidence that this approach is effective.

Treatment plan
SUI with pelvic floor muscle dysfunction with no awareness of pelvic floor muscles
Objective: patient becomes aware of pelvic floor muscles.
Therapy: electrostimulation, biofeedback, or digital assessment by the therapist or the patient, or a combination of these methods. After the successful induction of awareness, pelvic floor muscle exercises are important and the patient is encouraged to exercise by himself or herself.

If awareness cannot be achieved, the patient should be sent back to the primary care physician or medical specialist. This may occur, for example, when there is a central or peripheral neurological problem that cannot be identified by the physical therapist. If the patient does become aware of the pelvic floor muscles, treatment can be continued as described below.

SUI with pelvic floor muscle dysfunction with awareness of pelvic floor muscles
Objective: full recovery of pelvic floor muscle function.
Therapy: exercise therapy for pelvic floor muscles that involves exercises at home. An option for women is pelvic floor muscle exercises using vaginal cones.

The first aim of therapy is to help the patient make isolated contractions of the pelvic floor muscles. If able to do this, then the patient should try to perform a single task, such as a specific normal daily activity, while being aware of the pelvic floor muscles. Thereafter, double and multiple complex tasks should be attempted to help the patient achieve automatic control of the pelvic floor muscles. It should be noted that it may be difficult for very old people to perform double and multiple complex tasks while maintaining awareness and automatic control

of the pelvic floor muscles because of concentration problems, for example.

Unsatisfactory results may be caused by concurrent internal urethral closing mechanism dysfunction or endopelvic fascia lesions. In postmenopausal women, internal urethral closing mechanism dysfunction may be caused by changes in hormonal status. As a result, the treating physician may prescribe a medication, such as an estrogen. If the results of physical therapy are unsatisfactory, the patient should be sent back to the referring physician.

SUI with pelvic floor muscle dysfunction in which pelvic floor muscle function is disturbed by breathing or other actions of the locomotor system, or by toilet posture, behavior, or regimes
Objective: the reduction or elimination of the adverse influences of breathing or other actions of the locomotor system, or of toilet posture, behavior or regime. In addition, improvement of pelvic floor function.
Therapy: exercise therapy involving, for example, exercises to ensure adequate breathing, relaxation exercises, posture exercises, instruction on lifting, and exercises to improve toilet posture, toilet behavior and toilet regime. In addition, pelvic floor muscle exercises and exercises to be carried out at home are specified for improving pelvic floor muscle function. More information is given below in the section on providing information in the review of the evidence. If results are unsatisfactory, the patient should be sent back to the referring physician.

SUI without pelvic floor muscle dysfunction
Objective: compensation for other types of dysfunction.
Therapy: pelvic floor muscle exercises and exercises to be carried out at home. An option for women is pelvic floor muscle exercises using vaginal cones.

Since SUI occurs without pelvic floor muscle dysfunction, it is likely that there is dysfunction of the intrinsic closing mechanism (i.e., the internal sphincter). Physical therapy aims to reduce the impairments and disabilities resulting from SUI. The chance of achieving total recovery by using pelvic floor muscle exercises is small. In postmenopausal women, the physician may decide to combine physical therapy with pharmacological therapy (i.e., hormone supplementation). If results are unsatisfactory, the patient should be sent back to the referring physician.

Existence of general factors, other than SUI, that inhibit recovery and adaptation
Objective: maximum possible reduction of the effects of inhibitory factors.
Focal points: some of these general factors, such as cardiovascular disease or hormonal changes, cannot be influenced by physical therapy, but they are important for prognosis because they can delay recovery or adaptation. On the other hand, other factors, such as misconceptions, shame, avoidant behavior and participation problems, can be influenced by the physical therapist through the provision of adequate information and training, as can factors affecting compliance with therapy.

Providing information and prevention
Treatment will only lead to permanent successful results if the patient is able to incorporate the skills he has learned into normal daily activities. The therapist who provides education about the pelvic floor plays an important role in helping the patient achieve behavioral change. Providing information is, therefore, an important component of treatment. A professional approach to providing information requires a knowledge of and an insight into the way in which information has to be given and into the factors that can positively or negatively influence the achievement of behavioral change. These considerations are also important for secondary prevention.

The prevention of pelvic floor insufficiency is an important objective of pelvic floor education. Selecting patients who may benefit from preventive measures requires the identification of risk factors that play a causative role in stress urinary incontinence. Several intrinsic and extrinsic risk factors are associated with pelvic floor problems. Genetic defects that result in connective tissue weakness or in prolapses are intrinsic factors. Pregnancy, for example, is an extrinsic factor. Primary prevention, or SUI prevention, is an important focal

point of therapy in women who are receiving postnatal training. Usually, the physical therapist becomes involved when SUI already exists.

Evaluation and reporting
Reporting on SUI involves the systematic methodical recording and documentation of (I) all relevant data from the physician's notification and referral and from the physical therapy diagnostic process; (II) the conclusions of the diagnostic process, including the decision on whether or not to treat the patient; (III) the treatment plan and therapeutic interventions; and (IV) the evaluation of the results of treatment; as well as a written report to the referring physician. The aim of reporting is to register all the facts from the initial notification up to and including the written report to the referring physician that is made at the end of the treatment period. This process may provide an insight into the choices and decisions made (i.e., clinical reasoning) during the different phases of physical therapy. More information is given in Royal Dutch Society for Physical Therapy (KNGF) guidelines entitled "Physiotherapeutic documentation and reporting".

Review of the evidence

Introduction
The Royal Dutch Society for Physical Therapy (KNGF) clinical practice guidelines for the physical therapy of patients with stress urinary incontinence have been developed to guide the physical therapy of adult patients with the condition. The guidelines describe a methodical approach to diagnosis and therapy, and focus on secondary prevention. At present, one other set of clinical guidelines on the diagnosis and treatment of urinary incontinence is in use in the Netherlands, namely the Dutch College of General Practitioners (NHG) guidelines on urinary incontinence.[1]

Definition
KNGF guidelines are defined as "systematic developments from a core guide, which has been formulated by professionals, that focuses on the context in which the methodical physical therapy of certain health problems is applied and that takes into account the organization of the profession"[2,3]

Guideline objective
The objective of the guidelines is to describe the optimal physical therapy, in terms of effectiveness and efficiency, for adult patients suffering from stress urinary incontinence as derived from current scientific research and from professional and more general knowledge. The care provided should lead to full recovery or, when full recovery is not possible, to the maximum possible relief from the condition.

Research shows that, in practice, therapeutic goals, interventions and the application of physical therapy vary widely.[4] In addition to the above-mentioned guideline goals, KNGF guidelines are explicitly designed:

- to adapt the care provided to take account of current scientific research and to improve the quality and uniformity of care;
- to provide some insight into the tasks and responsibilities of the physical therapist and to stimulate cooperation with other professions; and
- to aid the decision-making process.

To make use of the guidelines recommendations are formulated with regard to professionalism and expertise which are necessary to insure treatment according to the guidelines.

Main clinical questions
The group that formulated these guidelines set out to answer the following questions:

- What is the nature and severity of SUI and to what extent can it be influenced?
- Which parts of the physical therapy diagnostic process are valid, reliable and useful in daily practice?
- Which forms of treatment and approaches to prevention have a clinically significant (i.e., effective or efficient) impact on the nature and severity of SUI and the extent to which it can be influenced?

The monodisciplinary working group
In September 1996, a monodisciplinary working group of professionals, comprising a physician as chairman, two physical therapists with expertise in epidemiology and several other physical therapists, was formed to find answers to these clinical questions. In forming the working group, an attempt

was made to achieve a balance between professionals with experience in the area of concern and those with an academic background. All members of the working group stated that they had no conflicts of interest in participating in the development of these guidelines. Guideline development took place from September 1996 through April 1998.

Monodisciplinary working group procedures
The guidelines were developed in accordance with concepts outlined in a document entitled "A method for the development and implementation of clinical guidelines".[2,3,5,6] This document includes practical recommendations on the strategies that should be used for collecting scientific literature, including recommendations on the appropriate search terms, the sources to be consulted, and the period of time during which appropriate literature has accumulated. The document also details the criteria to be used in selecting suitable literature and describes how these recommended criteria were derived. Below, in this review of the evidence for these guidelines, details are given of the specific terms used in literature searches, the sources searched, the publication period of the searched literature, and the inclusion or exclusion criteria used to select relevant literature. The recommendations made on therapy are almost entirely based on scientific evidence. If no scientific evidence was available, guideline recommendations were based on the consensus reached within the working group (or a secondary group of professionals).

The epidemiologists in the working group individually selected and graded the documentation that was under consideration as scientific evidence. This resulted in a published systematic review.[7] The scientific evidence was presented to and discussed by the whole working group. Thereafter, a final summary of the scientific evidence, which included details of the amount of evidence available, was made. In addition to scientific evidence, other important factors were taken into account in making recommendations, such as: the achievement of a general consensus, cost-effectiveness, the availability of resources, the availability of the necessary expertise and educational facilities, organizational matters, and the desire for consistency with other monodisciplinary and multidisciplinary guidelines.

Validation by intended users
Before they were published and distributed, the guidelines were reviewed and systematically tested by intended users for the purpose of validation. The KNGF guidelines on stress urinary incontinence were presented three times to a randomly selected group of 71 physical therapists with the required skills who were working in different environments: the first time, for comments on the diagnostic process; the second time, for comments on the therapeutic process; and, the third time, for comments on the guidelines as a whole.[5] The physical therapists' comments and criticisms were recorded and discussed by the working group. If possible or desirable, they were taken account of in the final version of the guidelines. The final recommendations on practice, then, are derived from the available evidence and take into account the other above-mentioned factors and the results of the guideline evaluation carried out by intended users.

Composition and implementation of the guidelines
The guidelines comprise three parts: the practice guidelines themselves, a schematic summary of the most important points in the guidelines, and a review of the evidence. Each part can be read individually. In addition to the publication and distribution of the guidelines to KNGF members, a professional development module has also been produced and published to stimulate use of the guidelines in daily practice.[8,9] The guidelines should be implemented in accordance with the standard method of implementation, which has been described elsewhere.[5,6,10]

Literature
The publications reviewed were collected using the following databases: Index Medicus and Excerpta Medica, on CD-ROM; the Cochrane Library rehabilitation and therapy field, accessed at the University of Maastricht; and the database of the documentation center of the Dutch Institute of Allied Health Professions (NPi). The following keywords were used in the search: stress urinary incontinence, diagnosis, treatment, prognosis and prevention. For

Table 1. Definitions of the terms impairment, disability and participation problem.[16,17]

Impairment: Problem with body function or structure, such as a significant deviation or loss. According to the "Classification of disorders in the storage and voiding of urine and feces", the relevant impairment is 'urge urinary incontinence' or 'stress urinary incontinence'.
Disability: Restriction in the performance of or loss of ability to perform functions and activities in a normal manner, whether qualitatively or quantitatively. According to the "Classification of disabilities in voiding of urine and feces", the relevant disability is 'involuntary loss of urine'.
Participation problem: Problem an individual may experience with involvement in a life situation, perhaps due to an impairment or disability. The individual's normal level of participation depends on age, sex, and social and cultural factors.

interventions, a search was carried out using the following key words: exercise therapy, pelvic floor muscles exercise (PFME), vaginal cone, biofeedback, electrostimulation, and randomized clinical trial (RCT). The search was also performed with corresponding key words in German and Dutch. In total, the search resulted in the identification of 121 studies. The randomized clinical trials were assessed on the basis of the quality criteria described by Kleijnen et al.[11] After this assessment, 22 randomized clinical trials on therapeutic interventions remained.[7]

Focal point of the guidelines

The focal point of these KNGF guidelines is the group of adult patients with stress urinary incontinence (SUI). All other forms of incontinence are excluded. On the basis of diagnostic considerations, a distinction is made between SUI and genuine stress urinary incontinence (GSUI). GSUI is SUI in which urodynamic examination indicates that there is no detrusor activity.[12] Since the primary care physician does not often use urodynamic examinations when diagnosing SUI but instead usually refers the patient directly to a physical therapist, the KNGF guidelines defines SUI as follows: "every case of SUI that has been designated by a referring physician". A study carried out by Lagro-Janssen[13] showed that history-taking by a primary care physician is actually a good method of determining a diagnosis genuine stress urinary incontinence (sensitivity, 78%; specificity, 84%; and predictive value, 87%). History-taking can also be used to identify patients who have more general diagnoses.

Definitions

Discussing incontinence and collecting data about the condition is difficult because there are no standard criteria, categories or terminology. Therefore, the Dutch Foundation for Incontinence (SIN) requested the classification and definition commission of the (Dutch) National Council for Public Health to investigate the standardization of classifications and terminology in the area of incontinence.[14] The commission chose to define health problems in terms of impairments, disabilities and participation problems (see Table 1), as used by the International Classification of Impairments, Disabilities and Handicaps (ICIDH), now known as the International Classification of Functioning, Disability and Health (ICF). The International Continence Society defines urinary incontinence as "the involuntary loss of urine, which is objectively demonstrable, with such a degree of severity that it is a social or hygienic problem".[15]

For reporting and scientific research, the International Continence Society recommends that the term urinary incontinence should be defined precisely. For details, see 'The standardization of terminology of female pelvic organ prolapse and pelvic floor dysfunction.[18] The International Continence Society makes the distinction between urinary incontinence being either a symptom, a sign, or a condition. SUI is regarded as a symptom when the patient reports that there is involuntary loss of urine during exertion. SUI is regarded as a sign when it is observed that involuntary loss of urine from the

urethra occurs synchronously with physical stress (e.g., coughing). SUI is regarded as a condition when SUI is confirmed by observation of the involuntary loss of urine resulting from an increase in abdominal pressure in the absence of detrusor contraction or of an overdistended bladder. Urodynamic examination is necessary to identify this condition.[12]

A comparison of these two ways of describing SUI leads to the following conclusions:

- If the patient complains of involuntary urine loss during physical exertion, there is a disability in being able to urinate at the correct time and place; the International Continence Society classifies this as a symptom.
- The sign characterized by urine loss that can be observed to occur synchronously with exertion and the condition characterized by urine loss with increased of intra-abdominal pressure in the absence of detrusor contraction are, in terms of ICIDH terminology, regarded as impairments in the storage and voiding of urine.
- A major advantage of ICIDH terminology is that it makes it possible to describe the patient's health status associated with SUI in terms of social participation (i.e., in terms of handicaps).

Continence

Two interacting mechanisms are responsible for urinary continence:

1. an internal urethral closing mechanism, which involves:
   - the tunica mucosa;
   - the tunica spongiosa; and
   - the tunica muscularis; and
2. a supporting external mechanism, which involves:
   - pelvic floor muscle function.

The thicknesses of the mucous membrane and the tunica mucosa, and the degree of swelling of the tunica spongiosa determine the internal diameter of the urethra, thereby accounting for approximately one third of the pressure within the urethra. The tunica muscularis, which consists of an inner layer of smooth muscle and an outer layer of striated muscle, actively contributes to the internal urethral closing mechanism.

When body posture and pelvic structure are normal, an increase in intra-abdominal pressure leads to an increase in urethral closing pressure that results from increased smooth muscle activity in the urethral wall caused by sympathetic stimulation.[19] The contraction of pelvic floor muscles during exercise provides an active external contribution to the urethral closing mechanism and prevents the descent or movement of the bladder neck and urethra. This can result in closure of the urethra when intra-abdominal pressure on the pelvic floor increases.[19,20] During exercise, 60% of the closing pressure in the urethra is due to the internal urethral closing mechanism and 40% is due to the active external contribution of pelvic floor muscles.[19]

Stress urinary incontinence

Stress urinary incontinence is present if there is involuntary loss of urine when, during exercise and in the absence of a simultaneous detrusor contraction, the intravesical pressure exceeds the maximum urethral pressure.[12] SUI can be caused by dysfunction of the internal urethral closing mechanism, dysfunction of the external supporting mechanism, or the combination of the two. Dysfunction of the internal urethral closing mechanism may be due to atrophy of the tunica mucosa and tunica spongiosa (e.g., in postmenopausal women) or to a functional disorder of the tunica muscularis (e.g., after a prostatectomy).[21,22] Dysfunction of the external supporting mechanism can be caused by weakness of the pelvic floor muscles due to inactivity or disuse, to damage to local nerve fibers supplying the pelvic floor, to damage to the endopelvic fascia (e.g., due to traumatic childbirth), or to a combination of these factors.[23–29] During exertion, pelvic floor muscle dysfunction can lead to insufficient active external support for the urethral closing mechanism, abnormal descent of the pelvic floor, and hypermobility of the urethra and bladder neck. These problems may occur in conjunction with effacement of the urethrovesical junction, which can obstruct the transmission of intra-abdominal pressure to the urethra.[30,31]

Epidemiology

Involuntary loss of urine is a frequently occurring problem, though the exact number of people with

the condition is unknown. It is estimated that the prevalence of (a certain degree of) urinary incontinence is about 5% in the Dutch population, which means that possibly 800,000 Dutch people aged five years or older are affected by involuntary urine loss.[13,32] The reported prevalence of SUI in women varies from 8%[33] to 26%[34] This variation in reported prevalence may be explained by the fact that studies involved different population groups, in which different definitions of SUI were used. The prevalence of SUI in men under 65 years of age, usually due to transurethral prostatic resection or prostatectomy, is reported to be very low in those attending primary care physicians.[35,36] The estimated prevalence varies from 1.5% to 5%.[37] Generally, SUI in men results from an internal sphincter deficiency caused by surgery, radiation or a neurological disorder.[22]

Costs

The cost of incontinence material has increased dramatically.[38] According to the (Dutch) National Health Service Council, 135 million guilders (60 million euros) were spent on incontinence material in the Netherlands in 1994.[39]

Guidelines target group

These guidelines are intended for use by physical therapists who work with patients with pelvic floor problems. The physical therapist is expected to have demonstrable specific knowledge and skills concerning this group of patients, a positive attitude towards them, and an insight into their problems. In view of current (Dutch) legislation laid down in the "Law on agreement to medical treatment"[40] and the "Law on professions providing individual healthcare",[41] the Royal Dutch Association for Physical Therapists (KNGF) regards the internal examination and treatment of patients as either a 'specified intervention' (e.g., palpation via the vagina or anus) or a 'restricted intervention' (e.g. insertion of an electrode into the vagina or anus), as defined by the legislation.[42]

Specified physical therapy interventions have five characteristics:

1. they are not covered by basic physical therapy training;
2. they are either part of the treatment involved in physical therapy or their use follows logically from the adoption of a particular treatment method;
3. their nature or method of application is relatively new;
4. patients may considered them to be more troublesome than other more general forms of physical therapy; and
5. certain conditions must be satisfied before they can be used.

According to the KNGF, the following conditions need to be satisfied before specified interventions can be used:[42]

- the patient must be provided with the relevant information;
- written consent must be obtained;
- the specified intervention must be validated;
- the agreement of the referring physician must be obtained;
- the demands made on the patient must be estimated;
- the physical therapist must have the requisite skills and expertise; and
- notes must be kept and a treatment plan must be made.

Restricted interventions require even more care in their application. These are interventions that can threaten the patient's health or life if not performed by an expert. The Dutch "Law on professions providing individual healthcare" stipulates that these interventions should only be carried out by physicians, dentists and obstetricians. KNGF requirements for interventions that involve the insertion of a catheter or electrode are the same as those for interventions that are legally defined as restricted interventions. This means that, according to KNGF guidelines, physical therapists may only use these interventions if they are explicitly requested to do so by a referring physician. In addition, the conditions applied to specified interventions also need to be satisfied.[42]

In conclusion, a physical therapist is permitted to examine and treat a patient internally if the referring physician has requested or agreed to the procedure

and if the patient has agreed after being fully informed about the proposed treatment and possible alternatives. Physical therapists carrying out these interventions are expected to have demonstrable specific knowledge and skills, a positive attitude and understanding.

In physical therapy, a number of quality criteria must be satisfied.[43] Any group treatment or training must be preceded by an individual exploratory interview in which the patient is informed about possible alternative approaches. If the patient decides, together with the physical therapist and the referring physician, to exercise in a group, treatment has to be evaluated individually at least once.

Referral

In the Netherlands, a referral to a physical therapist must be made by a primary care physician or a medical specialist, for example, a urologist or gynecologist. The primary care physician can use the Dutch College of General Practitioners (NHG) guidelines on urinary incontinence.[1] These guidelines describe diagnosis in adults with, for example, stress urinary incontinence and the policy primary care physician should adopt with these patients. The primary care physician can treat patients with SUI adequately in accordance with these guidelines without using medications if he acknowledges the problems involved and, in addition, has some degree of expertise. The primary care physician himself can instruct the patient in how to contract the pelvic floor muscles and, thereafter, the patient can exercise at home by following verbal and written instructions. The primary care physician will refer the patient to a specialized incontinence nurse or to a physical therapist if he judges it appropriate. This may be the case if the patient is unable to contract the appropriate muscles by following instructions or if the primary care physician does not regard himself as being the best person to provide appropriate exercise therapy. If he provides instruction himself, the primary care physician should see the patient again after six weeks to evaluate the results of the prescribed exercises. According to NHG guidelines, treatment should not be continued if there is no improvement within three months. Shortly before the publication of the NHG guidelines, about 15% of primary care physicians referred patients to physical therapists without first providing exercise instruction themselves.[44] In commenting on the NHG guidelines, urologists recommended greater involvement by physical therapists in the treatment of SUI.[45] Data on the referral of patients with SUI to physical therapists made by medical specialists are scarce.

The referring physician is responsible for making an indication for the use of physical therapy. This means that it is the referring physician who judges whether physical therapy can contribute to satisfying the patient's needs. The referring physician has to have enough knowledge about the potential of physical therapy for the referral to be made responsibly. It is remarkable, then, that a study by Kerssens and Curfs[45] indicated that a significant proportion of primary care physician questioned thought that they had insufficient knowledge about the potential of physical therapy in general. A study by van Dongen et al.[46] indicated that about 40% of primary care physicians never referred patients with SUI to physical therapists.

Requesting physical therapy

After the patient has been examined by the referring physician, any request for physical therapy must be accompanied by the following data:

- the date of referral and the patient's particulars, such as date of birth, sex, address and health insurance details;
- details of the diagnosis of SUI, including its severity (see Table 3 and Figure 1 below in the section on diagnostic analysis);
- details of the therapy requested and of any previous therapy used;
- details of causal factors, such as the course and number of any deliveries, or trauma or surgery in the pelvic region, such as vaginal or abdominal uterus extirpation, or transurethral prostatic resection;
- details of any local inhibitory factors that could impede recovery or adjustment, such as a prolapse, congenital disorder or hernia;
- details of any general inhibitory factors that could impede recovery and adaptation, such as diabetes, cardiovascular disease, medication use (e.g. of psychopharmaceuticals), or stressful psychosocial

factors; and
- the diagnostic findings of the primary care physician and medical specialist, if appropriate, for example, on the patient's ability to contract and relax pelvic floor muscles with or without awareness of the muscles, or on the patient's strength.

The purpose of providing these data is not to enable conclusions to be drawn about whether the diagnosis of SUI and the related referral are justified. They are needed to formulate physical therapy objectives and to decide on the strategy to be used in the individual patient so that appropriate therapy can be provided. It is important to discover whether there are any local or general inhibitory factors that could impede recovery and adaptation and which cannot, or can only to limited extent, be influenced by physical therapy. Logically, these factors may have implications for the therapeutic strategy selected and for the result of treatment. It is recommended that standard referral documentation is used.

Diagnosis

The terms impairments, disabilities and participation problems, which are derived from the International Classification of Impairments, Disabilities and Handicaps, are used to describe the severity of the health problems associated with SUI. The objective of physical therapy is to reduce impairments, disabilities and participation problems, or to improve functions, abilities and social participation. If and to what extent this goal can be achieved depends on the nature of the disorder responsible for SUI, on whether or not local or general inhibitory factors that impede recovery and adaptation are present and on the extent to which these factors can be influenced by physical therapy. The physical therapy diagnostic process, supplemented by referral data, must result in enough information to judge the severity of the health problem and to evaluate whether and to what extent the underlying disorder and any inhibitory factors can be influenced by physical therapy. This information is needed to formulate the treatment plan and make it as specific as possible.

History-taking

History-taking, together with physical examination, underlies the treatment process. The essential relationship of trust between patient and physical therapist begins then. History-taking covers the patient's medical and health details, mode of communication, and attitude. Though limited in extent, it must be carried out purposefully and systematically. The questions asked during history-taking can be divided into a number of categories, as follows.

(I) Questions to assess the severity and course of the disorder, including the use of any aids, in terms of impairments, disabilities and handicaps:
- When does urine loss occur? For example, while lifting, coughing, sneezing, or participating in sport.
- Do you feel the urge to void urine during urine loss?
- How much urine do you lose? (jet = +++; splashes = ++; drops = +)
- How often do you lose urine? (once or many times a week or day)
- Which part of the day? (morning, afternoon or evening)
- Do you use pads or other protective material? (small, medium or large)
- Do you visit the toilet frequently? For example, because of a fear of urine loss or because of an increased frequency of micturition.
- Does urine loss affect your normal daily activities? For example, activities associated with work, sport, housework, social life or sexuality.
- Can you describe your toilet posture?

During history-taking, the patient should complete the PRAFAB questionnaire, as shown in Table 2, as part of the standard procedure.

(II) Questions to determine the nature of the underlying disorder, taking into account a number of possible causal factors:
- Start and course of the condition (e.g., after surgery or childbirth, or postmenopausal);
- Number of births and their nature (e.g., patient had to push for a long or short time, weight of the child, forceps or vacuum delivery, tearing or

Table 2. PRAFAB questionnaire questions (47).

Protection
1. I never use protection for urine loss.
2. I use protection sometimes, or I have to change my underwear because of urine loss.
3. I normally use protection, or I change my underwear several times a day because of urine loss.
4. I always have to wear protection because of urinary incontinence.

Amount
1. The amount of urine lost is just a drop.
2. Sometimes I loose a small quantity of urine.
3. Urine loss is so great that it wets my protective pad or clothing noticeably.
4. Urine loss is so great that my protective pad is soaked or leaks.

Frequency
Involuntary loss of urine occurs:
1. once a week or less.
2. more than once but less than three times a week.
3. more than three times a week, but not every day.
4. every day.

Adjustment
Implications of urine loss:
1. My normal daily activities have not been restricted.
2. I have stopped some activities, such as some sports and some physically demanding activities.
3. I have stopped most physical activities that cause involuntary urine loss.
4. I almost never go out.

Body image
1. I do not worry about urine loss.
2. I think urine loss is annoying and troublesome, but I am not greatly bothered by it.
3. I find urine loss disgusting.
4. I am disgusted by myself because of my urine loss.

incision, or cesarean section);
- Surgery in abdominal or pelvic region (e.g., vaginal or abdominal uterus extirpation, bladder neck suspension surgery, anterior and posterior wall repair, anterior and posterior colporaphy, prostate surgery, or lumbar surgery for a herniated disk, leading to possible denervation problems);
- Trauma;
- Congenital disorder.

(III) Questions to assess local inhibitory factors impeding recovery and adaptation:
- Do you suffer from obstipation?
- Do you suffer from complaints before, during or after menstruation?
- Do you use diuretics?
- Has the physician observed any hernias or prolapses?

(IV) Questions to assess general inhibitory factors impeding recovery and adaptation:
- Do you have any other disorders or complaints? (e.g., cardiovascular disease, neurological disorders, diabetes, or chronic obstructive

pulmonary disease)
- Do you use any other medications? (e.g., psychopharmaceuticals, parasympathomimetics, sympathomimetics, sympatholytics or estrogens)

(V) Questions to assess general factors. Record:
- Personal data;
- Efforts the patient makes to alleviate SUI.

It is recommended that standardized registration forms are used during history-taking to clarify the physical therapy diagnostic process.

Physical examination
Physical examination comprises visual examination of the patient at rest and during movement, palpation, and functional examination. The objectives are:
1. to assess the extent to which the pelvic floor can be controlled with awareness;
2. to assess pelvic floor function; and
3. to assess the extent to which pelvic floor function is disturbed by the actions of other parts of the locomotor system.

The physical examination focuses particularly on obtaining knowledge about the impairment itself, which, here, means the impairment in pelvic floor muscle function. The methods available to the physical therapist are visual examination of the patient at rest and during movement, palpation, and functional examination.

Some physical therapists who provide physical therapy for patients with pelvic floor problems are willing to carry out internal examinations and treatment, whereas others are not. The description of the diagnostic and therapeutic processes given in the guidelines specifically mentions every occasion on which local internal examination of the genital and anal region is involved. If a physical therapist, after consultation with the patient and after agreement, decides that an internal examination is necessary, he must ensure that he is fully informed about all the different factors involved.

If an internal examination is included in the physical examination, the genital and anal region must be examined on only one occasion. This can include visual examination of the patient at rest and during movement, palpation, and functional examination, as far as these involve internal examination.

For the sake of clarity, the general sequence of the physical examination is described below.

Visual examination with the patient at rest
General:
- general impression;
- posture while standing and sitting (to evaluate, for example, the urogenital and anal triangles, and abdominal pressure);
- respiration (e.g., breath-holding and vocalization behavior).

Local and regional:
- observation of abdominal and pelvic region;
- local observation of genital and anal region.

Additional internal examinations
Examination position: patients lie on their backs with their knees bent and spread apart. The physical therapist must wear gloves and take normal hygienic precautions.

Visual examination of the upper thighs and labia
- look for skin irritation, as this often points to constantly wet skin or to inadequate protective measures.

Visual examination of the perineum, and the entrance to and distal part of the vagina
The inner and outer labia must be opened. For this purpose, gel or lukewarm water may be used:
- in the perineum, look for any scars due to ruptures or incisions, and for atrophy of the pelvic floor muscles;
- inspect the urethral opening;
- inspect the entrance to the vagina.

Be aware of any possible signs of vaginitis (e.g., red and dry tissue instead of rose-colored and moist tissue) or leukorrhea, and exclude fungal infection.

Visual examination of the vagina
- Look for the presence of urethrocele, cystocele, prolapse of the uterus, or rectocele;

- Look for varices.

Visual examination during movement
General:
- mobility and muscle tone (e.g., in the spinal cord, abdominal and pelvic regions);
- movement patterns.

Local and regional:
Visual examination and observation of muscles in the abdomen, buttocks and leg. In particular, when the pelvic floor muscles are fatigued, there is increased activity in other muscles.

Additional internal examinations
Visual examination and observation during the contraction of the pelvic floor muscles
Provide brief instructions on how to contract the pelvic floor and, thereafter, ask the patient to contract the pelvic floor muscles.
Observations:
- when the contraction is strong, wrinkling and retraction can be observed in the vaginal entrance, anal sphincter, and perineum;
- when the contraction is weak, only slight wrinkling can be observed, with perhaps no movement of the perineum.

Visual examination and observation while coughing
1. Ask the patient to cough.
   Observations:
   - if the pelvic floor area is strong and healthy, there is no or little movement of the vaginal entrance or the perineum;
   - if the pelvic floor area is weak, the perineum may descend or there may be opening or bulging of the vaginal entrance, or a combination of these events, which may be associated with a prolapse or urine loss.
2. Ask the patient to cough again, but this time instruct him or her to contract the pelvic floor muscles.
   Observations:
   - Determine if there are any differences visible between the effects of tests 1 and 2.

Functional examination by palpation and tests
The pelvic floor muscles form part of a group of muscles that principally comprises the M. extensor hallucis longus, the M. biceps femoris, the M. obturatorius internus, the M. rectus abdominis, the M. obliquus internus and externus, the M. latissimus dorsi, and the cervical flexors. Pelvic floor muscle function cannot be observed in isolation from the functioning of this muscle group.[48,49] Whenever this muscle group functions badly, the pelvic floor muscles also function badly. During movement, muscles work together not alone. They support, activate and inhibit one other: a series of movements is called a muscle chain.

In the pelvis, the pelvic floor is connected on its left and right sides to the M. obturatorius internus by fascial sheaths. If the M. obturatorius internus is placed under tension by exorotation of the leg, the pelvic floor will also be placed under tension. It can be concluded that the pelvic floor can only be tensed if there is exorotation of the leg. At the front, the pelvic floor is connected to the pubic symphysis by tendons and to abdominal muscles by fascial sheaths and, at the back, to the coccyx by tendons and to the fascia thoracolumbalis by fascial sheaths. There is also a connection to the M. gluteus maximus.

Abdominal pressure can only be adequately counteracted if the appropriate muscle groups contract in unison to provide support. Consequently, abdominal and pelvic floor muscles must work together to counteract abdominal pressure. Stabilizing structures in the pelvis help to make this possible. It makes sense, therefore, to test the strength, speed and coordination of the muscles that comprise the above-mentioned muscle group. If the muscle group is not functioning optimally, this can contribute to pelvic floor muscle dysfunction, with SUI occurring as a result. Thus, it is important to determine where the weak element in the muscle group is located.

Additional internal examinations
The pelvic floor can be palpated vaginally or rectally. Palpation is used to determine the size of the muscles, muscle resting tone, the strength of contraction, and reflex reactions to coughing.[50]

Vaginal palpation
The patient's position during palpation is the same as that for the visual examination with the patient at rest.
Palpation is used to determine:
- the vagina entrance, muscle tone and accessibility
- the tone of the levator ani muscle and urogenital diaphragm;
- diastasis of the levator ani muscle during contraction;
- the presence of scars;
- proprioception;
- sensitivity on the left and right sides;
- ventral pain on the left and right sides;
- dorsal pain on the left and right sides;
- pain trigger points on the left and right sides;
- the existence of levator ani muscle atrophy;
- the presence of hernias; and
- whether the female patient uses a pessary.

Anal palpation
The examination position is with the patient on the left side with legs raised.
Palpation is used to determine:
- anal sphincter tone at rest;
- the extent of any anal sphincter defects;
- the presence of rectocele;
- the strength, endurance and, exhaustion of the levator ani muscle (only men); and
- the functioning of the puborectal muscle.

Specified tests
Tests on the above-mentioned muscles should be performed in accordance with the method suggested by Kendall et al.[51]

Testing the coordination of abdominal and pelvic floor muscles by indirect palpation
Examination position: with the patient in supine position, in underwear. The examiner lays one hand on the anal cleft at the level of the anus and the other hand on the abdomen with the thumb at the level of pubis.

The examiner asks the patient:
- to cough; and
- to blow forcefully into a hand.

The pelvic floor is palpated indirectly and both muscle groups are palpated directly.

Reflexes in the pelvic floor are observed. If the pelvic floor is strong and healthy, the pelvic floor muscles contract at the same time as the abdominal muscles. If the pelvic floor area is weak, the pelvic floor bulges when the abdominal muscles contract. This test is then repeated with the patient in a standing position as this places the pelvic floor under more pressure.

Testing pelvic floor muscle strength by (in)direct palpation
The examination position is the same as for the above test. The tests consists of two parts:
1. The patient is asked to contract the pelvic floor muscles. By palpation, the examiner can feel via the abdomen whether the fascia that connects the pelvic floor to the lowest abdominal muscles is under tension. As the pelvic floor contracts, the anal cleft should retract and the perineum should rise. If this does not occur, there is pelvic floor dysfunction. The examiner also observes how the patient breathes during this activity.
2. The patient provides feedback (proprioception).

The examiner determines the strength of the muscular contractions and where they occur (i.e., ventrally or dorsally, left or right) and whether associated contractions occur in the muscles of the abdomen, buttocks or leg.

Subsequently, the examiner tries to get an indirect impression of pelvic floor muscle strength from feedback from the patient. The objective is to get an impression of muscle strength, muscle endurance, the number of possible repetitions, the number of fast contractions (i.e., lasting less than one second), and the number of slow contractions.

Micturition score
If history-taking indicates that urination is abnormal, the patient is asked to record how much he drinks and when, and how much he urinates and when over a 24-hour period. In evaluating micturition, the examiner derives a score from urination frequency, the total amount of urine produced, the amount of urine voided on each occasion, and how urination is

distributed over the 24-hour period. With knowledge of eating and urination patterns, advice can be given. Correct toilet behavior encourages continence.[49]

Toilet posture and toilet behavior
The pelvic floor plays an important role in micturition and defecation. If the posture adopted in the toilet is good, with relaxed pelvic floor muscles and relaxed respiration, conditions are optimal for emptying the bladder and bowls. Poor toilet posture or behavior, characterized for example by straining, can have an unfavorable effect on the pelvic floor.

Tests
Muscle strength and fatigue test
- maximum contraction duration without extraneous movement;
- sub-maximal contraction duration before fatigue occurs;
- number of contractions before fatigue occurs.

Stopping test
- possibility of interrupting or slowing the urine stream.

The stopping test increases awareness of the pelvic floor. It has to be acknowledged, however, that some examiners report that an abnormal urination pattern can result from performing this test too many times.[52]

Blowing test
- the patient blows forcefully three times into an uninflated balloon, while standing with legs slightly spread and with a half-full bladder. This tests the ability of the pelvic floor to sustain a persistent effort. It is noted whether urine loss occurs.

Lifting test
- a number of weights are lifted, thereby elevating abdominal pressure. It is noted whether the elevated pressure leads to urine loss.

Proprioception test
- to ascertain whether anal or urethral retraction can be felt on active muscular contraction.

Additional internal examinations
Tests
Muscle strength of pelvic floor muscles:
- muscle strength on left and right sides;
- levator ani muscle strength;
- urogenital diaphragm strength.

Using the PERFECT scheme
Subsequently, pelvic floor muscle strength can be determined using the PERFECT scheme. In this test, the examiner's middle finger and forefinger are inserted about three centimeters into the vagina. Muscle power (P), muscle endurance (E) or fatigue, the number of repeated (R) contractions, the number of fast (F) contractions lasting less than one second, and the number of slow contractions, with every (E) contraction (C) timed (T), are recorded. The PERFECT scheme is a simple way of evaluating muscle strength in the pelvic floor. In addition, use of this scheme generates data about fast and slow muscles, which provides information that can be used in devising a patient-specific treatment program.[50] The PERFECT scheme is a reliable and valid way of determining muscle strength.[53]

Analysis
The objective of the physical therapy diagnostic process, which supplements referral data, is to determine, as accurately as possible, whether and to what extent physical therapy can influence the disorder underlying SUI and any contributing inhibitory factors. During analysis, indications for treatment by physical therapy are clearly defined on the basis of information obtained during diagnosis. On the assumption that the referring physician has diagnosed SUI correctly, the severity of the disorder (i.e., grade 1–2 or grade 3–4) has to be determined using the PRAFAB questionnaire or the Inco-test,[47] or both, as shown in Table 3. The severity score that can be derived using Lagro-Janssen's classification scheme,[13] as shown in Figure 1, is less suitable for measuring the effects of treatment. For this reason, the guidelines' working group recommends the use of the PRAFAB questionnaire for diagnosis and for evaluating the result of treatment. Moreover, the PRAFAB questionnaire can be used to evaluate the effects of treatment on disabilities and participation problems.

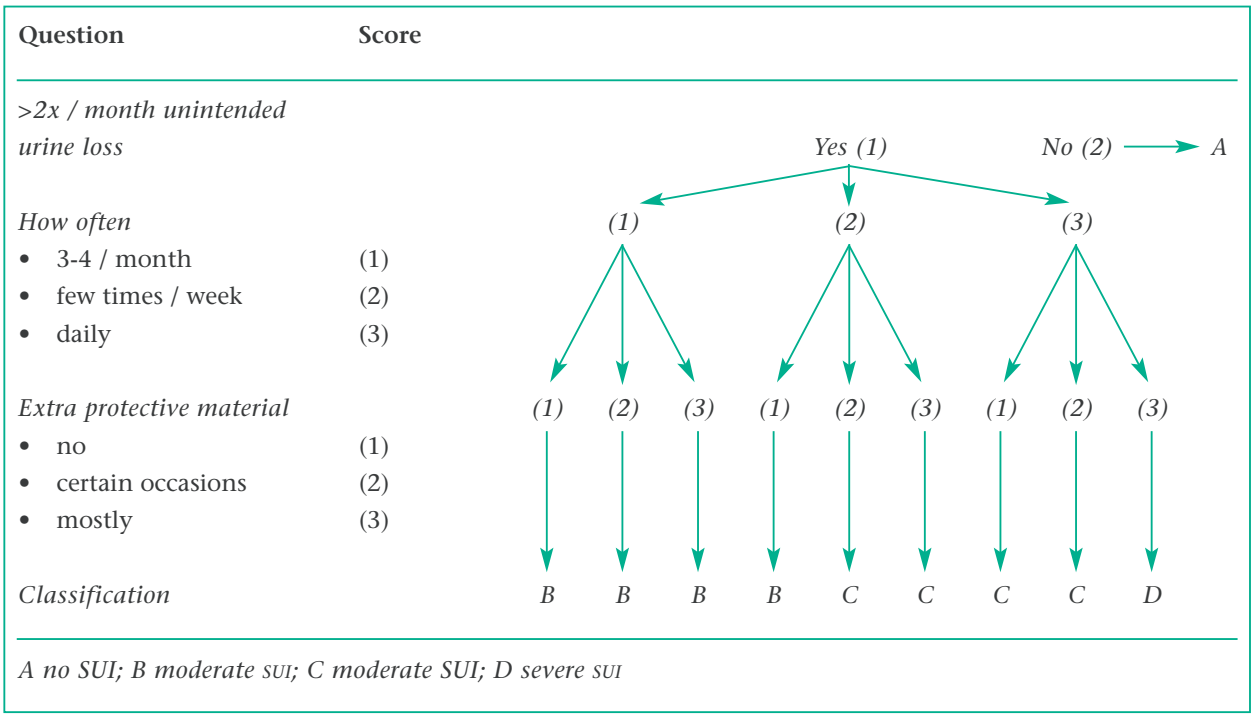
Table 3. Grading SUI severity.

Severity	Urine loss (Inco-test)	Protective material (PRAFAB)
1. (light)	< 20 g per 48 hours	None
2. (moderate)	20–100 g per 48 hours	Occasionally
3. (severe)	100–200 g per 48 hours	Constantly, except while resting
4. (very severe)	> 200 g per 48 hours	Day and night

Adapted from Mulder and Vierhout[47]

Although surgery is described as the most effective form of therapy in patients with severe SUI (i.e., grades 3 and 4)[54] and physical therapy, involving pelvic floor re-education, is the therapy of first choice in moderate and light SUI (i.e., grades 1 and 2),[55] it is recommended that all patients, irrespective of SUI grade and including severe cases, start with non-surgical forms of therapy.[22,56] The reason for this recommendation is the observation that pelvic floor re-education produces sufficiently good results in some patients that surgical intervention becomes unnecessary.[57] Moreover, if surgical intervention is still needed because therapy has not produced sufficient benefit, the patient's condition will have improved in the meantime. In addition, this improvement can have a positive impact on recovery after surgery and can reduce the risk of postsurgical complications.[12] Norton et al.[4] advise exercise therapy before surgical interventions in the urogenital area to prevent postsurgical complications. Another reason for having reservations about surgical interventions is because the long-term results of these interventions as treatment for SUI appear to be less successful than was earlier believed.[58] The high prevalence of SUI and the fact that surgical intervention, which entails a risk of permanent damage to the pelvic floor, is not the most suitable solution for all patients[59–62] have led to a renewed interest in the use of conservative treatments for SUI.[59,63]

Figure 1. SUI severity grading as suggested by Dutch College of General Practitioners' (NHG) guidelines.



It can be concluded that:
- a diagnosis of SUI that is made on the basis of history-taking by the primary care physician is not always correct; and
- when a referral is made, the severity of SUI is important for prognosis and for evaluating the effects of interventions, but may not help the physical therapist select the most appropriate treatment strategy.

Most patients are referred by primary care physicians with suspected stress urinary incontinence, without the nature of the underlying disorder being clear. Consequently, it cannot always be predicted beforehand whether and to what extent SUI can be influenced by physical therapy. Therefore, physical therapy can be considered as a pilot treatment, and it is only possible to discuss the extent to which physical therapy might influence SUI on the basis of possible prognostic factors.

In terms of these prognostic factors, the following specific complaints can be distinguished:

- *SUI with pelvic floor muscle dysfunction*
  Pelvic floor muscle dysfunction involves failure of external supporting mechanisms. Concurrent dysfunction of the internal urethral closing mechanism cannot, however, be excluded by the physical therapist's diagnosis. Poor functioning of pelvic floor muscles may be due to weak pelvic floor muscles resulting from inactivity or misuse, to lesions in local nerve fibers supplying the pelvic floor, to lesions in the endopelvic fascia, which may be due to traumatic partus, or to a combination of these factors.[23–27,29] The objective of pelvic floor muscle exercises in this group of patients to improve the pelvic floor muscles' ability to provide external support. In addition, there may be some compensation of possible internal urethral closing mechanism dysfunction. It is impossible to detect lesions in the endopelvic fascia using the diagnostic techniques available to the physical therapist. Depending on their severity and extent, these lesions can prevent the recovery of normal pelvic floor muscle function.[29]

- *SUI with pelvic floor muscle dysfunction with no awareness of pelvic floor muscles*
  When there is pelvic floor muscle dysfunction without awareness of pelvic floor muscles (i.e., in terms of their contraction and relaxation), electrostimulation, biofeedback, digital assessment by the patient or physical therapist, or some combination of these techniques is indicated. After awareness has been successfully restored using these interventions, treatment using pelvic floor muscle exercises is possible. First, isolated contractions of the pelvic floor muscles are practiced, followed by contractions during the performance of normal daily activities, initially with awareness. Activities are then increased in complexity from single to multiple tasks so that, ultimately, automatic functional use of the pelvic floor during normal daily activities and sports can be achieved. If awareness of the pelvic floor muscles cannot be achieved, the patient must be referred back for further evaluation. Failure to adequately restore awareness can result from concurrent internal urethral closing mechanism dysfunction or from lesions in the endopelvic fascia. If the former occurs in older postmenopausal woman, estrogens can be expected to have a positive effect. If the latter occurs when incontinence is caused by traumatic delivery, further evaluation by a medical specialist is necessary.

- *SUI with pelvic floor muscle dysfunction with awareness of pelvic floor muscles*
  When there is pelvic floor muscle dysfunction with awareness of pelvic floor muscles, exercises are indicated. The objectives are, initially, to enable the patient to perform normal daily activities, in increasing complexity from single to multiple tasks, and, then, to achieve automatic control of the pelvic floor during normal daily activities and sports. If the results of treatment are limited, the cause may be concurrent internal urethral closing mechanism dysfunction or lesions in the endopelvic fascia. If the former occurs in older postmenopausal woman, estrogens can be expected to have a positive effect. If the latter occurs when incontinence is caused by traumatic delivery, further evaluation by a medical specialist is necessary.

- *SUI with pelvic floor muscle dysfunction in which pelvic floor muscle function is disturbed by breathing or other actions of the locomotor system*
  In addition to giving pelvic floor muscle exercises, attention should be paid to reducing the deleterious influence of breathing or other actions of the locomotor system by treating the disorders responsible as far as possible.

- *SUI without pelvic floor muscle dysfunction*
  When there is SUI without pelvic floor muscle dysfunction, internal urethral closing mechanism dysfunction is clearly the cause. The dysfunction may have been caused by catheterization, by a prostatectomy in men, or by atrophy of the internal sphincter. The last of these possibilities occurs especially in postmenopausal women. It is unlikely that physical therapy interventions can influence internal urethral closing mechanism dysfunction. Therefore, the objective of pelvic floor muscle exercises in this group of patients is to compensate for internal urethral closing mechanism dysfunction as far as possible by improving the pelvic floor muscles' ability to provide external support. The effect of pelvic floor muscle exercises is strongly dependent on neuromuscular tracts being intact. It is important that there are no serious defects in interconnections between different components of the pelvic floor. A serious defects caused, for example, by a traumatic lesion in the endopelvic fascia could interfere with normal functional recovery.

- *The existence of general factors, other than SUI, that inhibit recovery and adaptation*
  A number of inhibitory factors, such as cardiovascular disease and hormonal changes, cannot be influenced by physical therapy. Their presence is prognostically important, however, because they can delay recovery or adaptation. In addition, aging eventually results in the loss of nerve and muscle tissue and alters the structure of connective tissue. These changes also have a negative influence on the result of treatment and physical therapy has little effect on them. Other inhibitory factors, such as misconceptions, shame, avoidant behavior and problems with social participation, can be influenced by the physical therapist through the provision of adequate information and training.

Prognostic factors

A knowledge of prognostic factors is important for estimating the likely extent and rate of recovery. In addition to SUI severity, successful pelvic floor re-education depends on the duration of the complaint, whether the patient is in the postpartum period, whether the patient is premenopausal or postmenopausal, previous surgery, the patient's age and general condition, the intensity of the physical therapy intervention, the physical therapist's care and enthusiasm, and the patient's motivation.[64,65]

Wilson et al.[66] examined 60 women who had received four different types of treatment involving therapeutic exercises. They compared the characteristics of patients who had positive responses with those of patients who had negative responses. Age, the amount of urine loss, and surgical history all appeared to be important prognostic factors. Young patients, who had slight or moderate forms of incontinence and who had not undergone earlier unsuccessful surgery, showed the best results. However, similar studies carried out by Kujansuu[67] and by Sandri et al.[68] failed to confirm these results. Neither the number of pregnancies nor body weight had a predictive value.

According to Tapp et al.,[69] women who are not menopausal and who have moderate complaints that have lasted only a short period of time have the greatest chances of recovery. However, Bø et al.[65] observed that patients who had positive responses were slightly older, had more severe complaints and had complaints that had lasted longer than patients with negative responses. Moreover, some were overweight.

Because of these contradictory findings, it has to be concluded that there are, at present, few prognostic clinical factors that predict a positive treatment response. Attempts to find urodynamic factors that have a predictive value for successful pelvic floor re-education lead to the same degree of confusion[55] In a review of studies on this topic, Hilton[55] concluded,

with extreme caution, that maximum urethral closing pressure during exertion, functional urethral length during exertion, and perineometry can predict which patients are likely to benefit from pelvic floor re-education.

Therapy

Therapy starts with explaining the condition to patients and providing information. Understanding the health problem will motivate the patient to start therapy.

The specific objectives of physical therapy in individual patients are formulated in terms of reducing impairments, disabilities and participation problems, or in terms of improving functions, abilities and social participation. On the basis of diagnostic findings, a treatment plan is drawn up in which treatment goals and the times at which they must be met are explicitly formulated. The strategy adopted to achieve these goals involves the combined actions of patient and physical therapist, both of whom have their own interests, desires and expectations. It is important to explain what is expected of the patient and what the patient can expect from the physical therapist. A number of important concepts are explained: for example, what stress urinary incontinence is, what bladder function is, where and how urine production occurs, the relationship between the kidneys, bladder and pelvic floor, and the effect of respiration on the pelvic floor.

Before patients can exercise the pelvic floor effectively, they must know where the pelvic floor is situated, what its function is, and how it can be contracted and relaxed. For this purpose, educational material in the form of anatomical diagrams and models can be used.

For long-term success, behavioral change is necessary and, for this purpose, the provision of information and training are important, especially with regard to pelvic floor use and micturition behavior. Although the provision of information and training are regularly part of the therapeutic process, here, for didactic purposes, the treatment objectives and the appropriate treatment plan for each specific complaint are described first. This is followed by a description of the different forms of treatment and, thereafter, attention is given to the provision of information and training.

As mentioned above, in the discussion of analysis, it cannot be predicted beforehand whether and to what extent the health problems associated with SUI can be influenced by physical therapy. By taking possible prognostic factors into account, a number of specific complaints can be distinguished. However, the treatment given has to be considered as pilot treatment. It normally involves 6–9 visits. Whether or not treatment objectives are achieved is of diagnostic significance. It can become clear that there is an underlying disorder that cannot be influenced by physical therapy and that further evaluation of the problem is necessary.

Descriptions of treatment objective and plan for each specific complaint

- ***SUI with pelvic floor muscle dysfunction with no awareness of pelvic floor muscles***
  Objective: patient becomes aware of pelvic floor muscles.
  Therapy: electrostimulation or biofeedback, or both. After the successful induction of awareness, pelvic floor muscle exercises have to be performed and the patient is encouraged to exercise by himself or herself.

  The physical therapist's treatment strategy must focus on enabling the patient to achieve awareness of the pelvic floor. The physical therapist who does not use an internal method of treatment can employ techniques such as instruction and feedback, for example, by asking the patient herself to carry out digital vaginal palpation or to use vaginal cones. If the results of this approach are unsatisfactory, the patient can be referred to another physical therapist who does use an internal method of treatment. Physical therapists who use internal methods of treatment can treat these patients by electrostimulation, either during pelvic floor muscle exercises or separately. Biofeedback can also be applied during pelvic floor muscle exercises.

If awareness cannot be achieved during the pilot treatment, the patient should be sent back to the referring physician. This may occur, for example, when there is a central or peripheral neurological problem that cannot be identified by the physical therapist. If the patient does become aware of the pelvic floor muscles, treatment can be continued as described below.

- ***SUI with pelvic floor muscle dysfunction with awareness of pelvic floor muscles***
  Objective: full recovery of pelvic floor muscle function.
  Therapy: exercise therapy for pelvic floor muscles that involves exercises at home. An option for women is pelvic floor muscle exercises using vaginal cones.

  Therapy starts with asking the patient to make isolated contractions of the pelvic floor muscles. If able to do this, the patient should then try to perform a single task, such as a specific normal daily activity, while being aware of the pelvic floor muscles. Thereafter, double and multiple complex tasks should be attempted to help the patient achieve automatic control of the pelvic floor muscles during normal daily activities. It should be noted that it may be difficult for very old people to perform double and multiple complex tasks while maintaining awareness and automatic control of the pelvic floor muscles because of concentration problems, for example.

  Unsatisfactory results can be caused by concurrent internal urethral closing mechanism dysfunction or endopelvic fascia lesions. In postmenopausal women, internal urethral closing mechanism dysfunction may be caused by changes in hormonal status. In these cases, the pilot treatment will still have a positive influence on SUI because pelvic floor muscle function will be improved, thereby compensating for internal urethral closing mechanism dysfunction. However, this will probably not lead to full recovery. Combination with pharmacological therapy in this category of women is possible.[70,71] If the results of physical therapy are unsatisfactory, the patient should be sent back to the referring physician.

- ***SUI with pelvic floor muscle dysfunction in which pelvic floor muscle function is disturbed by breathing or other actions of the locomotor system, or by toilet posture, behavior or regime***
  Objective: the reduction or elimination of the adverse influences of breathing or other actions of the locomotor system, or of toilet posture, behavior or regime. In addition, improvement of pelvic floor function.
  Therapy: exercise therapy involving, for example, exercises to ensure adequate breathing, relaxation exercises, posture exercises, instruction on lifting, and exercises to improve toilet posture, toilet behavior and toilet regime. In addition, pelvic floor muscle exercises and exercises to be carried out at home are specified for improving pelvic floor muscle function. More information is given below in the sections on providing information and prevention. If results are unsatisfactory, the patient should be sent back to the referring physician.

- ***SUI without pelvic floor muscle dysfunction***
  Objective: compensation for other types of dysfunction.
  Therapy: pelvic floor muscle exercises and exercises to be carried out at home. An option for women is pelvic floor muscle exercises using vaginal cones.

  Since SUI is present without pelvic floor muscle dysfunction, it is likely that there is dysfunction of the internal urethral closing mechanism (i.e., the internal sphincter). Physical therapy aims to reduce the impairments and disabilities resulting from SUI. The chance of achieving total recovery by using pelvic floor muscle exercises is small. In postmenopausal women, the physician may decide to combine physical therapy with pharmacological therapy (i.e., hormone supplementation). If the results are unsatisfactory, the patient should be sent back to the referring physician.[70,71]

- ***The existence of general factors, other than SUI, that inhibit recovery and adaptation***

Objective: maximum possible reduction in the effects of inhibitory factors.
Focal points: some of these general factors, such as cardiovascular disease or hormonal changes, cannot be influenced by physical therapy, but they are important for prognosis because they can delay recovery or adaptation. On the other hand, other factors, such as misconceptions, shame, avoidant behavior and participation problems, can be influenced by the physical therapist through the provision of adequate information and training, as can factors affecting compliance with therapy.

Caution should be applied in using internal interventions and diagnostic techniques in the treatment of adults with stress urinary incontinence, because:
- the elderly may have vaginal or anal atrophy;
- some women may have intact hymens;
- some patients may have sexual problems, such as vaginismus;
- some women may be pregnant; and
- some patients may have urogenital or anal infections, or hemorrhoids.

In addition, the guidelines on hygiene during medical procedures in the pelvic region issued by the Dutch Association for Physical Therapy in Pelvic Disease and Perinatal Care (NVFB) should be followed.[72] Any doubts about the use of internal interventions or therapeutic techniques should be discussed with the patient and the referring physician, and all relevant ethical and legal factors should be taken into account.

Forms of treatment
The different forms of treatment that can be used in treating adults with stress urinary incontinence are:
- exercise therapy comprising pelvic floor muscle exercises;
- biofeedback;
- electrostimulation; and
- the use of vaginal cones.

Pelvic floor muscle exercises
Exercise therapy given in combination with the provision of information and training is an example of a so-called behavioral technique.[56] Within the scope of these guidelines, behavioral techniques are interventions that involve a low risk for the patient, that are administered by physical therapists with special training in the underlying complaint, and whose objective is to reduce involuntary urine loss. The major advantages of pelvic floor muscle exercises are that there are no side effects and that future alternative forms of therapy remain possible, if required.

The pelvic floor is a complex, continuously adapting, coherent organ system that comprises different structures with various material properties. The bladder and intestines are interconnected with the pelvic floor and, therefore, form part of it. In healthy people with no disorders, the strength and endurance of the levator ani muscle are highly variable.[73] Therefore, it is not possible to standardize physical therapy on the basis of achieving optimal values for the strength, velocity and endurance of pelvic floor muscles. This view is confirmed by the available literature on the many different norms concerning this topic.[74] The most important objective of pelvic floor muscle exercises is to restore pelvic floor function to the highest degree possible. This means that some patients will become dry quickly and easily, whereas this will never be fully achieved in others.

Treatment and training in groups
Pelvic floor muscle exercises can be practiced alone or in a group. If exercise therapy is indicated and the patient does not wish individual therapy, group therapy can be given.[75] The program usually consists of nine two-hour sessions spread over six months. This give patients the opportunity to become familiar with the exercises. These groups usually receive instructions from physical therapists. Primary care physicians, sex therapists, psychotherapists, and district nurses may also be involved.

According to Borghuis et al.,[75] providing pelvic floor training in groups has a number of advantages over individual training: the long duration of each training session give patients more opportunity to ask questions; patients are able to meet others with the same problem, with women, in particular, developing

strong bonds; taboos are overcome ("we did not realize we all had the same problems"); the greater distance between physical therapist and patient can enable patients to be more relaxed; and patients are able to motivate and support each other, importantly encouraging one another to persevere and keep up.

A preliminary study by Borghuis et al.[75] indicated that, in patients with SUI, the pelvic floor muscle exercises provided by physical therapists to groups were just as effective as those provided individually. For many women, group physical therapy is very valuable. However, these findings need to be given a more solid scientific basis.[75] Currently, the effects of providing physical therapy to groups are being investigated in an intervention study.[76] The initial findings of this study have been described in an overview and seem to confirm the results of Borghuis et al.'s preliminary study.[75,77] Bø compared the effects of a special training program for groups with those of a home exercise regimen in two similar groups of women with genuine stress incontinence.[78] In one group, patients followed a special pelvic floor muscle exercise course that involved once-a-week group training with an instructor for 45 minutes. These patients were asked to perform 8–12 strong pelvic floor muscle contractions three times a day for six months (i.e., the intensive exercise group). Another similar group of women followed the same exercise regimen but without group training (i.e., the home exercise group). The results of exercise in the intensive exercise group were significantly better than those in the home exercise group.[65]

In motivated patients, the prognosis for partial or full recovery is good. Pelvic floor muscle exercises are effective in reducing involuntary urine loss in patients with SUI.[7,78] However, accurate determination of the efficacy of pelvic floor muscle exercises is hampered by a lack of uniformity in the methodological criteria used in the scientific studies.[22,78] Pelvic floor muscle exercises improve the external supporting mechanism and have a positive effect on the urethral closing mechanism. Pelvic floor muscle exercises increase the strength of voluntary periurethral and pelvic floor muscles. Contraction of the pelvic floor provides support for the intestines in the pelvis and narrows the urethra. This can limit involuntary urine loss during a sudden increase in intra-abdominal pressure. DeLancey[28] states that, normally, pelvic floor contraction presses the urethra against the pubic symphysis and mechanical pressure in the area is increased.

Pelvic floor re-education starts with learning to contract the pelvic floor muscles while being aware of their movement. The ability to contract the pelvic floor muscles at will is an important part of the patient's developing awareness. Repeated contraction of the pelvic floor in the correct manner is essential for bringing about improvement during pelvic floor muscle exercises and pelvic floor muscles are strengthened by regular, intensive and long-lasting training programs.[78–80] At the moment, there is no agreement about which exercise program is most effective, in terms of the number, frequency and intensity of exercises, nor about the minimum duration of the program.[7,78]

Wallace[74] gives an example of an effective exercise program. This program focuses on improving muscle strength in the pelvic floor, thereby influencing the level of impairment. Pelvic floor muscle exercise programs include both short and long duration exercises. Both type I and type II muscle fibers must be exercised using techniques that involve overloading. Type II muscle fibers are trained by using fast contractions lasting one or two seconds; type I muscle fibers by using longer contractions lasting 5–15 seconds. It is recommended that exercise regimes that involve increasing the number of repetitions (e.g., from 5 to 30 times in each exercise period) to the point at which muscles are fatigued should be practiced once or twice a day. Excessive overloading should be avoided. However, improving the absolute power and endurance of pelvic floor muscles does not guarantee correct functioning of the mechanisms responsible for continence. Therefore, it is necessary for patients to follow a process that leads from being aware of isolated contractions of the pelvic floor muscles to fully automatic control of the pelvic floor during the performance of multiple complex tasks.[49]

Although in the literature in general, as in the study by Wallace[74] mentioned above, little attention has

been paid to functional training of the pelvic floor, most professionals consider this an essential part of the exercise program.[49] Further investigation, in randomized clinical trials, is required to determine the most effective exercise programs.[74,78] Exercises that are carried out at home, after instruction has been received, form an essential part of exercise programs. It is important that both patient and physical therapist are well-motivated if the pelvic floor muscle exercise program is to succeed.[64,78]

Biofeedback

Biofeedback is based on the principles of operant conditioning. These are that behavior is encouraged by positive reinforcement and discouraged by negative reinforcement. Biofeedback can involve the use of a number of audiovisual techniques whose function is to inform the patient about the activity of striated muscles while he is trying to control those muscles. With the help of biofeedback, a patient with SUI can learn to contract the pelvic floor muscles selectively. A vaginal or anal electrode can be used to measure pressure in the vagina or anus and the result can be presented visually or acoustically. Alternatively, an anal sphincter electromyogram can be used.

It is important to recognize that biofeedback is used in addition to other forms of treatment, it cannot be used for therapy in isolation. When used in combination with pelvic floor muscle exercises, biofeedback is helpful in reducing urine loss in SUI.[64] The successful use of biofeedback depends strongly on the knowledge and skills of the physical therapist.[22] However, the effectiveness of supplementing pelvic floor muscle exercises with biofeedback is still controversial.[81] Nevertheless, the Urinary Incontinence Guidelines Panel in the United States[22] reports that studies on different forms of biofeedback used in combination with pelvic floor muscle exercises in patients with SUI show a 54–95% improvement in the condition. Berghmans et al.[64] concluded that pelvic floor muscle exercises provide an effective form of treatment for patients with SUI, whether or not biofeedback is used, but that supplementing exercises with biofeedback leads to quicker progress in the initial phase of physical therapy. It is possible that treatment using biofeedback in addition to pelvic floor muscle exercises is more effective than treatment using pelvic floor muscle exercises alone in patients with insufficient awareness of pelvic floor muscles.[7]

Electrostimulation

If the pudendal nerve is intact, neuromuscular electrostimulation may induce a motor response in patients who have problems contracting pelvic floor muscles voluntarily and may be useful for training weak pelvic floor muscles. In this technique, appropriate neuromuscular electrostimulation induces reflex contraction of striated paraurethral and periurethral muscles by afferent excitation of the pelvic floor.[82] In addition, direct excitation of pudendal efferent nerve fibers can lead to contraction of both the levator ani muscle and the external urethral sphincter, and, together with excitation of hypogastric nerve fibers, which activate periurethral smooth muscle, may affect the urethral closing mechanism. Excitation of pelvic efferent nerve fibers seems to increase intraluminal urethral pressure. Neuromuscular electrostimulation may also encourage a transformation from fatigable to fatigue-resistant muscle fibers.[56] The physiological mechanisms involved in electrostimulation still remain unclear.

One of the arguments for using electrostimulation in the treatment of SUI is the fact that over 30% of women with SUI are unable to contract the pelvic floor muscles selectively.[78] Neuromuscular electrostimulation helps improve awareness of when the pelvic floor is being contracted correctly. Cognitively, it provides an important first step in functional training programs that focus on restoring the load-bearing capacity of the pelvic floor.[7,78] In patients with SUI and pelvic floor muscle dysfunction who are not awareness of the pelvic floor, neuromuscular electrostimulation is the therapy of first choice.[56,78] Therefore, it is important to choose, from the many available options, the form of electrostimulation most suitable for inducing appropriate responses in pelvic floor muscles.

Different forms of neuromuscular electrostimulation are used in physical therapy. Short-duration maximum-intensity electrostimulation is usually

given by the physical therapist, whereas long-duration low-intensity electrostimulation is applied at home by the patient himself or herself. There are a few side effects, such as pain and tissue damage. Electrostimulation is contraindicated for patients who have pacemakers and for those who are pregnant.

Literature reports indicate that neuromuscular electrostimulation is successful in between 37% and 92% of patients with SUI. However, most results come from studies that did not use control subjects and whose methodological quality was poor. Recent reviews show that electrostimulation can be as effective as other physical therapy interventions but no more effective. Further investigation is required to establish the precise efficacy of neuromuscular electrostimulation in patients with SUI and how it can be best applied.[7,78]

Vaginal cones

Women patients can use vaginal cones to supplement pelvic floor muscle exercises. In this method, the patient uses a set of cones that all have the same dimensions but that have different weights. As part of the training program, the woman inserts the selected cone into the vagina following a standard procedure and then tries to hold the cone in position for 15 minutes by contracting the pelvic floor muscles. This is repeated twice daily. Theoretically, the pelvic floor muscles are strengthened because of increased proprioception. Several studies have reported that the success rate of treatment with vaginal cones is between 68% and 79% after four weeks.[66,83,84] No side effects have been reported. However, these studies involved premenopausal women and extrapolation to older women is not possible, especially because of the increased occurrence of vaginal atrophy and other co-morbid conditions in older women.[22] A review carried out by Berghmans et al.[7] only identified one randomized clinical trial of vaginal cone use. In this trial, a group of women using cones in combination with pelvic floor muscle exercises was compared with a second group who received electrostimulation combined with pelvic floor muscle exercises.[84] To date, there are no randomized clinical trials on the effects of therapy using cones alone. In addition, Bø[85] has questioned the theoretical basis for cone therapy. Further investigation is needed to evaluate the use of vaginal cones in treating patients with SUI.[78,86]

Providing information

Behavioral change

In order to ensure that the results of therapy are permanent, patients have to incorporate the exercises and skills they learned during physical therapy into their daily lives. The physical therapist who provides pelvic floor training also plays an important role in helping to bring about behavioral change. The provision of information is an important part of care and a professional approach to educating patients is required. Van der Burgt and Verhulst[87] presented an overview of the different educational models used in counseling and translated them into a patient education model for use by allied health professionals. They integrated the Attitude, Social Influence and Personal Efficacy model, which hypothesizes that the patient's willingness to modify behavior is determined by the interplay between the patient's attitude, social influences, and the patient's perception of his or her own efficacy (personal efficacy), with Hoenen et al.'s step-by-step model,[88] which involves the steps of being open, understanding, wanting and doing. Taking allied health professionals' practice into account, van der Burgt and Verhulst[87] added another two steps: being able and keeping on doing.

For patients with SUI who are referred for physical therapy, the steps are: thinking, in which the exchange of information and explanation are of central importance; feeling, in which achieving an awareness of and feeling for the pelvic floor, posture and movement are central; doing; and keeping on doing, in both of which the accent is on exercising and training the pelvic floor muscles and on encouraging adherence to therapy over both the short and long term.

Thinking

- Many patients are familiar with the word stress in the sense of mental tension or pressure but are not able to understand its relationship with urine loss. An explanation of the term stress urinary incontinence is, therefore, necessary.
- In general, patients do not understand bladder function. In providing an explanation, it is

important that the therapist fully appreciates the patient's needs (e.g., how complicated the explanation should be, and what kind of language should be used) and is aware of how the patient reacts to the explanation.
- It is important to clarify the meanings of the terms load and load-bearing capacity so that patients understand their own situations. The objective is for patients to gain an appreciation of the background to their condition, and of the consequences of their condition and how to deal with them. The intention is to enable patients to care for themselves as well as possible

Feeling
- Becoming aware of one's own body and being able to feel the pelvic floor are both absolutely essential before learning about incontinence can begin. Learning should eventually result in the acquisition of new habits.
- The patient has to constantly communicate their experiences, which means that there should be an ongoing dialogue between patient and therapist involving questions such as: Where do you feel it? How does it feel? Do you feel it more or less now?
- Myogenic feedback can be used to help the process of learning to feel, especially if the patient is unable to feel.

If the pelvic floor is weak, a type of electrostimulation known as functional electrical stimulation can be used to teach patients about where to feel and about the sensations to look for.

Doing
1. Experiencing and controlling basic pelvic floor movements (e.g., short and fast or slow and long movements) provides the basis for performing other movements. Training is built up once control is experienced.
2. If the pelvic floor muscles can only be weakly or moderately contracted when the patient is aware of them, pelvic floor movement can be enhanced by the simultaneous synergistic contraction of other muscle groups.
3. Together the abdominal muscles, the pelvic floor and the diaphragm are able to spread and absorb abdominal pressure. In women and men who do not take part in sports and who sit a lot and in the elderly, the abdominal muscles are sometimes the weakest link in the chain. Improving pelvic floor muscle performance is then vital for pelvic floor function.
4. If newly learned behaviors involving the pelvic floor are clearly observable during and deeply embedded in the patient's normal daily activities, it is easier to maintain those behaviors. Therefore, in addition to teaching the patient new skills and ways of acting, it is important to pay attention to how new learning could be applied outside the therapeutic environment.

Keep on doing

Evaluation can encourage adherence to therapy over the long term. Evaluations should take place before and at the end of each treatment session. Doing this makes it easier for the patient to see the overall effects of therapy, and this is often encouraging. Setting one's own goals and subsequently rewarding oneself if one succeeds in reaching those goals is a well-tested self-management technique.

Preventing stress urinary incontinence

The prevention of pelvic floor insufficiency is an important objective of pelvic floor training.[4] In order to identify the target group that may benefit from preventive measures it is necessary to look at risk factors for pelvic floor insufficiency. There are several intrinsic and extrinsic risk factors associated with pelvic floor problems. Genetic defects that result in, for example, connective tissue weakness or prolapses are intrinsic factors. Extrinsic factors include pregnancy, some types of work and sporting activities, and chronic straining during bowel movement. In addition, some types of exercise that increase abdominal pressure may contribute to pelvic floor dysfunction. How strongly these factors affect the pelvic floor is not yet known.[4] In practice, it is difficult to identify a target group for prevention. One reasons is that persons with pelvic floor insufficiency often do not consider it a problem and, in moderate forms of SUI, they are hardly bothered by it. Therefore, most of these people will not ask for professional help by going, for example, to their primary care physician. If the condition becomes worse after some time, there are often also other symptoms such as frequent micturition, urgency and

nocturia. Women who use incontinence protection frequently suffer from chronic vulvitis. Contraction of the pelvic floor can stabilize the bladder neck or close the urethra when intra-abdominal pressure increases. Increasing muscle strength and improving awareness of the pelvic floor before SUI occurs can have an influence on the development of these additional symptoms.

Although pelvic floor training improves control over and the strength of pelvic floor muscles, it is difficult to find evidence in the literature that it is effective in preventing SUI.[4,7] Only the study carried out by Wall and Davidson[12] concluded that pelvic floor muscle exercises are effective in preventing urinary incontinence. During pregnancy, these exercises may also reduce birth trauma and promote postpartum recovery, possibly leading to improved pelvic floor muscle function over the long term.[12] Since the prevention of urinary incontinence can improve the quality of life of patients with SUI and could reduce the costs of paramedical and other therapeutic interventions in these patients, there is a great need for more research.[4,7]

Documentation and reporting

Reporting on SUI involves the systematic methodical recording and documentation of (I) all relevant data from the physician's notification and referral and from the physical therapy diagnostic process; (II) the conclusions of the diagnostic process, including the decision on whether or not to treat the patient; (III) the treatment plan and therapeutic interventions; and (IV) the evaluation of the results of treatment; as well as a written report to the referring physician. The aim of reporting is to register all the facts from the initial notification up to and including the written report to the referring physician that is made at the end of the treatment period. This process may provide an insight into the choices and decisions made (i.e., clinical reasoning) during the different phases of the physical therapy process. The KNGF has developed guidelines on physical therapy documentation and reporting.[8,9]

The guidelines distinguish a number of distinct phases in the physical therapy process, each of which involves recording a minimum amount of data. After receiving the physician's notification and referral, the patient's personal and health insurance details, the date of notification, and the patient's referral data are recorded. The physical therapy process also includes history-taking and physical examination. After history-taking, the reasons for the consultation, data on the patient's condition (including the severity of SUI), the patient's expectations, and personal data are recorded. In addition, a list of causal and general inhibitory factors is also made. After the physical therapy examination, the examination data, including information obtained during visual examination, palpation and functional examination, are recorded. After conclusions have been formulated, they are also recorded along with an explanation of how they were derived. In addition, any relevant data that does not arise from the physical therapy process is also recorded.

Documentation and reporting of the treatment plan involves recording the goals of treatment, the treatment frequency, the number of treatments administered, the duration of the total treatment period, intervention details (e.g., type, nature and quantity), and details of agreements with the patient. Any data generated during therapy are also recorded. During therapy evaluation, data on the course of therapy and its results, and on any consultations are recorded. The report to the referring physician should include details of the type of therapy used, the number of physical therapy visits, the impact of therapy on the severity of the disorder and, if necessary, advice on additional treatment and its focal points.

Legal significance of the guidelines

These guidelines are not statutory regulations. They provide knowledge and make recommendations based on the results of scientific research, which healthcare workers must take fully into account if high-quality care is to be provided. Since the recommendations mainly refer to the average patient, healthcare workers must use their professional judgement to decide when to deviate from the guidelines if that is required in a particular patient's situation. Whenever there is a deviation from guideline recommendations, it must be justified and documented.[3,6] Responsibility, therefore, resides with

the individual physical therapist.

Revisions

These KNGF guidelines are the first such clinical guidelines to be developed for the diagnosis, treatment and prevention of stress urinary incontinence in adult patients. Subsequent developments that could lead to improvements in the application of physical therapy in this group of patients may have an impact on the knowledge contained in these guidelines. The prescribed method for developing and implementing guidelines in general proposes that all guidelines should be revised a maximum of three to five years after the original publication.[3,6] This means that the KNGF, together with the working group, will decide whether these guidelines are still accurate by 2003 at the latest. If necessary, a new working group will be set up to revise the guidelines. These guidelines will no longer be valid if there are new developments that necessitate a revision.

Before any revision is carried out, the recommended method of guideline development and implementation should also be updated on the basis of any new insights and to take into account any cooperative agreements made between the different groups of guideline developers working in the Netherlands. The details of any consensus reached by Evidence-Based Guidelines Meetings (i.e., the EBRO platform), which are organized under the auspices of the (Dutch) Collaborating Center for Quality Assurance in Healthcare (CBO), will also be taken into account in any updated version of the method of guideline development and implementation. For example, the stipulation that uniform and transparent methods are necessary for determining the amount of evidence needed and for deriving practice recommendations would constitute an important improvement.

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Attachment: Important aspects of internal examination and treatment

Personal aspects

In general, it is not necessary to say much about the significance of these procedures. Clearly, their impact is quite different from that of palpating other parts of the body.

A number of factors can have an influence:

- for the patient, earlier experiences may be significant. For example, traumatic delivery, or sexual trauma associated with incest and or bad experiences with care workers;
- for the physical therapist, it is generally the case that substantial understanding is required and that certain procedures must be followed before interventions involving the visual examination and palpation of the urogenital area can be undertaken. The personal profile of physical therapists working with patients with pelvic floor problems are stipulated by the educational commission of the Dutch Association for Physical Therapy in Pelvic Disease and Perinatal Care (NVFB). The levels of competence and professionalism required are described in this profile and individuals should be trained in an institution that satisfies the standards of the educational commission.

Furthermore, physical therapists must be tested on their competence and professionalism, in terms of both theory and practice. Registration follows testing. Only physical therapists who have undergone testing and who are registered are allowed to carry out specified interventions.

Ethical principles

- The principle of respect: respect for the autonomy of human beings and for the integrity of the human body.
- The principle of doing good: for any intervention, the demands placed on the patient have to be balanced against the final benefit to the patient.

- The principle of not harming: if there is a conflict between the principle of doing good and the principle of not harming, the latter will almost always prevail.
- The principle of justice:
  - at the level of the individual patient, human dignity and autonomy;
  - at the level of the provision of care, solidarity and equity.

Legal aspects
Firstly, it is essential to determine if the specified intervention lies within the practitioner's area of competence. A Dutch law entitled the "Law on professions providing individual healthcare" (BIG) stipulates who, under strict conditions, may perform defined 'restricted' interventions if requested to do so and who is professionally qualified to perform them independently. Individual physical therapists working in institutions may be authorized or delegated to perform these interventions, an arrangement that has been legally accepted by the WUG. These two laws derive their legitimacy from the demonstrable competence of the therapist. The therapist's competence must be defined in a protocol, as must the procedure to be followed, and the allocation of responsibilities between the client and individual implementing the therapy.

In discussions on the BIG law, the government has indicated that it is willing to accept such an arrangement in situations in which not all members of a particular professional group are allowed to carry out interventions involving a particular body cavity. For restricted interventions, the concepts of authorization and delegation are overlaid by the concepts of "individuals who are independently authorized to perform the intervention" and "individuals who are not independently authorized to perform the intervention".
The application of certain specified interventions must also conform to relevant laws on health and to ethical principles. The competence and professionalism of all health practitioners involved must be ascertained. Competence and professionalism are the primary concerns in determining whether a particular physical therapist, whether specialized or not, may perform a specified intervention. The therapist also has to demonstrate the necessity of performing the particular intervention. There must be an appropriate written agreement with the referring physician (e.g. a treatment protocol), the patient must be properly informed about the procedure, and the patient must agree to the proposed treatment.

Hygiene
The hygienic measures followed must be in accordance with the guidelines on hygiene during medical procedures in the pelvic region issued by the Dutch Association for Physical Therapy in Pelvic Disease and Perinatal Care (NVFB).[72]

Privacy
The demands made on organizations and institutions to ensure that they guarantee the patient's privacy are also described in the "Guidelines on hygiene during medical procedures in the pelvic region".[72]

Physical therapist's attitude to patients
Pelvic floor dysfunction, and the patient's feelings about pelvic floor dysfunction, can affect the individual and his or her perception of self more than dysfunction in any other part of the human body. Consequently, pelvic floor dysfunction does not only have a physical effect on patients, it also influences their social and personal life, and their perceptions and behavior. Physical therapists who work with patients affected by the condition must be aware of these consequences and take them into account when giving advice and treatment. The physical therapist's attitude is, therefore, an essential part of treatment and has a great influence on its success. Overall, physical therapists should act in accordance with the general rules guiding their professional behavior. Judging a physical therapist's attitude is difficult. However, the all the necessary conditions may be satisfied by following the rule that: "palpation can be carried out on the conditions that the physical therapist has received proper instruction and that it has been confirmed that he has all the qualities required of him". In this way, all the factors that have an important impact on healthcare can be extensively tried and tested.

References

1 Lagro-Janssen ALM, Breedveldt Boer HP, van Dongen JJAM, Lemain TJJ, Steeneken F, Dijkstra RH et al. NHG-standaard Incontinentie voor Urine. Utrecht, the Netherlands: Nederlands Huisartsen Genootschap; 1995.

2 Hendriks HJM, Reitsma E, van Ettekoven H. Centrale richtlijnen in de fysiotherapie. Ned Tijdschr Fysiother 1996,106:2-11.

3 Hendriks HJM, van Ettekoven H, Reitsma E, Verhoeven ALJ, van der Wees PJ. Methode voor centrale richtlijnontwikkeling en implementatie in de fysiotherapie. Amersfoort, the Netherlands: KNGF/NPi/CBO: 1998.

4 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.

5 Hendriks HJM, van Ettekoven H, van der Wees PJ. Eindverslag van het project Centrale Richtlijnen in de fysiotherapie (Deel 1). Achtergronden en evaluatie van het project. Amersfoort, the Netherlands: KNGF/NPi/CBO; 1998.

6 Hendriks HJM, Bekkering GE, van Ettekoven H, Brandsma JH, van der Wees PJ, de Bie RA. Development and implementation of national practice guidelines: A prospect for continuous quality improvement in physiotherapy. Introduction to the method of guideline development. Physiotherapy 2000;86:535-47.

7 Bergmans LCM, Hendriks HJM, Bø K, Hay-Smith EJ, de Bie RA, van Waalwijk-van Doorn ESC. Conservative treatment of stress urinary incontinence in women. A systematic review of randomized controlled trials. Br J Urol 1998,82:181-91.

8 Van der Wees P, Hendriks HJM, Ettekoven H. Publicatie van de KNGF-richtlijn stress urine incontinentie is een feit! Fysiopraxis 1998;7:3-4.

9 Samenvatting en deskundigheidsbevorderingspakket stress urine incontinentie. Fysiopraxis 1998;7(2):supplement.

10 Hendriks HJM, van Ettekoven H, Bekkering T, Verhoeven A. Implementatie van KNGF-richtlijnen. Fysiopraxis 2000;9:9-13.

11 Kleijnen J, de Craen AJM, van Everdingen J, Krol L. Placebo effect in double-blind clinical trials with medications. Lancet 1994;344:1347-9.

12 Wall LL, Davidson TG. The role of muscular re-education by physical therapy in the treatment of GSI. Obstet Gynecol Surv 1992;47:322-31.

13 Lagro-Janssen ALM. Urine-incontinentie bij vrouwen in de huisartsenpraktijk (thesis). Nijmegen, the Netherlands: Katholieke Universiteit Nijmegen; 1991.

14 Kleijn-de Vrankrijker M. De classificatie van incontinentie. Issue 1994;1:10-1.

15 Abrams P, Blavais JG, Stanton SL, Andersen JT. The standardization of terminology of lower urinary tract function. Scand J Urol Nephrol 1988;114(suppl):5-19.

16 Heerkens YF, Brandsma JW, van Ravensberg CD. Proposals for adaptation of the classification of Impairments and the classification of Disabilities of the ICIDH from the perspective of five Dutch health professions. Zoetermeer, the Netherlands: Nationale Raad Voor de Volksgezondheid/WHO Collaborating Centre for the ICIDH; 1993.

17 World Health Organization. International Classifications of Impairments, Activities and Participation. A manual of dimensions of disablement and functioning. Beta-1 draft for field trials. Geneva, Switzerland: WHO; 1997.

18 The standardization of terminology of lower urinary tract function. Br J Obstet Gynaecol 1990; 97(suppl 6);1-16.

19 De Boer PW, Vereecken RL, de Voogt HJ. Urology. Utrecht, the Netherlands: Bunge; 1987.

20 Karram MM, Bathia NN. Management of coexistent stress and urge incontinence. Obstet Gynaecol 1989;73(1):4-7.

21 De Bruin AJJ. Incontinentie en hulpverlening. Houten/Antwerpen, the Netherlands/Belgium: Bohn Stafleu Van Loghum; 1990.

22 Urinary Incontinence Guidelines Panel. Urinary incontinence in adults: Clinical Practice Guideline. AHCPR Pub. No. 92-0038. Rockville, MD: Agency for Healthcare Policy and Research, Public Health Service, US Department of Health and Human Services; 1992.

23 Wall LL, DeLancey JOL. The politics of prolapse: A revisionist approach to disorders of the pelvic floor in women. Perspect Biol Med 1991;34:486.

24 Anderson RS. A neurogenic element to urinary genuine stress incontinence. Br J Obstet Gynaecol 1984:91:41-5.

25 Gilpin SA, Gosling JA, Smith ARB, et al. The pathogenesis of genitourinary prolapse and stress incontinence of urine. A historical and histochemical study. Br J Obstet Gynaecol 1989;96:15-23.

26 Smith ARB, Hosker GL, Warell DW. The role of pudendal nerve damage in the aetiology of genuine stress incontinence in women. Br J Obstet Gynaecol 1989;96:29-32.

27 Swash M, Snooks SJ, Henry MM. Unifying concept of pelvic floor disorders and incontinence. J R Soc Med 1985;78:906-11.

28 DeLancey JOL. Structural aspects of the extrinsic mechanism. Obstet Gynaecol 1988;72:296-301.

29 DeLancey JOL. Stress urinary incontinence: Where are we now, where should we go? Am J Obstet Gynaecol 1996;175:311-9.

30 Debruyne FMJ, van Kerrebroeck PEV. Practical aspects of urinary incontinence. Den Haag, the Netherlands: Martinus Nijhoff; 1986.

31 De Blok S. Spatial architecture of musculo-fibrous tissue in the female pelvic region (thesis). Lisse, the Netherlands: Swets & Zeitlinger BV; 1982.

32 Kok ALM, Voorhorst FJ, Halff-Butter CMC, Janssens J, Kenemans P. De prevalentie van urine-incontinentie bij oudere vrouwen. Ned T Geneeskd 1991;135:98-101.

33 Iosif CS, Bekassy Z, Rydhstrom H. Prevalence of urinary incontinence in middle-aged women. Int J Gynaecol Obstet 1988;26(2):255-9.

34 Bø K, Maehlum S, Oseid S, Larsen S. Prevalence of stress urinary incontinence among physically active and sedentary female students. Scand J Sports Sci 1989;11:113-6.

35 Borghuis ME, Koster J, Lemain TTJ, Venhoek G. Training van de bekkenbodem en van de blaas (course-book). Malden, the Netherlands: 1992.

36 Lisdonk EH, van der Bosch WJHM, Huygen FJA, Lagro-Janssen ALM. Ziekten in de huisartspraktijk. Utrecht, the Netherlands: Bunge; 1990.

37 Thomas TM, Plymat KR, Blannin J, Meade TW. Prevalence of urinary incontinence. Br Med J 1980;281:1243-5.

38 Kampen M. Urine-incontinentie, bekkenbodem-reëducatie. Leuven, Belgium and Amersfoort, the Netherlands: Acco; 1992.

39 Statistische bijlage Financieel Jaarverslag Ziekenfondsraad 1994: Algemene Wet Bijzondere Ziektekosten. Amstelveen, the Netherlands: Ziekenfondsraad; 1995. p. 3.

40 Wet op de Geneeskundige Behandelingsovereenkomst (WGBO). Staatsblad 1994; 838.

41 BIG. Wet op de beroepen in de Individuele Gezondheidszorg.

(Wet van 11 november 1993). Staatsblad 1993; 655.
42 Van Mourik WA, Wiarda VL. Advies (brochure) bijzondere en voorbehouden handelingen. Amersfoort, the Netherlands: KNGF; 1997.
43 KNGF (Koninklijk Nederlands Genootschap voor Fysiotherapie). Raamwerk voor het schrijven van een werkplan 'Fysiotherapeutische behandeling in groepsverband'. Amersfoort, the Netherlands: KNGF; 1996.
44 Van Dongen JJAM, Visschedijk AB, Bernards ATM, Beusmans GHM, de Laat E, Crebolder HFJM. De handelwijze van huisartsen bij stress urine-incontinentie voor urine bij vrouwen ouder dan 55 jaar. Unpublished report.
45 Janknegt RA, van Kerrebroeck PEV, van der Bosch JLHR. NHG-Standaard Incontinentie voor Urine nader beschouwd. Ned T Urol 1995;3:73-7.
46 Kerssens JJ, Curfs EC. Extramurale fysiotherapie (thesis). Utrecht, the Netherlands: Rijksuniversiteit Utrecht; 1993.
47 Mulder AFP, Vierhout ME. De Inco-test. Medicus 1990;264.
48 Koldewijn E. Progress in neuro-urology: Evaluation of investigatory techniques and new treatment options (Thesis). Katholieke Universiteit, Nijmegen, the Netherlands, 1994.
49 Versprille ES. Begeleiding van patiënten met bekkenbodemdysfunctie. Utrecht, the Netherlands: De Tijdstroom; 1995.
50 Laycock J. Clinical evaluation of the pelvic floor. In: Schüssler B, Laycock J, Norton P, Stanton S, editors. Pelvic floor re-education. London, UK: Springer-Verlag; 1994.
51 Kendall HO, Kendall FP, Wadsworth GE. Muscles: testing and function. Baltimore: The Williams and Wilkins Company; 1971.
52 Millard RJ. Overcoming incontinence. Wellingborough, UK: Thorsons; 1987.
53 Laycock J. Assessment and treatment of pelvic floor dysfunction (thesis). Bradford, UK: University of Bradford; 1992.
54 Maksimovic P, Schröer FH, Kurth KH. Stress urine-incontinentie bij de vrouw; resultaten van de operatieve behandeling volgens Stamey Pereyra. Ned T Geneeskd 1985;129:951-4.
55 Hilton P. The role of urodynamics in pelvic floor re-education. In: Schüssler B, Laycock J, Norton P, Stanton S, editors. Pelvic floor re-education. London, UK: Springer-Verlag; 1994. vol 1, p.57.
56 Bourcier AP, Juras JC. Non-surgical therapy for stress incontinence. Urol Clin North Am 1995;22:613-27.
57 Klarskov P, Belving D, Bischoff N, et al. Pelvic floor exercise versus surgery for female urinary stress incontinence. Urol Int 1986;41:129-32.
58 Schüssler B. Introduction. In: Schüssler B, Laycock J, Norton P, Stanton S, editors. Pelvic floor re-education. London, UK: Springer-Verlag; 1994.
59 McGuire EJ. Stress incontinence: New alternatives. Int J Fert 1996;41:142-7.
60 Leach GE, Trockman BA, Sakamoto M, Santiago L, Zimmern PE. Modified Peyrera bladder neck suspension: Minimum 5-year follow-up in 101 patients. J Urol 1995;153(suppl):813.
61 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.
62 Weil A, Reyers H, Bischoff P, Rottenberg RD, Krauer F. Modifications of urethral rest and stress profiles after different types of surgery for urinary stress incontinence. Br J Obstet Gynaecol 1978;132:844.
63 Rush CB, Entman SS. Pelvic organ prolapse and stress urinary incontinence. Med Clin North Am 1995;79:1473-9.
64 Berghmans LCM, Frederiks CMA, de Bie RA, Weil EHJ, Smeets LWH, van Waalwijk-van Doorn ESC et al. Efficacy of biofeedback, when included with pelvic floor muscle exercise treatment, for genuine stress incontinence. Neurol Urodyn 1996:15:37-52.
65 Bø K, Hagen RH, Kvarstein B, Jorgensen J, Larsen S: Pelvic floor muscle exercise for the treatment of female stress urinary incontinence. Effects of two different degrees of pelvic floor muscle exercises. Neurourol Urodynam 1990;9:489-502.
66 Wilson PD, Samarrai TA, Deakin M, Kolbe E, Brown ADG. An objective assessment of physiotherapy for female genuine stress incontinence. Br J Obstet Gynaecol 1987;94:575-82.
67 Kujansuu E. The effect of pelvic floor exercises on urethral function in female stress urinary incontinence: a urodynamic study. Ann Chirurg Gynaecol 1983;72:28-32.
68 Sandri SD, Marino V, Castiglioni M et al. The normal bladder compliance. Neuro Urodyn 1990;9(2):207-8.
69 Tapp AJS, Hills B, Cardozo LD. Randomized study comparing pelvic floor physiotherapy with the Burch colposuspension. Neurourol Urodyn 1989;8:356-7.
70 Wells TJ, Brink CA, Diokno AC, Wolfe R, Gillis GL. Pelvic muscle exercise for stress urinary incontinence in elderly women. J Am Geriatr Soc 1991;39:785-91.
71 Fedorkow DM. Non-surgical management of stress urinary incontinence. JSOGC 1993;15:695-705.
72 Nederlandse Vereniging voor Fysiotherapeuten bij bekkenproblemen en pre- en postpartum gezondheidszorg. Richtlijn voor hygiënisch werken in het bekkengebied. Amersfoort, the Netherlands: NVFB; 1997.
73 Bø K, Kvarstein B, Hagen RR, Larsen S. Pelvic floor muscle exercise for the treatment of female stress urinary incontinence: 1. Reliability of vaginal pressure measurements of pelvic floor muscle strength. Neurourol Urodynam 1990;9:471-7.
74 Wallace K. Female pelvic floor functions, dysfunctions, and behavioral approaches to treatment. Clin Sports Med 1994;13:459-81.
75 Borghuis ME, Lemain TTJ, Schreuder JLM. Groepsgewijze behandeling van vrouwen met incontinentieklachten. Fysiopraxis 1993;8:4-6.
76 Miltenburg TEM, Janssen T. Onderzoeksvoorstel Urine-incontinentie bij vrouwen en oefentherapie. Nijmegen, the Netherlands: Instituut voor Toegepaste Sociale Wetenschappen; 1994.
77 Janssen T, Miltenburg T. Effectiviteit van oefentherapie bij incontinentie. Individuele en groepsgewijze oefentherapie vergeleken. Instituut voor Toegepaste Sociale wetenschappen (ITS), Nijmegen, the Netherlands, 1998.
78 Bø K. Physiotherapy to treat genuine stress incontinence. Int Cont Surv 1996;6:2-8.
79 American College of Sports Medicine (ACSM). The recommended quantity and quality of exercise for developing and maintaining cardio-respiratory and muscular fitness in healthy adults. Med Sci Sports Ex 1990;22(2):265-74.
80 DiNubile NA. Strength training. Clin Sports Med 1991:10:33-62.
81 Bø K. Stress urinary incontinence, physical activity and pelvic floor muscle strength training. Scand J Med Sci Sports 1992;2:197-206.
82 Eriksen BC. Electro-stimulation of the pelvic floor in female

urinary incontinence (thesis). Trondheim, Norway: University of Trondheim; 1989.
83 Peattie AB, Plevnic S, Stanton SL. Vaginal cones: a conservative method of treating genuine stress incontinence. Br J Obstet Gynaecol 1989;95:1049-53.
84 Olah KS, Bridges N, Denning J, Farrar DJ. The conservative management of patients with symptoms of stress incontinence: A randomized prospective study comparing weighted vaginal cones and interferential therapy. Am J Obstet Gynaecol 1990;162(1):87-92.
85 Bø K. Vaginal weight cones. Theoretical framework, effect on pelvic floor muscle strength and female stress urinary incontinence. Acta Obstet Scand 1995;74:87-92.
86 Wilson PD. Conservative management of urethral sphincter incompetence. Clin Obstet Gynaecol 1990;33:330-45.
87 Van der Burgt M, Verhulst F. Doen en blijven doen. Houten/Diegem, the Netherlands: Bohn Stafleu Van Loghum; 1990.
88 Hoenen JAJH, Tielen LM, Willink AE. Patiëntenvoorlichting stap voor stap: Suggesties voor de huisarts voor de aanpak van patiëntenvoorlichting in het consult. Rijswijk, the Netherlands: Uitgeverij voor gezondheidsbevordering, Stichting O&O; 1988.
89 Koninklijk Nederlands Genootschap voor Fysiotherapie. Richtlijnen voor de fysiotherapeutische verslaglegging. Amersfoort, the Netherlands: KNGF; 1993.