National practice guidelines for physical therapy in patients with low back pain

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I. Introduction

These guidelines describe the diagnostic and therapeutic procedures involved in providing physical therapy for patients with low back pain. Manual therapy is not discussed because the techniques involved demand specific knowledge and specialized skills. A list of abbreviations and a glossary of the key concepts used are provided. The second part of these guidelines, entitled "Review of the evidence", contains a detailed explanation of the reasons for choosing the particular diagnostic and therapeutic approaches described.

Definition of low back pain

In these guidelines, the term 'low back pain' refers to 'non-specific low back pain', which is defined as low back pain that does not have a specified physical cause, such as nerve root compression (the radicular syndrome), trauma, infection or the presence of a tumor. This is the case in about 90% of all low back pain patients.

Pain in the lumbosacral region is the most common symptom in patients with non-specific low back pain. Pain may also radiate to the gluteal region or to the thighs, or to both. It may be increased by the patient adopting a certain position, by movement, or by the imposition of an external load (e.g., during lifting). Morning stiffness may also be present. General symptoms of disease, such as fever or weight loss, are absent.

The pain may be continuous or intermittent, with the first episode usually occurring between the ages of 20 and 55 years. An episode of low back pain can be classified according to its duration as either acute (0–6 weeks' duration), sub-acute (7–12 weeks' duration) or chronic (> 12 weeks' duration). Recurrent low back pain is defined as the occurrence of more than two episodes of back pain within one year such that the total duration is less than six months.

Magnitude of the problem

Between 60% and 90% of the population will experience low back pain at least once in their lives. The corresponding annual incidence is 5%. In general practice, 3% of all patients in any year will present with low back pain. In physical therapy, the condition provides the most frequent referral diagnosis: 27% of all patients visiting physical therapists are sufferers. In the Netherlands, low back pain has important economic consequences: of all musculoskeletal complaints, it generates by far the highest costs because of absenteeism from work and disability.

Prognosis and course

The natural course of low back pain is usually favorable. In 80–90% of cases, patients' complaints diminish spontaneously within 4–6 weeks. Approximately 65% of patients who consult their primary care physician are free of symptoms after 12 weeks. Recurrent low back pain is common.

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Absence from work

Over 90% of working people who experience low back pain do not stay off work because of the condition. Of those who do, 75% will return to work within four weeks. However, these persons may not all have been treated and may not have resumed all activities in the work setting. Delayed return to work is associated with recurrent episodes of low back pain and to low socio-economic status.

Bio-psychosocial model

These guidelines are based on a bio-psychosocial model that relates the occurrence of low back pain to the interaction between biological, psychological and social factors. When the complaints of patients with low back pain continue the psychosocial factors will have more impact on the disabilities due to low back pain than the biomedical or biomechanical factors.

Normal and abnormal courses

A long episode of low back pain does not necessarily imply an unfavorable prognosis. However, when an episode is associated with long-lasting disability and with problems with participation in society, the prognosis is poor. Because of this, these guidelines place special emphasis on how disabilities and participation problems progress.

Over time, the courses followed by disabilities and participation problems can be described as either normal or abnormal. In the normal course, the patient's activity level and degree of participation gradually increase over time to the level existing prior to the episode of low back pain. In most patients, symptoms decrease. This does not always mean that the low back pain will disappear completely but simply that normal activities and the patient's participation in society will no longer be restricted. Most low back pain patients should expected to follow a normal course.

The course is abnormal when a patient's disabilities and participation problems do not decrease over time but, instead, either stay at the same level or, even, increase. For most patients, these difficulties will be accompanied by persistent or worsening symptoms. Abnormal courses may be seen in patients with either acute or chronic low back pain. In the guidelines working group, there was a consensus that the course should be defined as abnormal when the patient's activity level and degree of participation do not increase within three weeks.

An abnormal course may be either caused or maintained by bio-psychosocial factors. These can include (a) biological factors, such as decreased mobility, decreased muscle strength or decreased co-ordination, (b) psychological factors, such as a fear of movement or faulty cognition about low back pain and (c) social factors related to the work setting or to the support and acceptance offered by family and friends. However, psychosocial factors can also have a positive influence on complaints. For example, the patient's progress may be quicker when he* is able to cope adequately with his low back pain or when family and friends encourage the patient to increase his activity level.

Coping with low back pain

Patients may cope with their condition either adequately or inadequately. Low back pain patients who are able to adjust their normal activities appropriately can be said to have an adequate coping strategy. These patients are able to adapt the load imposed by all the activities and tasks they would like to or have to carry out to match the load-bearing capacity of their backs, which limits the feasible level of activities and tasks. If the low back pain persists, the use of a strategy such as 'seeking distraction from the pain' or 'maintaining the intention to have an active lifestyle' indicates an adequate coping style. On the other hand, patients who restrict their movements because of low back pain, who persist in avoiding certain activities, or who rest a lot to relieve pain can be said to have inadequate coping strategies.

The coping strategy adopted depends on the individual patient's characteristics, among other things. In this respect, the significance the patient attaches to the low back pain and the degree of control he experiences are important. Patients may regard low back pain as being anything from "not threatening at all" to "highly threatening". A patient

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

may interpret his complaints as threatening if he believes that low back pain is an indication of physical damage and that any increase in pain, for example during movement, is a sign of new damage. The consequence could be a fear of movement. The more a patient feels threatened by his complaints, the higher the chance that he will cope inadequately. In addition, a patient may feel he has a high level of control over his condition when he understands the underlying health problem and has the confidence to manage the back pain himself. These factors depend directly on the significance the patient attaches to his complaints. Someone who understands the underlying health problem and knows what to do will adopt an adequate coping strategy.

The interaction between a patient and his environment (i.e., social factors) also plays a role in the coping strategy adopted. For example, an overprotective partner or the receipt of contradictory information and recommendations from different healthcare providers may frighten the patient and have a negative influence on the coping strategy. In addition, the attitude of the physical therapist may play a role. Giving too much attention to pain and not encouraging the patient enough to become independent may have a negative effect.

Role of the physical therapist
For most patients in whom low back pain follows a normal course, physical therapy is not indicated. Management by the primary care physician will be sufficient to improve the patient's activity level and participation in society. If this is not the case, or if the primary care physician feels that additional guidance is needed, the patient may be referred to a physical therapist. In contrast, physical therapy is indicated for patients in whom low back pain follows an abnormal course.

Patients' perspective
In consultation with the Dutch Patients and Consumers Federation (NPCF) the most important wishes and preferences of patients with low back pain are discussed. These are shortly described hereafter in a framework, and they fit in well with the important role of inform/advise in the treatment plan. Therefore in the framework is referred to table 4: 'Six steps in the process of patient education' in the 'Review of the evidence'.

Co-operation with other disciplines
Several guidelines and other documents have been specifically developed by the Dutch Societies of Physiotherapy and General Practice to stimulate and facilitate co-operation and communication between physical therapists and primary care physicians. When a patient has problems related to low back pain in the work setting, co-operation with an occupational physician is useful. The content of the physical therapy guidelines presented here is in line with the recommendations of the Dutch Primary Care Physicians' Guidelines, which promote an initial 'watchful waiting' attitude and the provision of adequate information and advice, and with the recommendations of the Occupational Physicians' Guidelines, which advise the encouragement of a gradual increase in activities and participation in society.

II. Diagnosis

The main objectives of the diagnostic process are to assess the severity and identify the type of the low back pain, and to evaluate the extent to which physical therapy can improve the patient's level of activity and participation. Often in patients with non-specific low back pain, it is not possible to find an anatomical impairment underlying the condition. Even when impairments have been identified, they will not normally be sufficient to explain the development or continuation of the complaints. Diagnosis should, therefore, focus on the patient's level of disability and degree of participation.

Often in patients with non-specific low back pain, anatomical impairments do not provide a sufficient explanation for the condition. Diagnostic procedures should, therefore, focus on the patient's level of disability and degree of participation.

The starting point is the patient's needs. The physical therapist will evaluate whether the course of the disability or the course of any problems with participation is normal or abnormal. If abnormal, the physical therapist will determine which (bio-

Framework: Patients' perspective:

- It is important for the patient that pain is acknowledged and respected, that the mental stress of the pain and the consequences in daily life are noticed (see step 1).
- The patient expects the physical therapist to take time, to give room for questions, to listen and to be understanding and treats the patient as an individual (see step 1).
- It is very helpful for the patients if the disorder is being explained unambiguous (see step 2). It should be noted that over the in the guidelines used definition of a-specific low back complaints and the mentioned specific causes of low back pain is internationally a consensus. If psychosocial factors play an important role in the continuance of complaints, then it is necessary to explain what is meant by it.
- Patients indicate that it is important to recognize the expectation of the patient in discussing the treatment plan, and furthermore that time-bound agreements are made about the treatment plan (see step 5).

psychosocial) factors either caused or are maintaining the complaints. The physical therapist will also assess the extent of the patient's knowledge about his condition, his beliefs about what caused it, and the level of control he thinks he has.

The starting point for these guidelines is that the referring physician has excluded the possibility that the low back pain has a specific cause. If the physical therapist suspects there is a specific cause, based on the way the condition changes over time, he should contact the referring physician.

Referral

Referral by a primary care physician or by a medical specialist is a prerequisite for the treatment described in these guidelines. Important referral data are: the patient's needs, the reasons for referral, the previous courses of the disability and of any problems with participation, information on additional diagnostic procedures, and prognosis. The physical therapist should contact the referring physician if the referral documentation contains insufficient data.

History-taking

The key points of history-taking in low back pain patients are listed in Table 1. In cases of recurrent low back pain, the physical therapist will look specifically for a possible cause for the recurrence (for example, changes in work load or activity), and will determine the total duration of the complaint and the time between episodes of low back pain. The physical therapist will also ask about the implementation of any ergonomic recommendations and the patient's compliance with these recommendations. If the patient does not adhere to previously given advice, the physical therapist should identify reasons for non-compliance. The guidelines development group recommends use of the Patient-Specific Complaint questionnaire and the Quebec Back Pain Disability Scale to assess the patient's functional status.

Indications for an abnormal course are:

- the complaints persist or worsen;
- the number of daily rest periods increases;
- analgesic use remains steady or increases;
- there is no return to normal activities or to normal participation, or both;
- the patient specifically asks for diagnosis and treatment by a medical specialist.

These indications relate to low back pain and to a complaint period of three weeks, and take into account the patient's activity level.

Examination

The purpose of the examination is to identify factors that may either hamper or facilitate treatment, and to assess the patient's level of physical fitness and degree of participation. The starting points in any examination are the disabilities and problems with participation that were identified during history-taking (for example, problems in maintaining a sitting position, in picking up an object from the floor, or in standing up from a lying position). The physical therapist will try to identify the impairments (for example, decreased muscle strength in the back extensors, decreased lumbar spine mobility, or decreased physical fitness) that may be related to the disability and participation problems.

Table 1. Key points of history-taking in patients with low back pain.

- identify the patient's needs and expectations, and evaluate his complaints
  - what are the consequences of the complaints for daily life
  - what are the expectations of the patient and maybe the underlying fears
- identify the onset of the complaints, taking details of
  - the situation before the start of the complaints (levels of activity and participation)
  - the development of the complaints
- evaluate the course of the condition over time, taking details of
  - the present state: severity and nature of complaints (impairments, disabilities and participation problems)
  - the course of the complaints (normal or abnormal)
  - previous diagnostic procedures and treatment interventions and their results
  - previous information obtained (type and source of information)
- determine coping strategy, taking details of
  - the significance the patient attaches to his complaints
  - the patient's degree of control over his complaints
- note additional information on
  - co-morbid conditions
  - current treatment: medication, other treatment or advice, and medical aids
  - work-related factors

If, based on the findings revealed by history-taking, the physical therapist suspects nerve root compression, he will carry out a neurological examination that comprises the straight leg raising test (Lasèque test) and an assessment of muscle strength, sensibility, and the tendon reflexes of the spinal nerves involved. The treatment of patients with the lumbosacral radicular syndrome (that is, a herniated disc) is beyond the scope of these guidelines. If neurological tests give positive results, the physical therapist should contact the referring physician.

Analysis

The following questions should be answered during the diagnostic analysis:

- Which impairments and disabilities are related to the patient's participation problems?
- Does the back pain follow a normal or an abnormal course?

If the course is abnormal:

- Is there any evidence that (bio-psychosocial) factors maintain or aggravate the complaints?
- Can these hampering factors and the relevant impairment, disability and participation problems be influenced by physical therapy?

At the end of the diagnostic process, the physical therapist has to answer the following questions:

- Is physical therapy indicated?
- Are the guidelines relevant to this particular patient?

If both questions can be answered positively, the physical therapist, together with the patient, will devise a treatment plan and set individual treatment goals.

The physical therapist should contact the referring physician if he thinks the hampering factors or the impairment, disability and participation problems cannot be treated by physical therapy (alone).

Treatment plan

The main goals of the treatment plan are to return the patient to a full (or desirable) level of activity and participation and to prevent recurrences and the development of chronic complaints. Most patients whose low back pain follows a natural course will return to normal levels of activity and participation, irrespective of treatment. Therefore, only one treatment session, to coach the patient, will be sufficient. Patients whose low back pain follows an abnormal course will need therapy, the key elements

of which are the provision of appropriate information and advice, and exercise therapy. The physical therapist will use an active approach that involves the patient in both constructing the treatment plan and carrying out the treatment.

The physical therapist will use an active approach towards low back pain patients.

III. Therapy

In the following description of the therapeutic process a distinction is made between low back pain that follows a normal course and low back pain that follows an abnormal course.

1. Treating low back pain that follows a normal course

The starting point here is that the patient is able to cope adequately with his complaints. One treatment session should be sufficient. In this session, the physical therapist will give information and advice and, if necessary, will recommend some exercises. Advising the patient to stay active is useful, whereas advising bed rest is not. No further appointments have to be made, with the exception of a single follow-up session, if needed.

It is useful to advise (sub-)acute low back pain patients to stay active. Bed rest is not useful for patients with acute low back pain. If bed rest is unavoidable, it should be for a short period only – for a maximum of two days.

Information and advice

The physical therapist will explain that low back pain usually follows a favorable course and will discuss the relationship between load and load-bearing capacity. The message should be that gradually increasing activities is beneficial and not harmful for the back. The physical therapist will coach the patient and encourage him to continue current activities and to build up to a full level of activity and participation. The physical therapist and the patient will evaluate potential barriers to this process and seek solutions together.

Exercise therapy

To support the information and advice provided, the physical therapist will help the patient to understand through experience that movement and activity are not harmful. Moreover, by practicing the movements needed for normal daily activities, the patient will have positive experiences with those movements and may subsequently be able to transfer these experiences to other activities in daily life.

Evaluation and conclusion

The referring physician is informed about the results of the diagnostic process and the advice given to the patient.

2. Treating low back pain that follows an abnormal course

In these patients, secondary goals of therapy are to:

- increase the patients' awareness and understanding of their conditions;
- gradually increase the level of activity and participation;
- improve relevant physical functions, such as muscle strength, exercise capacity and mobility;
- promote an adequate coping style;
- modify any bio-psychosocial factors associated with a high risk of chronicity that are treatable within the scope of physical therapy (e.g., improve the patient's physical condition, or discuss the patient's workload or the partner's role).

As in the treatment of low back pain that follows a normal course, the most important interventions are giving adequate information and advice and recommending exercise therapy. Exercise therapy is not useful in patients with (sub-)acute low back pain because it has no added value above other treatment forms, such as no treatment. On the other hand, exercise therapy is useful in patients with chronic low back pain because it is more effective than no treatment. It remains unclear which exercises are the most effective. The use of a varied exercise program that meets the patient's needs and preferences is recommended. Exercise coaching employing behavioral principles (e.g., using a time-contingent approach as described below) is useful in chronic low back pain patients. If possible, or desirable, exercise therapy may be carried out in water.

In patients with (sub)acute low back pain, exercise therapy does not have added value above no treatment. Exercise therapy should be used in the treatment of chronic low back pain patients. These guidelines recommend the use of a varied program of exercises. In chronic low back pain patients, time-contingent exercise is useful.

Information and advice

The physical therapist will teach patients to control their 'recovery', to prevent any future complaints, and to manage possible recurrences and exacerbations. To achieve treatment objectives, the physical therapist will provide information on the nature and course of low back pain, on the relationship between load and load-bearing capacity, and on the importance of an active lifestyle. The patient should be told that low back pain is not usually harmful and that an increase in back pain does not necessarily imply that the back has been damaged. The physical therapist will teach patients to interpret their complaints accurately. Advice will, for instance, deal with the correct postures that should be adopted for activities in daily life. The provision of information and advice is an interactive process. The physical therapist should regularly check whether the patient understands the information given and whether the information and advice can be put into practice in the patient's daily life.

It is important that the patient adheres to the recommended treatment, in other words, that the patient is compliant, if there is to be a beneficial effect on his condition. Therefore, it is essential that the patient has a realistic understanding of his back pain and that he feels in command of the skills needed to manage back pain in the future. The information and advice given must be tailored to the patient's needs. It is of the utmost importance that contradictory information is avoided. A distinction is made between short-term compliance during the treatment period and long-term compliance after the completion of treatment. It is the task of the physical therapist to promote both short-term and long-term compliance. To promote long-term compliance, it is important that there is co-operation between the physical therapist, the patient, the referring physician and, if involved, the occupational physician. More detailed information is provided in the second part of these guidelines, which is entitled "Review of the evidence".

Exercise therapy

To increase the patient's general level of activity, it is necessary to train relevant physical functions, such as muscle strength, exercise capacity and mobility, and to practice relevant activities. Physical functions can be improved by applying the principles of physiological training. In order to resume or increase activities, a time-contingent exercise program is set up. Time-contingency means that activities are gradually increased over a previously agreed span of time and are not limited by any experience of pain. The main purpose of this approach is to focus on the activities rather than on the pain.

The exercise program starts with the determination of a baseline measure of activity, which is the mean of the current levels of a range of activities. The exercise regime is then drawn up in consultation with the patient. It is based on the baseline measurements and on set goals. The program will prescribe increases in the duration, frequency and intensity of each exercise or activity. In following the program, the patient will exercise no less, but also no more, than was mutually agreed for that day. In addition, the patient will also exercise at home and keep a record of his progress. (See the second part of these guidelines, entitled "Review of the evidence"). If the patient would like to learn an activity that he is not able to perform, the physical therapist will break the activity up into a number of parts that can be practiced step by step.

If the patient is anxious about moving, the starting activity level must be set lower and the steps recommended must be smaller. After consulting the patient about his fears, the least threatening activities will be practiced first, with the more threatening activities following later. The physical therapist will encourage the patient to exercise in the practice under his guidance. In this way the patient can move in safe environment. If activities are increased during the therapy sessions, the patient will be expected to increase his corresponding activities at home, thus carrying over the treatment effects. The primary objective is for patients to control their movement behavior.

Neither biofeedback nor traction is recommended because there is no evidence that these interventions are effective. It is not clear whether massage therapy, electrotherapy (including transcutaneous electrical nerve stimulation; TENS), ultrasound therapy or laser therapy is effective for low back pain. Consequently, use of these interventions is not included in these guidelines and, in practice, physical therapists should have reservations about using them. In individual circumstances, the physical therapist may consider these methods but they should never be a key component of the treatment regime. They should only be used for a short time in support of the active approach.

Neither traction nor biofeedback is useful in chronic low back pain patients. Moreover, it is unclear whether massage therapy, electrotherapy (including TENS), ultrasound therapy or laser therapy is useful. These guidelines recommend that these interventions are only used reservedly and only in support of the active approach.

Evaluation

The physical therapist will evaluate treatment results regularly and systematically by setting them against treatment objectives. On the basis of this evaluation, the treatment plan may be modified. The physical therapist may use the measuring instruments mentioned above in the description of the diagnostic process. To evaluate the effectiveness of the information and advice given, the physical therapist should ask himself: “Does the patient know what he needs to know?” and “Does the patient cope in the way he should?” If treatment does not improve the patient’s functioning within three weeks, the physical therapist should contact the referring physician.

Final evaluation, conclusion and reporting

At the end of treatment, and possibly during treatment, the effects of the interventions used should be evaluated and reported back to the referring physician. The report should also include details of the treatment objectives and of the treatment process. Any report to the primary care physician should be written in accordance with the recommendations made in the Dutch national guidelines entitled “Communicating with and reporting back to general practitioners” and “Physiotherapeutic documentation and reporting”.

Review of the evidence

Ia. General introduction

The KNGF-guidelines Low Back Pain provide a guide for the physical therapy treatment of patients with non-specific low back pain. The guidelines describe the diagnostic and therapeutic process in line with the methodic physical therapeutic conduct.

Definition
KNGF-guidelines are defined as 'a systematic development form a central formulated guide which has been developed by professionals focusing upon the context of the methodic physical therapy treatment according to certain health problems and aspects which have to do with the organization of the profession'.[1,2]

Objective of the KNGF-guidelines: Low Back Pain
The objective of the guidelines is to describe the 'optimal' physical therapy treatment (effectiveness and efficiency and tailored care) for patients with non-specific low back pain based upon current scientific, professional and social insights. The care should result in the return to a full (or desired) level of activities and participation in society and the prevention of chronic complaints and recurrences.

Results from research show that there is a large variation between the therapy goals, interventions and the magnitude of physical therapy care in patients with low back pain.[3] However, recent data indicate that there has already been a clear change in the applied interventions in line with the current scientific insights over the past years.[4]

Besides the above mentioned objectives, the KNGF-guidelines are explicitly meant to:

- change the care in the desired direction based on current scientific research and improve the quality and the uniformity of this care.
- to assure insight into and to define tasks and responsibilities and to stimulate cooperation.
- support the physical therapists' process of decision making and usage of the diagnostic and therapeutic interventions.

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.

Presenting the clinical questions
The group which has formulated these guidelines wanted to attain an answer on the following questions:

- How can non-specific low back pain be defined?
- How big a problem is non-specific low back pain?
- What is the prognosis and course of non-specific low back pain?
- Which parts of the physical therapeutic diagnostic assessment are valid, reliable and useful in daily practice?
- Which interventions are useful in the treatment of non-specific low back pain?

The mono disciplinary working group
In February 1999 a mono disciplinary working group of professionals was formed to answer these clinical questions. In the formation of the working group an attempt was made to achieve a balance in professionals with experience in the area of concern or with an academic background. All members of the working group have stated that they had no conflicting interests what so ever in relation to the development of the KNGF- guidelines. The development of the guidelines took place from February 1999 until October 2000.

The guidelines have been developed according to the 'Methods for the Development and Implementation of Clinical Guidelines'.[1,2,5,6] The method includes practical instruction of the strategies used to collect literature. Later in the Review of the Evidence of these guidelines the specific terms used to gather literature, the consulted sources and the period of time over which the literature was accumulated and the criteria used to select literature are described. The recommendations for the therapeutic process are almost solely based on scientific evidence. If there was no scientific evidence available, the recommendations were formulated based upon consensus within the working group.

The level of evidence is described in four levels (see table 2). An intervention is recommended if there is strong evidence. An intervention is advised against if there is strong evidence that it is not effective. The guidelines use terms as 'is useful' and 'is not useful', respectively. If the level of evidence is moderate, the intervention is less pronounced recommended; an intervention 'seems useful' or 'seems not useful'. If there is limited, contradictory or no evidence, the interventions is neither recommended, nor advised against: 'It is unknown whether an intervention is useful'. In consensus with the working group it is decided to advise against the use of passive treatments, such as massage, TENS, Ultrasound, electrotherapy and laser, because the use of passive treatment might lead to dependency of the patient. This is against the objective of treatment, namely to make the patient independent so that he can control the complaints and the recovery by himself.
For the formulation of the recommendations there might be, apart form the scientific evidence, other important considerations, such as the achievement of general consensus, efficiency (costs), availability of means, required professionalism and education, organizational aspects and the attempt to be in line with other mono and multi disciplinary guidelines.

Once the mono disciplinary concept guidelines were completed they were sent off to external professionals and/or occupational organizations (secondary working group). The reason for this step in the process of guidelines development is to attain a general consensus within the other occupational groups or organizations and/or with other mono and multi disciplinary guidelines. Four physical therapists were added to the secondary working group to increase the support of the guidelines by physical therapists.

Validation by the supposed users
Before publication and distribution, the guidelines are systematically reviewed by the target group that will be using the guidelines in the future (validation). The draft KNGF-guidelines 'Low back pain' are presented to an at random selected group of 100 physical therapists of the KNGF register. The physical therapists were asked to judge the guidelines by using a questionnaire. This questionnaire included statements about six quality requirements, namely: clinical applicability, validity, specificity/differentiation, flexibility, clarity, and attractiveness.[7] The physical therapists were asked to reason their answers. The comments and remarks from the physical therapists were documented and discussed in the working group and if possible and/or desired included in the final guidelines.
The recommendations for the practice are the result of the available evidence, the above mentioned other aspects and the results of testing the guidelines amongst the users (physical therapists).
During the review of the literature no consequences of the interventions were found with respect to side effects and risks. An inventory of the cost implications has been considered but eventually not performed because there are only very few economic evaluations on the physical therapeutic intervention in low back pain, which are methodologically weak.[8]

Constitution, products and implementation of the guideline
The guidelines constitute of three parts: the practical guidelines, a schematic layout of the main points of the guidelines (summary) and the review of evidence section. All parts of the KNGF- guidelines can be read individually. Aside from the publication and distribution of the guidelines amongst members of the KNGF, there is a segment promoting professionalism developed and published to stimulate the use of the guidelines in daily practice.[9] The guidelines are implemented according to a standard of implementation strategies which are described in the method.[1,2,5,6,10]

Experience and expectations of patients
The final guidelines are presented to two patient organizations: Orthopedic Patient Council (SPO) and the Dutch Society of Patients with Low Back Pain (NVVR). The most important remarks concerned the fact that patients would like the physical therapists (and other care takers) to avoid talking about the possible causes of the low back pain. Patients expect physical therapists to take the low back pain seriously, which means that the low back pain is not considered as 'psychological' without an explanation. These remarks will be noticed during the revision of the guidelines.

Use of the guidelines
Working together with the Primary Care Physician is recommended for optimal care. The Primary care physician has to know the content of the KNGF-guidelines Low back pain, or the care the physical therapist can provide to patients with nonspecific low back pain. It is preferred that the Primary care physician and the physical therapist make work agreements together, which are regularly being evaluated and regulated.

Ib. Introduction to this quidelines

This review sets out to explain the choices made in deriving the guidelines on the management of low back pain issued by the Royal Dutch Society for Physical Therapy (KNGF). These guidelines are based, as much as possible, on evidence-based science.

In addition to being based on information from the scientific literature, the construction of these guidelines has also taken into account recent professional developments and other factors, including practical considerations. Moreover, the guidelines have also been brought into line with recommendations made in other Dutch national guidelines, such as the guidelines of the Dutch Society of Primary Care Physicians (NHG-guidelines),[11] and those of the Association of Occupational Physicians (NVAB-guidelines),[12] as well as with recommendations made in international low back pain guidelines.[13–16]

A distinction is made between specific low back pain and non-specific low back pain depending on the origin of the pain. Specific low back pain is back pain that has a specified cause, such as trauma, a tumor, an infection, or nerve root compression (the radicular syndrome). In non-specific low back pain, no physical cause can be demonstrated.

These guidelines are for the management of patients with non-specific low back pain. The various forms of specific low back pain are not taken into consideration. The role and nature of manual therapy for low back pain are detailed in the guidelines entitled "Manual therapy in low back pain", which were under development in 2003.

Impairments, disabilities and participation problems
Physical therapists describe the health problems of low back pain patients in terms of impairments, disabilities, and participation problems. Impairments are manifestations of a disorder that involve body structure or physiological or psychological functioning. Examples are decreased muscle strength, pain, sensory impairment, or fear of movement. Disabilities are problems with the performance of normal activities, such as bending, stretching or walking. Participation problems are the difficulties an individual may experience in his social life or work. These concepts are derived from the International Classification of Human Functioning, Disability and Health (ICIDH).[17] Their use is intended to promote a uniform approach in the rehabilitation professions. In the ICIDH, the term dysfunction is used as an umbrella concept to cover the above-mentioned three levels of functioning. In the NHG guidelines,[11] dysfunction is defined as "not being able to fulfill the demands made by the patient or his social system regarding normal activities in daily life and work".[11]

Target group
In order to use these guidelines correctly, physical therapists must know about the natural course of low back pain, about positive and negative factors influencing the natural course, about behavioral treatment principles, and about the methodical use of educational principles. In addition, physical therapists must have some knowledge of scientific findings on the management of low back pain patients by physical therapy.

Definition of low back pain
The definition of non-specific low back pain used in the guidelines is based on Waddell's[18] description of "simple low back pain", which is as follows: "Clinical presentation is usually at ages 20–55 years; lumbosacral region, buttocks and thighs; pain is 'mechanical' in nature: varies with physical activity and varies with time; patient well." Recurrent back pain is defined as the occurrence of several episodes of back pain within one year such that the total duration is less than six months.[19] In classifying back pain on the basis of duration into acute (0–6 weeks' duration), subacute (17–22 weeks' duration) and

chronic (> 12 weeks' duration) low back pain, these guidelines are in line with the classification used in the NHG-guidelines.[11]

Magnitude of the problem

In a review, Frymoyer[20] states that 60–90% of the entire population will experience an episode of low back pain at least once in their lives and that the corresponding annual incidence is 5%. The annual incidence and prevalence of non-specific low back pain in the average primary care physician's practice are 30 and 35 episodes, respectively, per 1,000 registered patients.[21] In 1998, the policy of primary care physicians in the Netherlands for dealing with low back pain was, for the main part, in accordance with their guidelines.[22] In 72% of all patients with low back pain, the primary care physician made a working diagnosis of "non-specific low back pain". Most patients received medication and the advice to increase activities. However, contrary to the guidelines, some patients with acute low back pain were referred for primary care (i.e., for physical therapy), some were advised to take lengthy bed rest, and medication was not always prescribed in a time-contingent manner.[22] For physical therapists, low back pain is a common referral diagnosis, with 27% of all patients referred having low back pain.[23]

Low back pain is not only a major medical problem, but also a significant economic problem. In 1991 in the Netherlands, the estimated cost of low back pain to society was 1.7% of the gross national product.[24] The indirect costs of low back pain, which include work disability payments and work absenteeism, made up 93% of the total. Direct medical costs, including costs for hospitals, medical specialists, primary care physicians and allied health professionals, made up 7% of the total.[24]

Prognosis and course

About 60% of patients with back pain state that their first episode had a sudden onset, with the complaint starting during activities such as bending or lifting. The other 40% said that symptoms started gradually.[18] Usually, the exact cause of back pain is not known.[25] No specific medical diagnosis is made in around 90% of patients.

The usual course followed by low back pain depends on the population from which the sample is drawn. In an open population, the prognosis is usual favorable. In an estimated 75–90% of patients, back pain disappears spontaneously within 4–6 weeks.[18] In the population of patients who visit primary care physicians specifically because of low back pain, the prognosis is a little less favorable, with 65% being free of their complaint after 12 weeks.[26]

Low back pain often recurs. Seventy-five percent of patients who seek help from their primary care physician experience at least one relapse within a year.[26] However, persistent low back pain does not necessarily indicate a less favorable prognosis.[27] There is a growing consensus that it is the extent of disability that is the most important predictor of outcome in patients with low back pain.[27]

Absence from work

In 90–95% of the working population, low back pain does not lead to absenteeism.[28] On the basis of findings in several studies, Waddell[18] describe absenteeism in terms of time: 67% of people go back to work within a week; 84% within a month; and 90% within two months. The return-to-work curve levels off after three months of sick-leave: persons who are still absent from work at this time run a higher risk of not coming back. After one year, absenteeism is down to 3%. The return-to-work curves reported in the literature all look similar. At first, there is a sharp rise, after which the curve levels off slowly. However, the percentage of patients still off work after one year is different in the various studies, ranging from 1–2% to 5–10%. On the basis of the results of several studies, Waddell[18] concluded that the return to work tends to be delayed in several groups of patients: in those with specific low back pain, in those who experience recurrence, in manual workers, and in those from lower socio-economic classes.

Bio-psychosocial model

In the traditional biomedical model, pain is a direct consequence of an underlying pathologic condition. Symptoms will diminish when the condition is removed. However, some chronic complaints, such as chronic low back pain, cannot be explained easily

using this model because there is no clear correlation between symptoms and pathology. Therefore, the current approach to chronic low back pain increasingly tends to be inspired by a bio-psychosocial perspective. In this view, low back pain, like most pain, is a result of the interaction of biological, psychological and social factors.[29,30] Psychosocial factors, in particular, are thought to play a role in maintaining complaints.

Prognostic factors influencing the maintenance of complaints

Linton[31] performed a systematic review of the relationships between psychological factors and neck and back pain. The review included 36 prospective studies. On the basis of several clinically relevant and methodologically sound studies, Linton concluded that psychological factors are strongly associated with a change from acute to chronic pain and with greater disability. In addition, Linton clearly found that psychosocial factors generally have a bigger impact on the disabilities caused by low back pain than either biomedical and biomechanical factors. The patient's attitudes and emotions are important. A passive coping strategy, the perception of pain as "a catastrophe", and conditions such as depression and fear are all highly associated with increased pain and disability. Also, there is moderate to strong evidence that these psychosocial factors may, in the long term, predict the level of pain and disability.

Waddell and Waddell[32] carried out a systematic review of the influence of social factors on back and neck pain. They concluded that, although there are many indications that social factors may be related to back and neck pain, the studies they looked at were methodologically weak. The only social factors for which findings are consistent, appearing in either one systematic review or in more than two methodologically sound studies, are lower social class and psychosocial aspects of work, such as low work satisfaction. The authors point out that these social factors are not risk factors for the development of back or neck pain. However, they may well influence the pain, and the way in which patients cope with their complaints.

Coping with low back pain

Patients may cope with their complaints either adequately or inadequately. Coping is defined as "the cognitive and behavioral efforts made by an individual to control, reduce and tolerate the internal and external demands created by a stressor".[33] Coping may be either active or passive. In active coping, individuals undertake actions by themselves to control the pain, for example, by seeking distractions or by moving. In passive coping, individuals adopt a passive attitude, for example, by resting or using medication. They may become dependent on others as a way of controlling pain or may decrease their activities in order to reduce the pain.[34] Active coping is associated with better functioning, whereas passive coping is associated with poorer functioning.[34] The way in which a person deals with his complaint is determined by his characteristics and by his interactions with his environment, which may include the physical therapist.

Patient characteristics

The significance the patient attaches to his complaints and his feeling of control over the complaints are two distinct characteristics. Being based on the subjective perception and interpretation of stimuli, the significance attached to a complaint may not correspond with objective reality. In this case, a logical error is being made. One common logical error is to 'catastrophize', that is to consider the pain, and the situation in which the pain is present, as being a serious threat, i.e., a catastrophe. The extent to which a person feels he has control over his pain is also important. The patient may feel that his health is mainly controlled by himself (i.e., there is an internal locus of control) or mainly controlled by other people or circumstances (i.e., there is an external locus of control). Some individuals may give other people, for example, the physical therapist, control over their health.[35] An internal locus of control is often related to active coping and, subsequently, to a better way of dealing with pain.[34]

Both the significance attached to the pain and the perceived sense of control may determine the patient's movement behavior. For instance, if pain is considered to be a sign of possible injury (i.e., a catastrophe), there is a high risk that fear of

movement will result. Fear of movement is the fear that movement will result in (new) pain or (re)injury. It can, in turn, lead to avoidance.[36] In addition, when, on the basis of previous experience, the patient expects that a certain activity will increase the pain in a way over which he has no control, there is a chance that the situation giving rise to that activity will be avoided.

Interaction between patient and surroundings
Social support can help an individual to deal with setbacks and to adjust to change. The most important source of social support is the patient's partner. Patients with low back pain who have good social support recover more quickly and return to normal daily activities sooner. On the other hand, the particular type of social support can also contribute to maintenance of the condition. For example, a partner who takes everything out of the hands of the patient will, by doing this, ensure that the patient's logical errors persist.

In addition, both the attitude of the physical therapist and the way in which he approaches the patient's complaints appear to influence the course of the complaints. In patients with chronic low back pain, it may be very important to use a time-contingent approach in which activities are gradually increased with time and not according to the patient's symptoms. The primary objective of this approach is to improve function, not to reduce pain.

Cooperation with other disciplines
Cooperation with other health workers will improve the effectiveness and efficiency of the care provided. The physical therapist should make formal agreements with other health workers in his area, such as primary care physicians, occupational therapists and psychologists, about adopting a common policy in this particular group of patients. Communication between physical therapist and primary care physician can be improved by making use of specifically designed guides, which include details of letters of referral, indication setting, consultation, maintaining contact during treatment, and writing reports.[37] The guide on indication setting encourages the discussion of each other's guidelines and the adoption of common policies.

The Dutch Society of Primary Care Physicians has published guidelines on low back pain.[11] The guidelines state that, in acute low back pain, no treatment gives better results than adopting a 'wait-and-see' policy. In low back pain that has lasted for more than six weeks, treatment is directed at preventing or decreasing dysfunction.

The Dutch Association of Occupational Physicians has published guidelines on low back pain that deal with the treatment of affected workers.[12] The objective is to prevent sick employees staying off work for an unnecessarily long time, thereby risking long-term disability. Occupational physicians may also advise employers on making adjustments at work (i.e. in the social work environment), such as introducing flexible working hours, assigning different tasks, making ergonomic adjustments, or changing the attitudes of management and of the patient's colleagues. Patients who are off work should, together with their manager and occupational physician, construct a plan for gradual re-integration. Good communication is essential so that this plan can be matched with the process of gradually increasing activities directed by the physical therapist. If appropriate, the physical therapist should consult the occupational physician.

Multidisciplinary guidelines on low back pain have recently been developed by national consensus at the Dutch Collaborating Centre for Quality Assurance in Healthcare (CBO).

II. Diagnosis

The process of problem-solving is central to the methodical management of patients by physical therapy.[38] The following elements are included: referral, history-taking, examination, analysis (including the formulation of a physical therapy diagnosis), devising a treatment plan, treatment, evaluation, conclusion, and report-writing.[39–41]

Referral
Important referral data concerning patients with low back pain are: the patient's needs; the reasons for referral; the history of the patient's functioning, in terms of activities and participation; information on

additional diagnostic procedures; and prognosis. Other referral data are: details of prescribed medications, co-morbidity, and the presence of relevant bio-psychosocial factors.

History taking

The physical therapist takes the patient's history to try to get a clear picture of the health problem. What does the patient expect and what would he like? Which complaint is most important? What impact does the complaint have on the patient's daily life? Which factors increase, decrease or maintain the complaint? How does the patient feel about his complaints and their consequences?[38]

The patient's coping strategy is particularly important in low back pain. Consequently, throughout history-taking the physical therapist will try to explore the significance the patient attaches to his condition. Does the patient make logical errors? Does he have control over his complaints? Does he fear movement? Answers to these questions will be used by the physical therapist during treatment. From additional data provided during referral, the physical therapist may be able to identify factors, such as co-morbid conditions, that could have a negative influence on the course of the low back pain or that could influence the choice of intervention.

These guidelines recommend the use of two specific measuring instruments. The first is the Patient-Specific Complaint questionnaire,[42] which is used to assess the patient's functional status. In it, the patient lists all the physical activities that he has difficulty performing because of back pain. These activities must be relevant and important to the patient and they must normally be performed regularly (i.e., every week). Subsequently, the patient selects three of the most difficult, most important and most frequently performed activities. The patient is scored on these activities at the beginning and end of the treatment episode using a visual-analog scale. To date, no studies have been carried out on the reliability of this instrument, although the Patient-Specific Complaint questionnaire has proved to indicate responses in patients with low back pain.[43]

Another instrument, the Quebec Back Pain Disability Scale, is used to identify disabilities and problems with participation. It contains 20 items on daily activities, in areas such as bed rest, sitting and standing, walking, moving, bending, and moving heavy objects. There are six possible answers to each question, ranging from "no difficulty at all" to "not able to perform". The total score on this instrument is the sum of the scores for all items. It may vary from 0 (not disabled) to 100 (totally disabled). A Dutch version of the questionnaire is available and has been shown to be valid, reliable and responsive.[43] The Quebec Back Pain Disability Scale is detailed in a supplement to these guidelines.[44] The Patient-Specific Complaint questionnaire may be found in a publication by Köke et al.[45]

Examination

It is recommended that the examination of patients with low back pain focuses on their abilities and problems with participation in society. This recommendation is based on the assumption that the referring physician has excluded the possibility that the back pain has a specific cause[11] and on evidence from previous research showing that the diagnostic tests carried out by physical therapists in low back pain patients have limited reliability and validity.[46,47]

The objectives of the examination are to identify any conditions that may limit treatment and to assess the actual level of the patient's physical functioning. The patient will undergo a physical examination and be observed at rest and during movement. Depending on the information obtained during history-taking, the physical therapist may:

- make anthropometric measurements of, for example, the positions of the spine and the legs;
- assess physiologic functions, such as joint functioning, muscle strength, balance, and movement patterns;
- assess the performance of activities, such as bending, lifting, pushing, maintaining posture, sitting and standing, and walking, in order to provide additional information or to verify data obtained during history-taking.

The physical therapist will form an impression of the relationship between the patient's functional and structural impairments and the extent of his disabilities and participation problems. In addition,

the physical therapist should gain insights into the way in which the patient controls his complaints, into his physical functioning, and into the quality of his movements. A patient who fears movement will be less inclined to move and may shun exercises.

Analysis
The data collected will be used to define the patient's health problem. Thereafter, the physical therapist will assess the patient's health status and decide if intervention is likely to be effective. If physical therapy is not indicated, the patient will be referred back to the physician. If indicated, the physical therapist will have to determine whether physical therapy can be carried out according to the guidelines. When the analysis is complete, the therapist will drawn up a treatment plan in close consultation with the patient.

It may not be possible to follow the guidelines if there are insufficient referral data or if there is a specific cause for the low back pain. If there is any evidence indicating that the condition has a specific cause, the physical therapist will contact the referring physician. In addition, specific personal factors may have a negative influence on the treatment content. The outcome of the therapeutic intervention may depend on the extent to which these factors play a role in the health problem and on the extent to which they can be influenced. The physical therapist will have to make a critical judgment of whether particular factors can be influenced by physical therapy. At present, there are no objective criteria for making this judgment. If necessary, the physical therapist will contact the referring physician.

Treatment plan
The treatment plan helps the physical therapist structure, control and evaluate treatment. It is drawn up together with the patient and details the individual treatment objectives, the type of intervention to be used, and the treatment strategy. The main objectives of treatment are to return the patient to his highest (or desired) level of activity and participation and to prevent recurrence and the development of a chronic complaint. The physical therapist will pursue an active policy in which the patient also takes responsibility for the results of treatment. This can be achieved by actively involving the patient in devising the treatment plan and in carrying out treatment.

III. Therapy

This part of the review of the evidence is divided into two sections: the first contains an evidence-based assessment of the physical therapy interventions used in low back pain patients and the second illustrates the therapeutic process recommended in these guidelines. These therapeutic recommendations are based primarily on scientific evidence. Moreover, all the treatment modalities employed by the physical therapist must be incorporated into the recommended active approach.

Evidence-based review
A computer-aided search for published systematic reviews or meta-analyses dealing with the efficacy of physical therapy interventions in low back pain patients was undertaken as follows. The MEDLINE (1982-september 2000), CINAHL (1982-september 2000), and Cochrane Library (2000, NR 3) databases and the databases of the Dutch Institute of Allied Health professions (up to September 2000) were all searched using the following key-words: back pain, physical therapy, behavioral therapy, massage, education, mobilization, electrotherapy, laser, ultrasound, thermotherapy, systematic review and meta-analysis. Additional literature was supplied by members of the working group. The search yielded 188 publications. Inclusion criteria were: (a) that the publication must be written in English, German, French or Dutch; (b) that the study design must be a systematic review or a meta-analysis; (c) that the article must concern the efficacy of treatment interventions in patients with non-specific low back pain; (d) that the article must concern interventions that are part of the Dutch professional domain of physical therapy; and (e) that the outcome measures used must relate to patients' physical functioning. After applying these criteria, 13 reviews remained. In addition, five reviews of the efficacy of electrotherapy techniques in patients with musculoskeletal disorders were included. For several types of intervention, reviews by van Tulder et al.[48,49] were used. These reviews refer to four different levels of scientific

Table 2. Definitions of different levels of scientific evidence, after van Tulder et al.[49]

Level of evidence	*Definition*
Strong	Consistent findings in several high-quality randomized controlled trials
Moderate	Consistent findings in one high-quality randomized controlled trial and one or more low-quality randomized controlled trials
Limited or contradictory	One randomized controlled trial (high or low quality) or inconsistent findings in several randomized controlled trials
None	no randomized controlled trials

evidence, which are based on the number of randomized controlled trials conducted and on their methodological quality (Table 2).

No reviews on exercise in water were found. In order to investigate the effectiveness of this particular intervention, therefore, an additional literature search was carried out in the MEDLINE, CINAHL (1990-2000) and Cochrane Library (Rehabilitation and Therapy Field) databases and at the documentation center of the Dutch Institute of Allied Health Professions. The following keywords were used: hydrotherapy, aquafitness, balneotherapy, spa therapy, exercise and water. These keywords were combined with the keywords: back pain and low back. This search yielded 19 articles, eight of which concerned randomized controlled trials.

A description of the outcomes expected for each intervention modality follows, accompanied by recommendations on their use.

Bed rest

Hagen et al.[50] performed a systematic review of the effectiveness of bed rest in patients with acute low back pain. The review included nine trials, in five of which the methodological quality was high. Two high-quality studies compared the advice to take bed rest with the advice to stay active. Both studies found no difference in pain intensity after three weeks of follow-up. However, they did show that staying active leads to a slightly better functional status. Another two high-quality studies demonstrated that seven days of bed rest did not have a better effect on pain than two to four days of bed rest. Moreover, sick-leave was shorter when the period of bed rest was

Table 3. Overview of the different modalities for treating low back pain, arranged according to the strength of evidence of their effectiveness. TENS = transcutaneous electrical nerve stimulation.

Strength of evidence	*(Sub-)acute low back pain*	*Chronic low back pain*
Strong evidence of effectiveness	Advice to stay active	Exercise therapy
Limited or moderate evidence of effectiveness		Behavioral therapy, exercise in water
Effectiveness unclear	ultrasound therapy, electrotherapy, laser therapy, TENS, massage therapy	ultrasound therapy, electrotherapy, laser therapy, TENS, massage therapy
Moderate evidence of ineffectiveness	Specific exercises, traction	Biofeedback
Strong evidence of ineffectiveness	Advice to rest in bed	Traction

shorter. Furthermore, two other high-quality studies failed to find that bed rest had a more positive effect on pain or functional status compared to exercise.

Two further reviews of the effectiveness of bed rest (49,51) included the same trials as the review above, with the exception of three additional studies. Two of these new studies were included in one of the reviews but were not used by Hagen et al. because of criteria restricting (co)interventions. The third study was only published in 1999 and was, therefore, not included by Hagen et al. The findings and conclusions of both these reviews are consistent and confirm that bed rest is not a useful treatment for acute low back pain. It may even cause a delay in recovery.

Bed rest is not useful in (sub-)acute low back pain patients. When bed rest is unavoidable, the guidelines recommend that it be keep short, to a maximum of two days.

Staying active

Two reviews describe the effect of advising patients with (sub-)acute low back pain to stay active.(49,51) Both reviews included exactly the same eight trials. Two randomized controlled trials compared advice to stay active with advice to take bed rest. Either no difference was found or there was a faster recovery with less pain and a better functional status in patients who were advised to stay active. Five randomized controlled trials compared advice to stay active with the use of traditional treatments, such as analgesics, and found that advice to stay active was either just as effective or led to less sick-leave and less chronic disability. Both reviews conclude that advice to stay active results in a faster return to work, fewer cases of chronic disability, and fewer problems with recurrence. Hence, advising patients to stay active is useful in the management of (sub-)acute low back pain.

It is useful to advise (sub-)acute low back pain patients to stay active.

Exercise therapy

A systematic review by van Tulder et al.(52) included 39 randomized controlled trials of the effectiveness of exercise therapy for low back pain in the primary healthcare setting. Every study evaluated at least one of the following primary outcome measures: degree of pain, functional status, overall improvement, and return to work. Twelve trials involved patients with acute low back pain and 23 studied patients with chronic low back pain. Three trials included a mixed patient population and one study did not mention complaint duration.

In patients with acute low back pain, there is strong evidence that exercise therapy is equally effective as placebo, as inactive treatment, and as any other active treatment. In patients with chronic low back pain, there is strong evidence that exercise therapy is equally effective as conventional physical therapy using hot-packs, massage, traction, mobilization, short-wave therapy, ultrasound therapy, stretching exercises, mobilization exercises, coordination improvement, and electrotherapy. Moreover, there is strong evidence that exercise therapy is more effective than the standard care provided by the primary care physician.

It remains unclear, however, which types of exercise are best. The review by van Tulder et al.(52) reports conflicting evidence on the efficacy of flexion and extension exercises. There is strong evidence that extension exercises are not effective in the treatment of acute low back pain and moderate evidence that flexion exercises are not effective in the treatment of acute low back pain. There is strong evidence that strengthening exercises are no more effective than any other type of exercise and moderate evidence that strengthening exercises are more effective than inactive treatment.

Hilde and Bø (53) carried out a systematic review on the efficacy of exercise therapy in chronic low back pain patients. In it, they concentrated on the type and quantity of the exercise therapy. Nine randomized controlled trials met their inclusion criteria. Seven of the trials were also included in the above-mentioned review by van Tulder et al., who omitted two because of the patient populations used. Hilde and Bø concluded that it is not clear if either the methodological quality, the quantity, or the type of exercise influences outcome.

In summary, it can be concluded that exercise therapy is effective in chronic low back pain patients. However, insufficient data are available to make specific recommendations about the optimal content of exercise therapy programs.

In patients with (sub-)acute low back pain, exercise therapy is no more valuable than other treatment forms. Exercise therapy should be administered to patients with chronic low back pain because it leads to better results than no treatment. It is not clear which type of exercise is best. Therefore, the guidelines recommend the use of a varied exercise program that meets the patient's needs.

Behavioral therapy

Behavioral therapy is based on the assumption that pain and disability are not solely influenced by somatic pathology but also depend on the patient's cognition, expectations, psychological distress, and illness behavior. Three main approaches to behavioral therapy can be distinguished: the operant, cognitive and respondent approaches.[54] Each focuses on modifying one of the three response systems that characterize emotional experiences: behavior, cognition, and physiological reactivity. Details of these techniques are given below in the explanation of the recommended therapeutic approach.

Van Tulder et al.[55] carried out a meta-analysis of the efficacy of behavioral treatment for chronic non-specific low back pain compared with that of other treatments for chronic low back pain. They also investigated which type of behavioral treatment was most effective. Their analysis included 21 studies. The results show that there is strong evidence that behavioral treatment, compared with either no treatment, being on a waiting list or receiving placebo, has a moderate positive effect on pain intensity (effect size [ES], 0.62; 95% confidence interval [95% CI], 0.25–0.98), and small positive effects on general functional status (ES, 0.35; 95%CI, -0.04–0.74) and behavioral outcomes (ES, 0.40; 95%CI, 0.10–0.70) in patients with chronic low back pain.

It is not clear how the efficacy of behavioral treatment compares with that of other treatments. Moreover, there is no evidence that any specific behavioral treatment modality is more effective than any other. There is moderate evidence that adding a behavioral component to a normal treatment program for chronic low back pain, such as standard physical therapy, back school, multidisciplinary treatment or medical treatment, has a small short-term effect on functional status (ES, 0.31; 95%CI, -0.01–0.64). No short-term effect was seen on pain intensity (ES, 0.03; 95%CI, -0.30–0.36) or on behavioral outcomes (ES, 0.19; 95%CI, -0.08-0.45). Finally, there is moderate evidence for small long-term effects on functional status (ES, 0.26; 95%CI, -0.06–0.57) and behavioral outcomes (ES, 0.32; 95%CI, -0.06–0.71).

Turner[56] carried out a meta-analysis of the efficacy of cognitive and behavioral interventions in patients with low back pain in the primary healthcare setting. Although 14 publications met the original inclusion criteria, for the present review only 10 could be traced. Of these, eight were included in van Tulder et al.'s review. Also, Turner did not present the results of the individual randomized controlled trials, making interpretation of these studies unclear. However, Turner's conclusions are broadly the same as those drawn by van Tulder et al. Turner concludes that cognitive and behavioral treatments have a better effect on pain behavior and disability than control treatments, such as being on a waiting list. No differences were found between cognitive or behavioral treatments and other active treatments.

Behavioral treatment seems useful in chronic low back pain patients, being more effective than no treatment. However, it is not clear which type is most effective. For physical therapists, the operant approach seems most suitable because movement behavior is the central concern.

Traction

In 1995, van der Heijden et al.[57] performed a systematic review of the effectiveness of traction in neck and back pain. Seventeen randomized controlled trials were included, 14 of which concerned the efficacy of lumbar traction. The authors reported that the methodological quality of the studies was too low to draw conclusions about the efficacy of traction in low back pain. A more

recent systematic review, by van Tulder et al.,[49] almost completely overlaps van der Heijden et al.'s review, with the exception of a single randomized controlled trial that was published in 1995. The newly added trial, which has a high methodological quality, compares the efficacy of traction with that of placebo-traction in patients with chronic low back pain. No effect on general improvement, pain or functional status was found. Mainly on the basis of this later trial, van Tulder et al. conclude that there is strong evidence that traction is not an effective treatment for chronic low back pain.

Traction is not useful in chronic low back pain and does not seem to be useful in acute low back pain.

Biofeedback

Van Tulder et al.'s systematic review[49] included five randomized controlled trials of the effectiveness of biofeedback in patients with chronic low back pain. All the trials had a low methodological quality. In three studies, no difference was found in pain or functional status between patients receiving biofeedback and those receiving placebo or remaining on a waiting list. Two studies compared biofeedback with progressive relaxation training and found conflicting results with regard to pain and functional status. Another study looked at the incorporation of biofeedback into a rehabilitation program and found that the inclusion of biofeedback resulted in no difference in pain or in the patients' range of motion. In conclusion, there is moderate evidence that biofeedback is not effective in patients with chronic low back pain.

The administration of biofeedback does not seem to be effective in chronic low back pain patients.

Massage

Ernst[58] conducted a review of the effectiveness of massage in patients with low back pain. Four randomized trials were included. All the studies used massage as a control treatment rather than an experimental intervention. Moreover, the methodological constructs of all the studies were weak. One study showed that massage is superior to no treatment and two other studies showed that massage is as effective as manipulation or TENS. The fourth study showed that massage is less effective than manipulation. In conclusion, the evidence on the efficacy of massage in low back pain is contradictory.

It is unknown whether massage is useful in low back pain patients.

TENS ***(transcutaneous electrical nerve stimulation)***

The review by van Tulder et al.[49] on the efficacy of TENS contains two trials that studied patients with acute low back pain. One study, which has a low methodological quality, found a larger decrease in pain and a larger increase in mobility in the TENS group. The other study, which has a high methodological quality, did not find any difference in pain or functional status. Four studies, three of which have a high methodological quality, compared TENS with placebo in patients with chronic low back pain. One study found a larger pain reduction with TENS after one week but not after three or six months. In addition, one cross-over study found a slightly larger general improvement with TENS. The remaining two studies did not find any differences in pain, functional status or mobility. In conclusion, the evidence on the efficacy of TENS in low back pain is contradictory.

It is unknown whether TENS is useful in low back pain patients.

Ultrasound therapy, electrotherapy and laser therapy

Van der Windt et al.[59] carried out a systematic review of ultrasound therapy in musculoskeletal disorders. The review covered 38 studies. One study looked at the effectiveness of ultrasound therapy in patients with degenerative rheumatic disorders, including disorders in the low back. The authors concluded that there is little evidence in favor of ultrasound therapy in the management of musculoskeletal disorders. This conclusion is in agreement with that of a previous meta-analysis of the same topic carried out by Gam and Johannsen.[60] The latter meta-analysis included a total of 22 studies, of which two trials concerned patients with low back pain. However, the results of those trials were not presented separately. No clear statement about the efficacy of ultrasound therapy in

patients with low back pain can be made on the basis of these reviews.

The efficacy of electrotherapy in patients with low back pain was reviewed by van der Heijden et al.[61] Eleven trials were included. Electrotherapy encompasses direct current therapies (e.g. diadynamic and ultra-reiz therapies) and alternating current therapies (e.g. TENS and interferential therapy). The authors concluded that there is insufficient evidence that electrotherapy is better than either placebo treatment, an active approach, or the combination of different forms of electrotherapy.

A meta-analysis of the effectiveness of low-level laser therapy in patients with musculoskeletal disorders was performed by Gam et al.[62] Twenty-three randomized controlled trials were included, one of which concerned patients with low back pain. The authors concluded that laser therapy has no effect on the pain resulting from musculoskeletal disorders. De Bie et al.[63] carried out a systematic review of the efficacy of therapy with 904-nm laser in patients with musculoskeletal disorders. A total of 25 trials were found, of which two studies involved patients with low back pain. The methodological quality of one study was low, while that of the other was high. Neither study was able to show that laser therapy was effective.

It is unknown whether ultrasound therapy, electrotherapy or laser therapy is useful in low back pain. However, because they are passive interventions, they are not recommended.

Exercise in water

Two randomized controlled trials describe the effects of exercise in water in patients with chronic low back pain of greater than three months' duration.[64,65] One study did not find any difference between exercising in water and exercising on land as both patient groups exhibited improvements in functioning and decreases in pain. The other study found that exercise in water results in an improvement in functional status but no significant improvement was found in mobility, pain intensity, or neurological test results. Overall, there is limited evidence to show that exercise in water is effective in improving the functional status of patients with chronic low back pain. In addition, there is limited evidence showing that exercise in water is as effective as exercise on land.

Exercise in water may be useful in chronic low back pain patients.

Explanation of the recommended therapeutic approach

1. Treating low back pain that follows a normal course

Treatment consists of a single session in which the physical therapist reassures the patient and encourages him to stay active. The physical therapist explains that low back pain is not harmful and that it is better to stay active and to resume gradually normal activities and normal participation in society. In order to reassure and motivate the patient, the physical therapist may ask him to practice movements that are deemed necessary for activities in daily life. If necessary, a second appointment may be made to evaluate the course of the disability and participation problems.

2. Treating low back pain that follows an abnormal course

Behavioral approach

The behavioral approach to therapy focuses on preventing further disability.[54] Treatment may follow an operant approach, in which the emphasis is on pain behavior, a respondent approach, in which the emphasis is on the recognition of tension, or a cognitive approach, in which the emphasis is on the patient's expectations and ideas. The operant approach is best suited to the physical therapist's professional domain. First described by Fordyce et al. in 1973, the operant approach's main purposes are to increase the patient's level of activity and to decrease pain behavior in such a way that the patient is able to perform his desired activities despite the pain.[54]

The characteristic behavioral principles involved are active participation and time-contingency. Active participation means that the patient co-operates actively in treatment and feels responsible for the results. The objective is to promote the patient's

control over his own movement behavior. Time-contingency means that time, rather than pain, determines the degree of progress with activities. In other words, the patients stops a certain activity, or exercise, because a certain amount of time has elapsed and not because pain has increased. More details of time-contingent activities are given below in the description of exercise therapy. The idea is to teach the patient to function despite the presence of pain. During treatment, the patient will receive positive feedback on his progress.

Information and advice

The physical therapist's main contribution to treating low back pain is to coach the patient to regain control over his function and activities. Coaching may include activating, reassuring and motivating the patient, assessing progress, and rewarding him through positive feedback. Therefore, patient education plays an important role in the process of physical therapy and special skills are required to ensure that the patient gets the maximum benefit. Research by Knibbe and van Zuilekom[66] showed that it is important to educate the patient in such a way that he becomes aware that his own behavior influences back pain. These authors write: "Through education, patients should learn to feel responsible for the health of their own backs. Patients must get the feeling that they themselves can exercise control over their recovery and prevent recurrence."

Effective education requires knowledge, educational skills, and the use of some behavioral techniques. Van der Burgt and Verhulst[67] carried out an overview of the educational models used in public counseling, from which they derived a model of patient education that could be applied by allied health professionals. They integrated the Attitude, Social Influence and Personal Efficacy determinant model with the step-by-step educational model proposed by Hoenen et al.[68] In the Attitude, Social Influence and Personal Efficacy model, it is hypothesized that the patient's readiness to change his behavior is determined by an interplay between attitude (How does the person perceive the change in behavior?), social influence (How do others perceive the change in behavior?) and the patient's perception of his own efficacy, his self-efficacy (Will it or won't it work?). The educational model proposed by Hoenen et al. envisages the stages of "being open", "understanding", "wanting" and "doing". For allied health professionals, van der Burgt and Verhulst added two additional steps: "being able" and "keeping on doing". Van der Burgt and Verhulst view education as being a process in which maintenance of the new behavior is the last step. This final step cannot be achieved if the preceding steps have not been taken. Hence, the six steps must be taken in succession. See table 4.

Table 4. The six steps in the process of patient education proposed by van der Burgt and Verhulst.[67]

1. Being open: the physical therapist tries to respond sensitively to the patient's experiences, expectations, questions and worries.
2. Understanding: information must be offered in such a way that the patient is able to understand and remember it.
3. Wanting: the physical therapist evaluates what either drives or prevents the patient from performing a particular behavior; the physical therapist offers support and provides information about possibilities and alternatives; agreements made should be feasible.
4. Being able: the patient must be able to perform the desired behavior; functional activities are practiced.
5. Doing: the physical therapist makes clear, concrete and feasible agreements with the patient and sets concrete targets.
6. Keeping on doing: during each treatment session there must be communication about whether or not the patient thinks he will be able to perform and maintain the new behavior; if there are problems, solutions must be sought.

For more information on this disorder a KNGF-brochure 'Less bothered by your back' that can be given to patients is available. For patients with chronic non-specific low back complaints, there has been developed a list with focal points by the NPCF (Dutch Patients and Consumers Federation), to prepare the discussions with care takers.

Promoting compliance

Sluijs[69] describes three important factors that promote non-compliance. The first is problems experienced by the patient in attempting to carry out the exercises and instructions given by the physical therapist. The second is a lack of positive feedback. The third is the feeling of helplessness the patient may experience if he thinks the exercise will not help. Other factors, such as a poor prognosis or the patient not feeling significantly hindered by the disorder, lead to only moderate compliance. Sluijs did not find any differences in compliance between men and women. Poorly educated persons were a little more compliant than the highly educated. Sluijs recommends that the physical therapist should explore carefully the extent to which patients are able to comply with the prescribed exercises and advice, and seek solutions to any difficulties together with the patient. The manual on patient education Sluijs wrote for physical therapists[70] contains a checklist of the measures that can be taken to promote compliance. See Table 5.

A distinction is made between short-term compliance up until treatment is over and long-term compliance after the end of the treatment period. To promote short-term compliance, it is important that the positive consequences of the new behavior are made as clear as possible and that the patient is taught to use cues. For example, a physical therapist may teach a telephone operator that he should correct his

Table 5. Checklist of measures that promote compliance.

1. Physical therapist-patient relationship: a good interpersonal relationship between physical therapist and patient forms the foundation for every care process.
2. Patient perceptions: the physical therapist should be receptive to the patient's thoughts and perceptions so that he can tailor information to the patient's ideas and frame of reference.
3. Discussion of compliance: the physical therapist should talk to the patient about what is easy and what causes problems.
4. Prevention of problems, and tailoring: the physical therapist should refrain from giving advice that is impossible or extremely difficult for the patient to act on; feasible options should be explored together with the patient.
5. Solving compliance problems: the physical therapist should ask about problems with compliance, explore the underlying reasons for them, and seek solutions or alternatives.
6. Positive feedback: the physical therapist should motivate the patient by giving positive feedback.
7. Use of cues: cues are signs that remind the patient of a certain behavior; by linking behavior to a routine, there is a greater chance that the new behavior will become routine.
8. Generalization: the patient must learn to transfer what he has learned to new situations; this way the patient learns to react adequately in the future.
9. Self-efficacy: the patient should have confidence in his own efficacy; the physical therapist can help build confidence by setting realistic goals and by evaluating behavior positively.
10. Physical therapist-physician co-operation: both practitioners should keep each other informed and support each other's advice.
11. Methodical conduct: the physical therapist should make a treatment plan and evaluate the extent to which the objectives have been met; with respect to patient education, he should ask himself: "Does the patient know what he needs to know and does he do what he should do?"

posture whenever the phone rings. The achievement of long-term compliance is comparable with the process of changing behavior, in this case, movement behavior. The patient's confidence in his own ability (his self-efficacy) and a belief that the advantages of the behavioral change will outweigh the disadvantages are essential in bringing about that change. In practice, this means that the physical therapist and patient must together select feasible goals and discuss the advantages and disadvantages of the new behavior. In addition, it is important that the physical therapist provides information in a step-by-step and systematic manner and in a way that corresponds to the patient's knowledge, ideas and experiences. The form and content of the information should be tuned to the specific phase of the behavioral change the patient is going through. See Table 4. By analyzing the various steps in the process and by asking, for example, which behavior the patient is not able to maintain and why, problems with compliance will become clear. Solutions to these problems should be sought together with the patient. The patient should be taught to transfer what he has learned about adequate coping strategies to possible future situations. The physical therapist will need to take into account any social factors that maintain the patient's behavior.

Exercise therapy

Increasing activities using a time-contingent approach

In a time-contingent program, activities are increased step by step on the basis of previously agreed stages (graded activity) that do not depend on the level of pain. See Table 6. The objective is to increase the patient's level of activity and to teach him how to operate within his physical capabilities. In order to fit the program to the patient's needs as closely as possible, he will be asked which activities he feels are most limited and which are most important. These activities will provide the points of departure for treatment.

Firstly, a baseline level for the activities to be practiced will be set. This is done by asking the patient to perform the activities as long or as frequently as possible. He must be told that the purpose of this baseline measurement is to make an accurate estimate of his current activity level. The patient must show that he can perform this level of activity without undue stress. It is preferable to perform the measurements repeatedly so that a more reliable estimate of the starting level can be achieved. The mean values of recorded parameters such as time, duration, weight and frequency are calculated to provide baseline measures for each activity. During the baseline assessment, the physical therapist should pay attention to the quality of the patient's movements. Subsequently, a feasible goal is agreed for each activity. The physical therapist will then grade the activities, starting some way below the baseline level and progressing to the projected outcome level, by carefully balancing the load and the patient's load-bearing capacity. The number of steps in the program and their size will depend on the difference between the patient's starting level and the projected outcome level and on the patient's load-bearing capacity. These must be estimated by the physical therapist. Activities may be practiced at home as well as on the physical therapist's premises. It is important that pain is not allowed to obstruct the exercise assignments. In order to observe the patient's progress, these guidelines recommend the use of graphs and training records.[71]

The use of painkillers need not stand in the way of building up activities. It may be good advice to increase the level of activities first and subsequently decrease the medication dose at a later stage while keeping the level of activity constant. If the patient's activity level decreases, for example, due to fear of movement or a passive coping strategy, the patient will be encouraged to move in safe surroundings under the supervision of the physical therapist. The level of supervision should be decreased during the course of the treatment session. In the beginning, control is in hands of the physical therapist. He will tell the patient what, how and how often something should be done. Later, the patient himself will gradually take over.

Treatment duration

The duration of treatment in patients with low back pain that follows an abnormal course depends on the course of the complaint, the time available for therapy, and the nature of any limiting personal and

Table 6. Contrasting examples of pain-contingent and time-contingent treatment.

Pain-contingent treatment The patient walks with the therapist. After 100 meters, the patient says that he is in pain. They sit down for a while. During the rest, they chat until "it's better" and walking is resumed. In effect the following happens: walking seems to be punished by pain, so walking will be reduced; the pain seems to be rewarded by a rest, so resting will increase; resting seems to be rewarded by social talk, so resting will increase.
Time-contingent treatment The patient walks with the therapist. They agree beforehand to walk to a particular corner with a bench. There they sit down for five minutes before walking back. It may be difficult and painful, or it may be easy and perhaps they could have gone further. But they stick to their agreement and do not walk more nor less. Afterward, the physical therapist gives positive feedback on the progress made.

external factors and the extent to which these can be influenced. It is recommended that explicit agreements are made with the patient at the start and finish of treatment. These will have a positive influence on the patient's control over his functioning.

Conclusion and written report to referring physician

The way in which treatment is concluded, including reporting back to the physician and writing a report, should conform to the respective KNGF guidelines entitled "Communicating with and reporting back to general practitioners"[72] and "Physiotherapeutic documentation and reporting".[73]

The legal significance towards the guidelines

Guidelines are no statutory regulations, but they give insights and recommendations, based on the results of scientific research, which health care workers must fulfill to attain quality care. Since the recommendations are mainly based on the average patient, the health care workers have to use their professional autonomy to deviate from the guidelines if the patient's situation requires this. Whenever there is a deviation from the guideline, this has to be augmented and documented.[1,2] The responsibility for the interventions remain therefore by the individual physical therapist.

Revisions

The KNGF-guidelines are the first development in clinical questions pertaining to diagnostics, treatment and prevention for patients with a non-specific low back pain. Developments that can improve the physical therapeutic care of this group of patients, can change the current insights written in the guidelines. In the method for developing and implementing guidelines is indicated that all guidelines will be revised after three to five years maximum after the original publication.[1,2] This means that the KNGF, together with the working group, will decide not later than in the year 2006 if these guidelines are is still accurate. If necessary a new working group will be installed to revise the guideline. The validity of the guidelines expire if new developments give reasons to start a reversionary process.

Before the reversionary process, also the Method for Guideline Development and Implementation will be updated based on new insights and cooperation agreements made between the several guidelines developers in The Netherlands. The consensus products of the Evidence Based Guideline Meeting (EBRO platform), which are developed under the auspices of the CBO, will be included in the updated method. The uniform and transparent methods for the determination of the amount of evidence and the derived recommendations for practice are important improvements.

External financing

This guidelines is subsidized by the Ministry of Public Health Care, Welfare and Sports (VWS) in the framework program 'Quality Support Policy Allied Health Professions (OKPZ)'. The possible interests of

the subsidizer have not influenced the content and the related recommendations.

Acknowledgements

Special words of gratitude are in order to the multidisciplinary working committee for the production of these guidelines for the Koninklijk Nederlands Genootschap voor Fysiotherapie (KNGF; Royal Dutch Society for Physical Therapy). Many thanks to, in alphabetical order: PF van Akkerveeken PhD (orthopedic surgeon, Rug Advies Centra Nederland), RM Bakker-Rens MSc (occupational physician, Dutch Society for Occupational Practice), AJ Engers PT, MSc (psychologist and human movement scientist, Centre of Care Research, St Radboud Medical Centre, Nijmegen), L Göeken PhD (rehabilitation physician, Dutch Society for Rehabilitation Physicians), JMA Mens PhD (orthopedic surgeon, Spine and Joint Centre, Rotterdam), HHCFM van Maasakkers PT (Rugcentrum Uden), ACM Romeijnders MSc (primary care physician, Dutch Society for General Practice), MA Schmitt PT (School of Physiotherapy, Utrecht), JWS Vlaeyen PhD (psychologist, University of Maastricht), and A de Wijer PT, PhD (School of Physiotherapy, Utrecht). Also, we would like to thank all the physical therapists who have co-operated in the field check. Finally, we would like to thank NE Knibbe MSc (human movement scientist, Locomotion), YF Heerkens PhD and EMHM Vogels MSc (both from the Dutch Institute of Allied Health Professions) for their contributions to these guidelines.

List of abbreviations and glossary

CI	Confidence interval
ES	Effect size
ICIDH	International Classification of Functioning, Disability and Health
KNGF	Royal Dutch Society for Physical Therapy
NHG	Dutch Society of Primary Care Physicians
NVAB	Dutch Association of Occupational Physicians
TENS	Transcutaneous electrical nerve stimulation

Activity	An individual's actual activity and behavior
95%CI	A range of values within which there is a 0.95 probability that the real value of a measured parameter is included
Disability	Inability to perform an activity in the manner or to the extent considered normal for that person
(Body) functions	Physiological functions of body systems (including psychological functions)
Impairment	Problem with the function or structure of part of the body
Meta-analysis	A systematic review of the scientific literature in which the results of all the studies found on a particular topic are combined (quantitatively) to derive a single conclusion
Participation	Involvement in a life situation
Participation restriction	Problems an individual may experience with normal involvement in life situations
(Body) structure	Anatomical part of the body, such as an organ or limb, or its component
Systematic review	A systematic review of the scientific literature in which the conclusion describes (qualitatively) the results of all the studies found on a particular topic

References

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

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

3 Van der Valk RWA, Dekker J, Van Baar ME. Physical therapy for patients with back pain. Physiother 1995;81:345-351.

4 Engers AJ, Schers H, Oostendorp RAB, Wensing M, Koes BW, Grol R. Het handelen van Nederlandse fysiotherapeuten bij lage-rugpijn: een beschrijvend onderzoek van de dagelijkse praktijk. Ned Tijdschr Fysiother 2001;111:142-51.

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

6 Hendriks HJM, Bekkering GE, van Ettekoven H, Brandsma JW, van der Wees PhJ, 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. Physiother 2000;86:535-547.

7 Grol RTPM, Van Everdingen JJE, Casparie AP. Invoering van richtlijnen en veranderingen voor de medische, paramedische en verpleegkundige praktijk. De Tijdstroom, Utrecht, 1994.

8 Goossens MEJB, Evers SMAA. Economic evaluation of back pain interventions. J Occup Rehab 1997;7:15-32.

9 Deskundigheidbevorderingspakket KNGF-richtlijn Lage-rugpijn. Bijlage bij KNGF-richtlijn Lage-rugpijn. Ned Tijdschr Fysiother 2001, 111,: 3: suppl.

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

11 Faas A, Chavannes AW, Koes BW, van der Hoogen JMM, Mens JMA, Smeele LJM, et al. NHG-Standaard Lage-Rugpijn. Huisarts Wet 1996;39:18-31.

12 Richtlijnen voor het handelen van de bedrijfsarts bij werknemers met lage-rugklachten. Netherlands: Nederlandse Vereniging voor Arbeids- en Bedrijfsgeneeskunde; 1999.

13 Bigos S, Bowyer O, Braen G, et al. Acute low back problems in adults:assessment and treatment. Clinical practice guideline number 14. AHCPR Pub 95-0643. Department of Health and Human Services, Agency for Health Care Policy and Research; 1994.

14 Waddell G, Feder G, McIntosh A, Lewis M, Hutchinson A. Low back pain evidence review. London, UK: Royal College of Primary Care Physicians; 1996.

15 New Zealand acute low back pain guide. Wellington, NZ: ACC and National Health Committee; 1997.

16 Abenhaim L, Rossignol M, Valat J, Nordin M, Avouac B, Blotman F, et al. The role of activity in the therapeutic management of back pain. Report of the international Paris Task Force on Back Pain. Spine 2000;25:1s-33s.

17 ICIDH-2: Internationale classificatie van het menselijk functioneren. Nederlandse vertaling van het Beta-2 voorstel, volledige versie. Bilthoven, Netherlands: RIVM; 1999.

18 Waddell G. The back pain revolution. Philadelphia: Churchill Livingstone; 1998.

19 Von Korff M. Studying the natural history of a back pain. Spine 1994;19:2041S-6S.

20 Frymoyer JW. Medical progress: back pain and sciatica. N Engl J Med 1988;318:291-300.

21 Lamberts H. In het huis van de huisarts. Verslag van het Transitieproject. Lelystad, Netherlands: Meditekst; 1991.

22 Schers H, Drijver R, Kastein M, van Doremalen J, van den Hoogen H, Braspenning J. A-specifieke lage rugpijnklachten in de huisartspraktijk. Nijmegen, Netherlands: Landelijk Informatie Netwerk Huisartsenzorg; 1998.

23. Van Ravensberg CD, van Klaveren AAJ, Wams HWA, Elvers JWH, Oostendorp RAB, Hendriks HJM. Variabelen in samenhang met het aantal behandelingen fysiotherapie. Amersfoort, Netherlands: NPi; 1995.

24 Van Tulder MW, Koes BW, Bouter LM. A cost-of-illness study of back pain in the Netherlands. Pain 1995;62:233-40.

25 Nachemson AL. Newest knowledge of low back pain: a critical look. Clin Orthop Relat Res 1992;279:8-20.

26 Van de Hoogen JMM, Koes BW, Devillé W, van Eijk JThM, Bouter LM. De prognose van de aan de huisarts gepresenteerde lage-rugpijn. Huisarts Wet 1998;41:62-8.

27 Von Korff M, Saunders K. The course of back pain in primary care. Spine 1996;21:2833-9.

28 Mason V. The prevalence of back pain in Great Brittain. Office of Population Censuses and Surveys Division, HSMO, London, 1994. In: Waddell G, editor. The back pain revolution. Chapter 7. The clinical course of low back pain. London, UK: Churchill Livingstone; 1998.

29 Waddell G. A new clinical model for the treatment of low-back pain. Spine 1987;12:632-44.

30 Waddell G. Bio-psychosocial analysis of low back pain. Baillières Clin Rheumatol 1992;6:523-57.

31 Linton SJ. Psychological factors in neck and low back pain. In: Nachemson AN, Jonsson E, editors. Neck and back pain: the scientific evidence of causes, diagnosis and treatment. New York: Lippincott Williams and Wilkins; 2000.

32 Waddell G, Waddel H. Social influences on neck and low back pain. In: Nachemson AN, Jonsson E, editors. Neck and back pain: the scientific evidence of causes, diagnosis and treatment. New York: Lippincott Williams and Wilkins; 2000.

33 Folkman S, Lazarus RS. An analysis of coping in a middle-aged community sample. J Health Soc Behav 1980;21:219-39.

34 Jensen MP, Turner JA, Romano JM, Karoly P. Coping with chronic pain: a critical review of the literature. Pain 1991;47:249-83.

35 Härkäpää K, Järvikoski A, Vakkari T. Associations of locus-of-control beliefs with pain coping strategies and other pain-related cognitions in back pain patients. Br J Health Psychol 1996;1(1):51-63.

36 Vlaeyen JWS, Kole-Snijders A, Rotteveel AM, Ruesink R, Heuts P. The role of fear of movement (re)injury in pain disability. J Occup Rehabil 1995;5:235-51.

37 Van den Heuvel CMF, Vogels EMHM, Wams HWA. Verslag van het HOF-project. Handreikingen voor de communicatie tussen huisarts en fysiotherapeut, oefentherapeut-Cesar en/of oefentherapeut-Mensendieck. KNGF, LHV, NVOM, VBC. Amersfoort, Netherlands: NPi; 1999.

38 Brouwer T, Nonhof-Boiten JC, Uilenreef-Tobi FC. Diagnostiek in de fysiotherapie: proces en werkwijze. Utrecht, Netherlands: Wetenschappelijke uitgeverij Bunge; 1995.

39 Van Ravensberg CD, Oostendorp RAB, Heerkens YF. Diagnostiek, basis voor behandelplan en evaluatie. In: Vaes P, Aufdemkampe

G, den Dekker JB, van Ham I, Smits-Engelsman B, editors. Jaarboek Fysiotherapie, Houten, The Netherlands: Bohn Stafleu Van Loghum, 1997. p. 302-25.
40 Oostendorp RAB, van Ravensberg CD, Wams HWA, Heerkens YF, Hendriks HJM. Fysiotherapie: wat omvat het? Bijblijven 1996;12:17-39.
41 Hendriks HJM, Oostendorp RAB, Bernards ATM, van Ravensberg CD, Heerkens YF, Nelson RM. The diagnostic process and indication for physiotherapy: a prerequisite for treatment and outcome evaluation. Phys Ther Rev 2000;5:29-47.
42 Beurskens AJHM, de Vet HCW, Köke AJA. Responsiveness of functional status in low back pain: a comparison of different instruments. Pain 1996;65:71-6.
43 Schoppink LEM, van Tulder MW, Koes BW, Beurskens AJHM, de Bie RA. Reliability and validity of the Dutch adaptation of the Quebec Back Pain Disability Scale. Phys Ther 1996;76:268-75.
44 Köke AJA, Heuts PHTG, Vlaeyen JWS, Weber WEJ. Meetinstrumenten chronische pijn. Deel 1: functionele status. Maastricht, Netherlands: Pijn Kennis Centrum; 1999.
45 Moons KGM, van der Graaf Y. Evaluatie van de toegevoegde waarde van diagnostische tests. Ned Tijdschr Geneesk 2000;144:1256-61.
46 Potter NA, Rothstein JM. Intertester reliability for selected clinical tests of the sacroiliac joint. Phys Ther 1985;65:1671-5.
47 Van Tulder MW, Koes BW, Bouter LM. Conservative treatment of acute and chronic nonspecific low back pain: a systematic review of randomized controlled trials of the most common interventions. Spine 1997;22:2128-56.
48 Van Tulder MW, Koes BW, Assendelft WJJ, Bouter LM. The effectiveness of conservative treatment of acute and chronic low back pain. Amsterdam, Netherlands: EMGO Institute; 1999.
49. Hagen KB, Hilde G, Jamtvedt G, Winnem M. Bed rest for acute low back pain and sciatica (Cochrane Review). The Cochrane Library Issue 3. Oxford, UK: Update Software; 2000.
50 Waddell G, Feder G, Lewis M. Systematic reviews of bed rest and advice to stay active for acute low back pain. Br J Gen Pract 1997;47:647-52.
51 Van Tulder MW, Malmivaara A, Esmail R, Koes BW. Exercise therapy for low back pain (Cochrane Review). The Cochrane Library Issue 3. Oxford, UK: Update Software; 2000.
52 Hilde G, Bø K. Effect of exercise in the treatment of low back pain: a systematic review emphasizing type and dose of exercise. Phys Ther Rev 1998;3:107-17.
53 Vlaeyen JWS, Kole-Snijders AMJ, van Eek H. Chronische pijn en revalidatie: praktijkreeks gedragstherapie. Houten, Netherlands: Bohn Stafleu Van Loghum, 1996.
54 Bekkering GE, Hendriks HJM, Oostendorp RAB. KNGF-richtlijn Lage-rugpijn gepubliceerd. Fysiopraxis 2001;10(4):28-31. Deskundigheidsbevorderingspakket KNGF-richtlijn Lage-rugpijn. Fysiopraxis 2001 (10), supplement.
55 Van Tulder MW, Ostelo RWJG, Vlaeyen JWS, Linton SJ, Morley SJ, Assendelft WJJ. Behavioural treatment for chronic low back pain (Cochrane Review). The Cochrane Library Issue 3. Oxford, UK: Update Software; 2000.
56 Turner JA. Educational and behavioral interventions for back pain in primary care. Spine 1996;21:2851-9.
57 van der Heijden GJMG, Beurskens AJHM, Assendelft WJJ, de Vet HCW, Bouter LM. The efficacy of traction for back and neck pain: a systematic blinded review of randomized clinical trial methods. Phys Ther 1995;75:18-29.
58 Ernst E. Massage therapy for low back pain: a systematic review. J Pain Symptom Manage 1999;17:65-9.
59 Van der Windt DAWM, van der Heijden GJMG, Berg SGM. Effectiviteit van ultrageluidbehandeling voor aandoeningen van het bewegingsapparaat: een systematische review. Ned T Fysiother 1999;109:14-23.
60 Gam JN, Johannsen J. Ultrasound therapy in musculoskeletal disorders: a meta-analysis. Pain 1995;63:85-91.
61 Van der Heijden GJMG, Torenbeek M, van der Windt DAWM, Hidding A, Dekker J, Bouter LM. Transcutaneous electrotherapy for musculoskeletal disorders: a systematic review. In: De effectiviteit van fysische therapie; elektrotherapie, lasertherapie, ultrageluidbehandeling. Den Haag, The Netherlands: Gezondheidsraad; 1999.
62 Gam AN, Thorzen H, Lonnberg F. The effect of low-level laser therapy on musculoskeletal pain: a meta-analysis. Pain 1993;52:63-6.
63 De Bie RA, Verhagen AP, Lenssen AF, de Vet HCW, van de Wildenberg FAJM, Kootstra G, Knipschild PG. Efficacy of 904-nm laser therapy in the management of musculoskeletal disorders: a systematic review. Phys Ther Rev 1998;3:59-72.
64 Sjogren T, Long N, Storay I, Smith J. Group hydrotherapy versus group land-based treatment for chronic low back pain. Physiother Res Int 1997;4:212-22.
65 McIlveen B, Robertson VJ. A randomized controlled study of the outcome of hydrotherapy for subjects with low back or back and leg pain. Physiother 1998;84:17-26.
66 Knibbe NE, Zuilekom A van. Eigen schuld? U bent snel weer beter ...? Een bijdrage aan de patiëntenvoorlichting bij secundaire preventie van lage rugklachten. Ned T Fysiother 1990;100:111-5.
67 Van den Burgt M, Verhulst F. Doen en blijven doen. Patiëntenvoorlichting in de paramedische praktijk. Houten/Diegem, Netherlands: Bohn Stafleu Van Lochem; 1996.
68 Hoenen JAJH, Tielen LM, Willink AE. Patiëntenvoorlichting stap voor stap: suggesties voor de huisarts voor de aanpak van patiëntenvoorlichting in het consult. Rijswijk, Netherlands: Uitgeverij voor gezondheidsbevordering, Stichting O&O; 1988.
69 Sluijs EM. Patient education in physical therapy. Utrecht: Nivel; 1991.
70 Sluijs E. Therapietrouw door voorlichting. Handleiding voor patiëntenvoorlichting in de fysiotherapie. Utrecht, Netherlands: Landelijk Centrum GVO; 1993.
71 Whiplash-team. Nieuwsbrief 4. Graded activity programma. Amersfoort: NPi; 2000.
72 Verhoeven ALJ, van den Heuvel CMF. KNGF-Richtlijn 'Informatieverstrekking huisarts'. Amersfoort, Netherlands: KNGF; 1995.
73 KNGF. Richtlijnen voor de fysiotherapeutische verslaglegging. Amersfoort, Netherlands: KNGF, 1993.